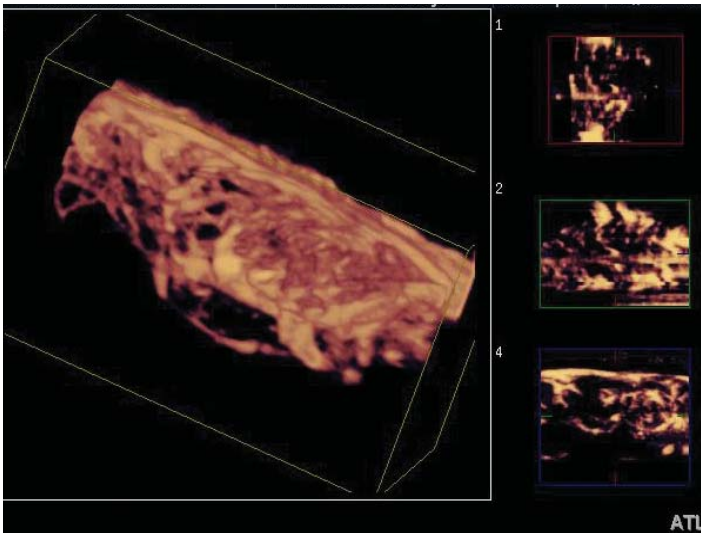
ISSN 1441-6891

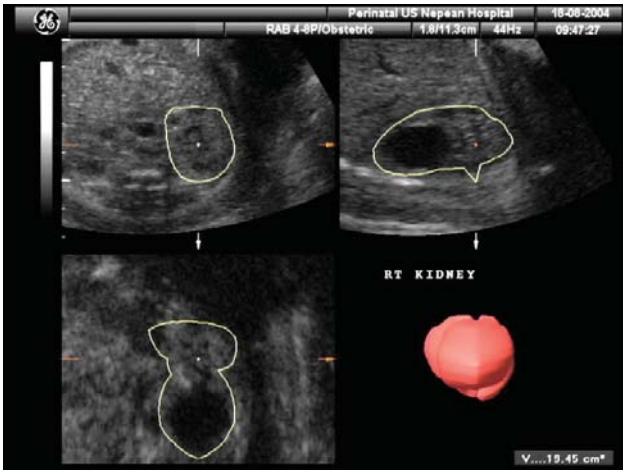
Volume 8 Number 4 November 2005

Australasian Society for Ultrasound in Medicine

ULTRASOUND BULLETIN

ASUM Multidisciplinary Ultrasound Workshop 2006
Gold Coast 24–25 March 2006
Obstetric and Gynaecological Ultrasound Symposium
Gold Coast 23–26 March 2006
Vascular Ultrasound Workshop
Gold Coast 24–25 March 2006
DMU Preparation Course
Gold Coast 22–26 March 2006
DDU Preparation Course
Gold Coast 22–23 March 2006
WFUMB World Congress Seoul
South Korea 28 May–1 June 2006
ASUM (NZ Branch) 2006 Ultrasound Conference
Napier, Hawkes Bay NZ 14–17 July 2006
ASUM Annual Scientific Meeting 2006 Melbourne
Melbourne 14–17 September 2006





- Fetal iliac angle
- Contrast ultrasound
- Small parts 3D ultrasound
- Duplex kidney
- Nuchal translucency
- Abnormal pregnancy
- LV failure

TOSHIBA

Premium Ultrasound Family

Aplio XV

Simply More Intelligent

Xario

Prime Ultrasound

With Toshiba's new Aplio XV and Xario we have developed a Premium Family designed to meet your daily needs with simply more intelligent technology.

With Aplio XV, Toshiba takes Ultrasound to a new level with pace setting technological developments such as 'Differential Tissue Harmonic Imaging'™, that meet the highest clinical standards.

With Xario, Toshiba brings premium technology to an affordable platform of compact, stylish design.

With our Premium Family

- **Enhance clinical and operational performance with an award winning platform.**
- **Improve workflow with advanced imaging techniques that help you achieve your goals for improved standardisation of studies.**
- **Increase diagnostic confidence with superb image quality for excellent diagnostic results.**
- **Reduce operator fatigue and exam time, and minimise work-related injuries with operational features that are designed for comfort and convenience.**

Innovation By Design

For over 125 years, Toshiba has led the world in developing technology to improve the quality of life. This Made for Life ™ commitment is reflected in our family of leading-edge Ultrasound systems. From creating our first X-Ray tube in 1915 to the introduction of the Aplio with Intelligent Component Architecture in 2001, Toshiba continues to build upon its legacy with award-winning technological innovation that improves patient care while providing lasting quality for a lifetime of value.

For more information or to experience Toshiba's award winning premium family contact your local Toshiba representative or phone (02) 9887 8003.

Email: Intouch@toshiba.com.au

Made for Life

Australasian Society for Ultrasound in Medicine

President
Dr David Rogers

Honorary Secretary
Mrs Roslyn Savage

Honorary Treasurer
Dr Andrew Ngu

Chief Executive Officer
Dr Caroline Hong

ULTRASOUND BULLETIN
Official publication of the Australasian Society for Ultrasound in Medicine

Published quarterly
ISSN 1441-6891

Indexed by the Sociedad Iberoamericana de Informacion Cientifien (SIIC) Databases

Editorial contributions
Original research, case reports, quiz cases, short articles, meeting reports and calendar information are invited and should be addressed to The Editor (address below)

Membership and general enquiries
to ASUM at the address below

Published on behalf of ASUM by Minnis Communications
Bill Minnis Director
4/16 Maple Grove
Toorak Melbourne Victoria 3142 Australia
tel +61 3 9824 5241 fax +61 3 9824 5247
email minnis@minniscomms.com.au

AUSTRALASIAN SOCIETY FOR ULTRASOUND IN MEDICINE
ABN 64 001 679 161
2/181 High Street
Willoughby Sydney NSW 2068 Australia
tel +61 2 9958 7655 fax +61 2 9958 8002
email asum@asum.com.au
website:http //www.asum.com.au

ISO 9001: 2000 Certified Quality Management Systems

ULTRASOUND BULLETIN

ASUM Ultrasound Bulletin November: 8: 4

Notes from the Editor

The 2005 Bulletin year is drawing to a close. With the Festive Season just around the corner, this edition has 'something for everyone'. There is a combination of academic articles covering vascular small parts, cardiac, O&G and general sonography, case reports, book reviews, reports and ASUM news.

Readers are also encouraged to consider developing an innovative research project in time to present to WFUMB 2009, to be held in Sydney. ASUM seeks to fund significant new ultrasound based research in Australasia and is looking to fund leading edge projects from the ASUM Research Fund. Readers could consider investigating areas such as high frequency ultrasound applications, therapeutic ultrasound or research into ultrasound of tissue elasticity.

The lead article in the Diagnostic Ultrasound section is an interesting, peer-reviewed article by Philip Schluter and Gary Pritchard, investigating the use of fetal iliac angle as a Down syndrome predictor. A fascinating article by Peter Burns considers the growing use of microbubble enhanced ultrasound and contrast agents in Canada, as well as examining the new relationship that is emerging between ultrasound and MR/CT. Fernandez describes some new applications of three-dimensional ultrasound in clinical practice other than obstetrics and gynaecology. Wye and Benzie present a comprehensive overview of prenatal diagnosis of a duplex kidney and ureterocele. Albalooshi and Benzie investigate the outcome where nuchal translucency measurements are increased in chromosomally normal fetuses. The remaining articles and Case Reports are equally valuable; all are recommended to readers.

The Abstracts section presents the readers with a fascinating and diverse range of abstracts from the highly successful Adelaide ASUM 2005 Scientific Meeting. Readers will appreciate the wealth of information and education available through ASUM and are encouraged to regularly attend scientific meetings.

ASUM editorial staff wish readers and ASUM members a happy Festive Season, safe holidays and a great start to 2006.

Assoc Prof Roger Davies
Editor

ASUM Multidis
Wednesday 22 – Sunday 26 March

Multidisciplinary Workshop Faculty

Anil Ahuja	Kim Forrester	Jo Newman
Bonita Anderson	Glenn Gardner	Simone Peacock
Peter Borzi	Roger Gent	Madelyn Peterson
Nick Bryant	Karen Goodwin	Rob Phillips
Darryl Burstow	Jon Hyett	Mandy Sampson
Yvonne Butcher	Jenifer Kidd	Roslyn Savage
Rob Cincotta	Pippa Kyle	Bridget Sutton
Teresa Clapham	Alison Lee-Tannock	Cameron Ward
Debbie Coghlan	Tony Lightfoot	Cathy West
Margaret Condon	Pauline McGrath	Alison White
Mike Dadd	Simon Meagher	Paul Woodgate
Andrew Edwards	Lucia Pemble	

Wednesday 22nd March 2005

DMU and DDU Preparation Courses

SESSION 1	Ultrasound propogation and basic transducers Transducer arrays and advanced techniques
SESSION 2	Standards and ultrasonic output Bioeffects and safety
SESSION 3	Imaging artifacts
SESSION 4	Imaging technology Q & A

Thursday 23rd March 2005

DMU and DDU Preparation Courses (Applied physics, Bioeffects and Safety)

SESSION 1	Doppler principles Doppler instrumentation
SESSION 2	DDU Tutorial DMU General and Obstetrics: Tutorial DMU Vascular: Vascular artifacts DMU Cardiac: Film analysis
SESSION 3	Measurements Phantoms Tissue harmonic imaging contrast agents
SESSION 4	DDU Tutorial DMU Vascular, General and Obstetrics: Film Analysis DMU Cardiac: Cardiac artifacts

Nuchal Translucency Course

SESSION 1	Principles of screening Practicalities of NT measurement
SESSION 2	NT and chromosome abnormality Screening and multiple pregnancy Biochemical screening 12-week anomaly scan
SESSION 3	Increased NT and normal chromosomes Counselling issues Invasive prenatal testing
SESSION 4	Assessment

Friday 24th March 2005

	O & G	Vascular	Musculoskeletal	General	DMU Preparation Courses
SESSION 1	Role of ultrasound in miscellaneous lumps and bumps in the neck Recognised and less recognised Doppler artifacts First trimester morphology scanning				**General / Obsteric** 1 Neck 2 Shoulder **Vascular** 1 Vascular anatomy. Physiology and haemodynamics overview **Cardiac** 1 Cardiac physiology and haemodynamics
SESSION 2	Obstetrics and gynaecology councilling	Carotids Renal arteries	**Workshops** Basic shoulder Alternate shoulder Elbow Hand and wrist	Untrasound of thyroid nodules	**General / Obsteric** 1 Liver, GB, bile Ducts 2 Knobology **Vascular** 1 Arterial case study review 2 Knobology **Cardiac** 1 Comprehensive 2D / Doppler examination and protocols
SESSION 3	**3D developments** Basic techniques 3D volumes in obstetrics 3D gynaecology	**Workshops** Carotids Aorta-iliac fistulas Internal hyperplasia	Elbow Hand and wrist	**Paediatric** Abdominal and renal	**General / Obsteric** 1 Paediatric abdominal and renal **Vascular** 1 Duplex techniques 2 Carotid, TCD, Aorta, Iliac, Mesenteric, REnal, Peripheral arterial, Penile **Cardiac** 1 the DMU Practical Examination 2 Workshop: The normal adult examination

ciplinary Workshop
2006 Conrad Jupiters, Gold Coast

	Friday 24th March 2005				
	O & G	**Vascular**	**Musculoskeletal**	**General**	**DMU Preparation Courses**
SESSION 4	**Gynaecology** Menorrhaghia Infertiltiy / IVF Ovarian cysts	Haemodynamics from the beginning Intimal thickening Aorta – iliac disease	**Workshops** Basic shoulder Alternative shoulder Elbow Hand and wrist	**Paediatric** Hip, head and spine	**General / Obsteric** 1 Paediatrics 2 Hip, head, spine **Vascular** 1 Duplex techniques 2 Carotid, TCD, Aorta, Iliac, Mesenteric, Renal, Peripheral arteries, Penile **Cardiac** 1 Prosthetic valves 2 Echo and systemic diseases

	Saturday 25th March 2005					
	O & G	**Vascular**	**Musculoskeletal**	**General**	**CARDIAC**	**DMU Preparation Courses**
SESSION 1	**Fetal cardiology** Normal fetal echo Abnormal fetal hearts and outcomes	**Workshops** Carotids DVT and deep venous insufficiency AV fistulas	Hip / groin hernia	Role of ultrasound in salivary gland lesions	Pericardial and myocardial disease	**General / Obsteric** 1 Testes 2 Mid trimester scan and measurements **Vascular** Venous duplex techniques 2 DVT, SVT, CVI, Pelvic veins, AVF, Bypass mapping, Hepatic, Portal
SESSION 2	**Screening** First trimester morphology, the genetic sonogram	Lower extremity venous disease	**Workshops** Hernia Thigh and knee Ankle and foot	**Workshop** Neck	Congenital heart disease embryology basic to complex	**General / Obsteric** 1 Renal and prostate 2 Legal, genetic councilling 3 Health communication **Vascular** 1 DVT, SVT, CVI, Pelvic veins, Bypass mapping, Hepatic, Portal
SESSION 3	**Fetal abnormalities** Fetal therapy – what the sonographer needs to look for Surgical outcomes of fetal abnormalities Neonatal outcomes of fetal anomolies	**Workshops** Carotids DVT Peripheral arterial deep venous insufficiency	Thigh and knee Mortons neuroma	Mammograms ultrasound correlation	Prosthetic valve assessment	**General / Obsteric** 1 Growth 2 Basic vascular – haemodynamics, DVT, Carotid **Vascular** 1 Complementary diagnostic techniques 2 interventional treatment 3 Follow-up venous pathologies, Venography, APG, Ligation, Coil and Filter placement, TIPS
SESSION 4	**Growth and wellbeing** Multiple pregnancies and what to look for IUGR and fetal wellbeing	Venous visceral diseases	**Workshops** Hernic Thigh and knee Ankle and foot	**Breast ultrasound** Benign vs malignant and special techniques	Case studies	**General / Obsteric** 1 Benign vs malignant 2 Special techniques **Vascular** 1 Venous duplex case study review 2 Critical review and discussion

See over for Sunday Program

Sunday 26th March 2005

DMU Preparation Courses

SESSION 1	**General / Obstetric** 1 Workshops on abdominal and 20-week scan **Vascular** 1Scanning Workshops: What to expect in an exam **Cardiac** 1 Exam techniques
SESSION 2	How to approach a written DMU Exam question and case studies
SESSION 3	1 The DMU – your questions answered 2 Film reading 3 Quality assurance

Pelvic floor ultrasound 2D, 3D, 4D an interactive educational session including virtual and live scanning

SESSION 1	2D pelvic floor ultrasound – the basics A sonographer's approach to pelvic floor imaging Pelvic floor imaging to guide the O & G surgeon: preop and adult
SESSION 2	3D / 4D pelvic floor ultrasound Clinical and research applications – Peter Dietz Introduction to Voluson hardware and 4D view
SESSION 3	Virtual and live scanning

Changing address? New job? Going overseas?
Make sure you tell ASUM
Contact tel +61 2 9958 0317 email asum@asum.com.au

Introducing the Philips HD11 System

Intelligent Design - user-centric ergonomics, powerful architecture and transducers for today's ultrasound suite

Intelligent Control - innovative interface, unprecedented exam optimisation and data management streamline exams

Revolutionary performance - extraordinary levels of clinical imaging

Revolutionary workflow - faster, more complete exams, quicker diagnoses

Call 1800 251 400 (Aust) 0800 251 400 (NZ) or go to www.medical.philips.com/iU22

HD11 Ultrasound

PHILIPS

sense and simplicity

What's the difference between Aquasonic® 100 and those other gels?

Clarity, reliability, and economy.

Aquasonic 100
Ultrasound Transmission Gel

The clarity that sonographers have counted on for over 40 years.

Purchasing that other gel seemed like a cost-conscious move, right? After all, while sitting on the shelf all gels are equal. But after three or four extra applications, those other gels aren't so cheap anymore.

Consider the superior formulation of Aquasonic 100 Ultrasound Transmission Gel. Aquasonic 100 aids in producing consistent, high-quality images, and since it won't dry out like other gels, it's cost-effective with each and every application. No wonder Aquasonic is the overwhelming choice of clinicians and ultrasound equipment manufacturers worldwide.

If you're currently using another ultrasound gel and would like to try Aquasonic 100, please call, fax, or e-mail. We'll send you a small sample that will go a long way.

PARKER

Parker Laboratories, Inc.
286 Eldridge Road, Fairfield, NJ 07004
973.276.9500 • Fax: 973.276.9510
www.parkerlabs.com
ISO 13485:1996 Certified

President's message

Dr David Rogers

ASUM MUST meeting

Greetings. We have just returned from an excellent meeting held by ASUM in conjunction with the Medical Ultrasound Society of Thailand (MUST) in Bangkok. The meeting was a huge success with over 300 delegates, held in a truly fabulous venue, the Conrad Hotel in Bangkok. ASUM provided a significant portion of the academic program with Dr Glenn McNally, Dr Simon Meagher, Mr Stephen Bird, Mr Roger Gent and myself presenting. There were some superb presentations from the Thai members. Of particular note was that of Professor Tongsong who had Dr Simon Meagher and myself stunned by the complexity and cleverness of his presentation using Macromedia Director instead of PowerPoint. No doubt we shall be researching this program. Dr Dhiraphongs, the President of MUST, put in a great deal of effort into the conference organisation and we all really enjoyed it.

ASUM holds a meeting in Asia each year, usually in November. It is a great way to gain education and also have a trip to Asia where many low priced but top quality resorts can be found. Next year we intend holding a joint meeting in Indonesia, so mark this event in your calendar.

Annual Scientific Meeting

The 2005 Annual Scientific Meeting, held in Adelaide in late September, was a huge success with an outstanding academic program. There were many top quality presenters, but of particular note were cutting edge presentations by Prof Peter Burns, Dr Jo Polak, Dr Rhodri Evans and Dr Rethy Chhem, to name but a few. The meeting was a great credit to the convenors, Mr Stephen Bird and Assoc Prof Roger Davies and their organising committee. The new Adelaide convention centre was top class and catered very well for the conference.

Council meetings

While at Adelaide, the Outgoing and Incoming Council Meetings were held. The former was the final Council meeting, in their current term, for three outstanding councillors.

First, Dr Glenn McNally, the most recent Past President, has made a huge contribution to ASUM over the years. He has steered the Society into a very good position and has been instrumental in many educational initiatives such as the Certificate for Clinician Performed Ultrasound (CCPU) courses and the DMU (Asia). He has been involved in DDU examining for many years and has been a frequent conference presenter. Fortunately, Glenn will maintain a role with ASUM, as Treasurer of the WFUMB 2009 Conference and, as such, is a member of the promotion team for this. Glenn will continue to oversee some educational projects. On behalf of ASUM, I extend my heartfelt thanks to Glenn for his tireless contribution.

Dr David Carpenter retires from his second term on Council; he was on Council from 1974 to 1983 and again from 1997 to 2005. David is well known to most ASUM members, being a Foundation Member and a Past President from 1981 to 1982. David has had a long career as a physicist in the Ultrasound Institute of the Department of Health and CSIRO and was instrumental in developing some landmark technologies in ultrasound. Most recently he has been Treasurer for ASUM and has been a pillar to rely upon. On behalf of ASUM, thank you David for your outstanding contribution.

Ms Janine Horton retires from Council after six years of significant contribution. Janine has been a driving force behind the DMU Advisory Committee and has been a champion of sonographer issues. She has given generously of her time in examining for the DMU. We will certainly miss Janine's efficiency and wish her well in her new career direction.

Council elections

At the Annual General Meeting, three new Councillors had their election to Council ratified. We welcome:

Dr John Crozier Vascular surgeon from Sydney as vascular representative;

Dr Andrew Ngu Obstetrician and gynaecologist from Melbourne and former President of ASUM 1998–2000; and

Mrs Michelle Pedretti Sonographer from Western Australia and former member of the ASUM Education Committee.

We also welcome the return to Council after re-election of Dr Matthew Andrews, Assoc Prof Roger Davies, Mr Stephen Bird, Mrs Kaye Griffiths and Mrs Roslyn Savage. I look forward to working with this well-balanced Council for the rest of my term.

China

In September, several ASUM Councillors were invited to present at the Annual Scientific Meeting of the Chinese Ultrasound Society held in Cheng Du. Prof Ron Benzie (sponsored by GE), Dr Glenn McNally, Dr Caroline Hong and myself presented at this large meeting, which was attended by over 1000 delegates.

The meeting was of high quality and some of it was conducted in English. Interpreters were available for our talks.

The Logical Choice

Leaders in Technology

Probe Testing Services

Digital acoustic analyser interrogates the entire probe structure from the connector contacts via the cable to the individual crystal elements.

Acoustic pulsing circuitry simulates the ultrasound system transmit signal.

Analysis

Each transsducer is scrutinised for microscopic fractures and degradation that will result in internal structure failure.

Hairline fractures or lens delamination allow the ingress of fluid that will eventually destroy the array.

Reporting

A comprehensive quantitative report of the test results is forwarded in PDF format by email.

Reports may be archived and used to track performance changes over time.

Performance reports are used for quality benchmarking and accreditation purposes.

Maintenance/Repairs

- Acoustic lens replacement
- Probe body shell repairs (cracks and damage)
- Strain relief (cable grommet) replacement
- Cable sheath repairs
- Connector repairs
- Complete restoration (As New)

probelogic™

smarttransducertechnology

1800 1PROBE (1800 177 623)

www.probelogic.com.au

Some very valuable links and friendships were made, especially with the President of the Chinese Ultrasound Society, Prof Jiang of Beijing. The banquets were amazing with a great number of courses of diverse foods.

China has been invited to be the focus country at our next Annual Scientific Meeting in Melbourne and we look forward to their presentations.

Vision College Kuala Lumpur

While in Bangkok, we met with representatives of the Vision College from Kuala Lumpur. In association with ASUM, they began this year running a course for the DMU (Asia) for Malaysian students.

They have put in a huge effort to get this up and running and the Malaysian Government is now looking to support sonographer training. Currently there are very few sonographers in Malaysia so this is quite a philosophical shift in this country.

Mr Alan Williams, a sonographer from Tasmania, is the main tutor at the school, supported by many obstetricians and radiologists in Kuala Lumpur.

ASUM has put in a lot of work here and we are supporting the school by providing the syllabus, examining expertise and some tutoring. Mr Roger Gent will kindly teach paediatrics in February and I shall teach vascular ultrasound in March 2006. We wish them all the best in this exciting venture.

DMU Part Two

Recently the Part Two exams for the DMU have been conducted. This involves a colossal effort on behalf of the examiners and the DMU Board of Examiners. It still amazes me and warms my heart that so many members willingly give of their time to voluntarily run this examination. I would like to thank all involved and wish all candidates success.

UK Presidential Exchange Program

In mid December, a delegation from ASUM is heading to England. Several years ago ASUM established a Presidential Exchange Program with the British Medical Ultrasound Society. Duly, it is now my turn to present at their Annual Scientific Meeting in Manchester. I shall be accompanied by Dr Caroline Hong and Dr Glenn McNally to continue the promotion of the WFUMB meeting in Sydney 2009. Time to pack the winter woollies, I suspect. This liaison is one of many now in place between ASUM and other countries and has helped raise the profile of ASUM throughout the world.

Looking forward to Christmas and 2006

Looking to next year, there is the Multidisciplinary Workshop in the Gold Coast in March. At the end of May the WFUMB Conference will be held in Korea. ASUM has supported this conference greatly and will be sending many speakers. To encourage people to attend, ASUM is offering some financial assistance to attending ASUM members. We look forward to this meeting with anticipation as it is the pinnacle of the ultrasound calendar, only held every three years. Our turn is next, in 2009.

Well, that just about concludes a very busy ASUM year. I wish you all a very Merry Christmas and hope Santa brings you all you wish. I hope you all have a peaceful summer break.

Until next year.

Dr David Rogers
President ASUM

ASUM seeks applications for research funding to be presented at WFUMB 2009 in Sydney

ASUM is seeking to support research which builds on the body of existing research findings and extends our knowledge of the applications, efficacy and safety of clinical ultrasound.
Applications are particularly invited in the areas of:

1 High frequency ultrasound
2 Therapeutic ultrasound applications
3 Tissue elasticity
4 Obstetric growth parameters pertinent to the whole Australian and/or New Zealand population
5 Flow mediated dilatation and/or intima media thickness studies

Projects in other areas will be considered, however it is unlikely that applications for projects that duplicate existing findings, or studies, will be successful except where it is judged that these are necessary to validate the findings of other studies.

Applications to be addressed to: The Chairman
ASUM Research and Grants Committee
2/181 High Street
Willoughby
NSW 2068 Australia

Enquiries to: Mr Keith Henderson email khenderson@asum.com.au

If you insist on paying $250,000 for a high-resolution ultrasound system, simply buy five of ours.*

The most complete solution in *high-resolution ultrasound*

an amazing technology...

MicroMaxx gives you big-machine performance in a lightweight package, weighing less than 3.5kg. This technology crossover point between hand-carried and heavy cart-based units opens a new era of ultrasound. This laptop-sized unit gives you the diagnostic confidence you need, in the office, department or at the point of care.

SonoSite is so confident in MicroMaxx's reliability that every system is backed by a 5 year warranty.

The MicroMaxx system can be hand-carried for mobile use or operated in the Mobile Docking System (MDS) for stationary use. It can also be used with MDS Lite.

*Based on average price; prices vary according to configuration purchased.

SonoSite MICROMAXX™

The emergence of an amazing technology

Sonosite Australasia Pty Ltd **Australia:** 1 300 663 516 **New Zealand:** 0 800 888 204

All correspondence should be directed to:

The Chief Executive Officer
AUstralasian Society for
Ultrasound in Medicine
2/181 High St
Willoughby
NSW 2068
Australia
asum@asum.com.au
http//www.asum.com.au

CEO's message

Dr Caroline Hong

As I started writing this message on my flight from the ASUM 2005 Adelaide Annual Scientific Meeting back to Sydney, I couldn't help but feel such a sense of pride about working for ASUM, which truly represents the peak organisation for ultrasound in medicine. Just observing and working with a multidisciplinary group of medical specialists, sonographers and the ultrasound industry, across all disciplines of health, is enough to energise and give meaning to our work at ASUM. To all the people who worked so hard, so passionately and with such enthusiasm, I want to say thank you over and over again. So much has happened since my last message and I can only write about a few major items at present.

ASUM 2005 Adelaide is over and the best ever

The superb venues at the Hyatt Regency Adelaide and the Adelaide Convention Centre overlooking River Torrens, the clear blue skies and the beautiful weather, all set the scene for a perfect start to the ASUM 2005 Annual Scientific Meeting.

Once again, we wish to publicly acknowledge the valuable contribution of the Convenors, Stephen Bird and Roger Davies. A huge thank you also goes to Cheryl Buckingham, Rosie Franklin, Anne Delon, Kaye Burgess, Jane Copley, Leah Kallos, Julie Olsen, Dr Denise Roach, Amanda Walsh, and Anne Robertson for all their hard work towards making this meeting in Adelaide a success.

The quality of the scientific program from the 10 keynote speakers and more than 50 other ASUM speakers was fantastic. We truly appreciate the impeccable presentations and willing contribution to the meeting from Prof Robert Gibson, Martin Necas, Dr Joseph Polak, Dr Rethy Chhem, Prof Peter Burns, Prof Pippa Kyle, A/Prof Anna Parsons, Dr Rhodri Evans, Dr Leandro Fernandez and Prof Byung Ihn Choi.

ASUM members, often perceived to be highly sociable creatures, also reported that the social wine tasting welcome reception and the Gala Dinner 'Dancing with the Stars' were among the best-attended functions ASUM has ever hosted. ASUM featured highly in the media on radio, television and the print media. I am still getting enquiries from media health writers about ASUM and for ultrasound stories. More than 500 people attended this meeting and ASUM would not have the success without the loyal and ongoing support of the sponsors, exhibitors and delegates.

To Toshiba, GE and Philips, our Gold sponsors, we say thank you. To all other exhibitors and sponsors, we value your continuing support at this meeting.

Of interest to some, the Faculty had a surprise when the Black Eyed Peas joined us after the Faculty Dinner, which was held at Shikki in the Hyatt Regency Adelaide Hotel.

A further report from the Convenor and photos are included elsewhere in this Bulletin.

ASUM MDW 2006 Gold Coast Fri 25 – Sun 27 March 2006

Now is the time to focus on the next major ASUM event, the ASUM Multidisciplinary Workshop. This was the brainchild of Dr David Rogers and is now in its third year in its current format, having run successfully in the Gold Coast and Melbourne and, now again, in the Gold Coast. The workshop program is well in place and the Conrad Jupiters at the Gold Coast is an attractive destination. Look out for

Australasian Society for Ultrasound in Medicine

Website: www.asum.com.au

ASUM extends a warm welcome to you

ASUM 2006 Meetings

24–25 Mar	Multidisciplinary Workshop	Gold Coast Australia
14–16 July	ASUM NZ Branch Ultrasound Conference Napier Hawkes Bay New Zealand	
15–17 Sept	Annual Scientific Meeting	Melbourne Australia

WFUMB 2009 World Congress: Sydney

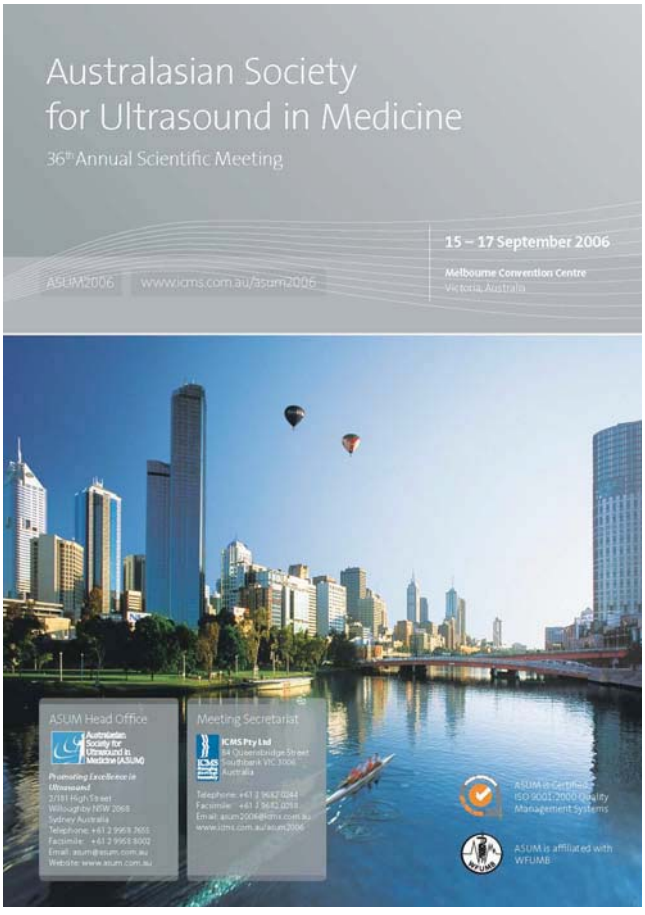
5–9 Sept **WFUMB2009 Congress** to be hosted by ASUM

For details, please contact ASUM

Address Suite 2, 181 High Street
Willoughby NSW 2068
Sydney, Australia

Phone +61 2 9958 7655
Fax +61 2 9958 8002
Email asum@asum.com.au

ASUM CEO: Dr Caroline Hong: carolinehong@asum.com.au



regular updates on the ASUM website www.asum.com.au. I also urge members to visit the website www.verygc.com or email vgc@goldcoast tourism for more information about the happenings and attraction of the Gold Coast in sunny Queensland.

WFUMB 2006 Seoul 28 May – 1 June 2006

This is a 'must attend' meeting for ASUM members. There are several important dates for members to note.

Abstract submissions are due on 30 November 2005

Early Bird registrations are due 28 February 2006.

ASUM is offering a one-off offer to ASUM members. Every ASUM member who registers for the WFUMB 2006 Seoul meeting will receive a $100 rebate to be used towards attending any ASUM meeting in 2006. All ASUM members who register with WFUMB 2006 (www. wfumb2006.com) are advised to contact ASUM CEO Dr Caroline Hong (email carolinehong@asum.com.au), to be eligible for the rebate and further surprises for the meeting.

ASUM, no doubt, is keen to encourage at least 200 ASUM members to go to the Seoul congress, which is also the congress where we will be launching the WFUMB 2009 Sydney World Congress.

ASUM New Zealand Napier Hawkes Bay 14–17 July 2006

This meeting is definitely confirmed for Napier at Hawkes Bay in New Zealand. Napier is located on the east coast of New Zealand's North Island in Hawkes Bay. It is reported that the Hawke's Bay Wine Country is New Zealand's leading food and wine region. Apparently, they have over 2200 hours of sunshine and Hawke's Bay is considered as a year-round holiday destination with an eclectic mix of visual and sensory experiences. Napier is also the Art Deco capital. Look up the website www.hawkesbaynz.com, and it is enough to get you planning to register for this meeting. Enquires can be directed to the Convenors, jayne.lloyd@hawkesbaydhb.govt.nz and rowena.tyman@hawkesbaydhb.govt.nz. Program planning is already in progress.

ASUM 2006 Melbourne 14–17 Sept 2006

Another meeting not to be missed and always a showcase for ASUM is our Annual Scientific Meeting. This time, it will be in Melbourne, Australia's second-largest city, after Sydney. Melbourne holds great festivals and is fantastic for shopping, food, wine, and fabulous arts. Outside Melbourne, there are the world-class wineries of the Yarra Valley, the mineral springs of Macedon Ranges and Spa Country, the coastal villages of the peninsulas to the alpine towns in the High Country, the Little Penguins at Philip Island and the spectacular Great Ocean Road. View www.visitmelbourne.com for planning your trip to Melbourne and also see www.asum.com.au for regular updates to register for this meeting. We have already a list of international keynote speakers organised to stimulate your passion for learning and updates on advances in ultrasound in medicine.

ASUM Councli

Council met on Saturday 1 October 2005 and considered many issues, some of which include discussions and decisions relating to the ASUM training centre, member subscriptions, sonographer professional indemnity, education, DMU, DDU, DMU (Asia), Asia Link programs, collaboration with other organisations, future meetings and Honorary Fellow and Life Members.

We are pleased to announce that the Council has appointed Margo Gill as Honorary Fellow for her outstanding contribution to the ultrasound profession and to the Society. More about Margo is reported in this issue.

At the Annual General Meeting held on 1 October, on recommendation from Council, Dr Peter Warren, Dr Ian McDonald and Dr Rob Gill, were approved to be Life Members of the Society, for their outstanding contribution to the profession and to the Society. More about these special awards is mentioned elsewhere in this issue.

The recent council election resulted in three new councilors, namely Dr John Crozier, Dr Andrew Ngu and Mrs Michelle Pedretti, for a term of three years on Council. Retired Councillors are Dr Dave Carpenter, Dr Glenn McNally and Ms Janine Horton. We are indebted to their long and valuable service to Council over the past years. ASUM is fortunate that they remain active in the society in other capacities and continue to be strong supporters of ASUM.

At the incoming Council meeting held on 1 October 2005, all members to committees and Boards of Examiners were also appointed. Details are updated on the ASUM website

ASUM International

The Society continues to remain active internationally, working in partnership and enhancing its profile internationally.

China

A delegation of four ASUM representatives were invited speakers by Dr Jiang YuXin at the recent 8th Society of Ultrasound/Chinese Medical Association in Chengdu, China in September this year, addressing more than 1000 delegates from all parts of China. Another ASUM member, Dr Ming Hao, was also a speaker in the Chinese session. We are also grateful to GE Medical for sponsoring Prof Ron Benzie for this meeting.

Indonesia

Dr Taufik Jamaan, being the first recipient of the ASUM Asia Link scholarship, completed a successful two weeks program in Sydney. We are indebted to Dr Glenn McNally and his staff at the Royal Women Hospital at Randwick and to Prof Ron Benzie, David Fauchon and the staff at the Nepean Hospital and also to Dr Harley Roberts of the Penrith Ultrasound for Women. More is reported elsewhere in this issue.

Vietnam

Through very enthusiastic efforts and the generous donations from Dr Harley Roberts and Prof Ron Benzie of the Nepean Hospital, ASUM is working on providing assistance to Vietnam in ultrasound training. More will be reported in future issues of the *Ultrasound Bulletin*.

Malaysia

The DMU(Asia) is progressing well with the first intake of students at Vision College in June this year. ASUM was invited to meet with the Ministry of Health and Vision College

to regarding training for government employees in sonography. This is a healthy development. DMU (Asia) and ASUM also received publicity in the news in Asia. The important role of sonographers and the multidisciplinary team approach, as represented by the unique ASUM membership, for the provision of ultrasound services is now gaining greater attention.

Korea

There will be no exchange in the year 2006 as most of the efforts will become part of the WFUMB 2006 Seoul World Congress. Members are all encouraged to log on to www.wfumb2006.com to submit your abstracts, register for early bird registrations and also to be updated on this important world congress. ASUM will be hosting a booth and launching the WFUMB2009 Sydney World Congress in Seoul in May 2006.

India

The Indian Federation for Ultrasound in Medicine and Biology has promoted the ASUM Asia link scholarship to its members and we will hear soon from IFUMB about their first scholarship recipient.

Denmark

The Collaborative Australasian Danish Undertaking for Continued Excellence in UltraSound (CADEUSUS) is finally happening. The ASUM President, Dr David Rogers, and Dr Roger Davies will be speaking at the 9th International Congress on Interventional Ultrasound to be held June 12–14, 2006 at Herlev Hospital University of Copenhagen in Denmark. Dr Christian Nolsoe, President of the Danish Society for Diagnostic Ultrasound (DSDU), is an invited speaker at the ASUM 2006 Annual Scientific Meeting to be held in Melbourne 14–17 September 2006.

Placement in Melbourne has also been organised for Dr Christoffer Brushøj, MD, who has a special interest in musculoskeletal ultrasound with the help of Dr Cheryl Bass. Dr Brushøj is currently a PhD student, Department of Radiology, Rigshospitalet, Copenhagen, Denmark. He has been working on his PhD thesis on patellofemoral pain including imaging techniques, examination techniques, functional tests, the medial plica and a RCT on prevention. During this period he was employed by the Ultrasound Section, Department of Radiology, Rigshospitalet and has gained knowledge of ultrasound scanning doing studies on US/MRI on patellofemoral pain and shin splints patients as well as by doing a study on reproducibility of tendon measurements using Ultrasound/MRI. More will be reported later.

Britain

An ASUM delegation is attending the BMUS2005 Manchester ultrasound meeting. Dr David Rogers is an invited speaker at the meeting as part of the Presidential exchange program between BMUS and ASUM.

Dr David Baxter, President of BMUS will attend in the alternate year, in 2006, as an invited speaker for ASUM 2006 in Melbourne. Dr Baxter is currently a Consultant Radiologist, Western Infirmary, Glasgow and Honorary Senior Lecturer, University of Glasgow since 1993. He is a general radiologist with subspecialty interest in oncology and GU, including renal transplantation and ultrasound.

Fiji

A request has come from an ASUM member, who is currently doing work in Fiji on behalf of RANZCR, to facilitate an ultrasound training program. This is currently being addressed by ASUM Council.

ASUM awards

On behalf of Council and members, we wish to extend our congratulations to all award winners announced at the recent ASUM 2005 Annual Scientific Meeting, namely, Prof Rob Gibson, Martin Necas, Neil Simons, Peter Coombs, Ann Quinton, David Watson, Fung Yee Chan and Faye Temple. Full details are listed on the ASUM website www.asum.com.au. Special thanks also go to the sponsors of the awards, GE Medical Systems, Toshiba, Philips and Siemens.

Mark these meetings in your diary for 2006

- ASUM 2006 Multidisciplinary Workshop - Gold Coast Fri 25 – Sat 26 March 2006
- WFUMB 2006 World Congress – Seoul Korea Sun 28 May to Thu 1 June 2006 (ASUM will be launching WFUMB 2009 at this Congress)
- ASUM 2006 NZ Branch Annual Scientific Meeting – Napier New Zealand Fri 14 –Sun 16 July 2006
- ASUM 2006 Annual Scientific Meeting – Melbourne Fri 15 – Sun 17 September 2006

For All details see http://www.asum.com.au

I would like to end this message for this year thanking all our valuable ASUM members, willing volunteers and corporate members for the ongoing support for ASUM.

With best wishes for a happy and safe holiday over the festive season.

Dr Caroline Hong
Chief Executive Officer
Email carolinehong@asum.com.au

AIUM honours George Kossoff

Barry Goldberg presented Dr George Kossoff with the Joseph H Holmes Basic Science Award in June at the AIUM meeting in Orlando, USA.

The citation read:

Dr Kossoff received his Bachelor of Science in 1957, his Bachelor of Engineering in 1959, his Master of Engineering in 1965 and his Doctor of Science of Engineering in 1981, all from the University of Sydney. Throughout his career, Dr Kossoff has advanced the field of ultrasound through his many achievements, including developing the round window ultrasonic treatment of Meniere's disease, introducing gray scale echography to ultrasonic imaging and pulsed Doppler sonography for quantitative measurement of blood flow, and introducing volume imaging for real-time 3-dimensional imaging of the fetus.

To the Editor

Non-diagnostic fetal ultrasound for entertainment

It is pleasing to see that ASUM is considering the important but complex issue of non-diagnostic fetal ultrasound for entertainment.

Those who oppose the use of ultrasound for non-medical purposes may be accused of merely protecting their own interests. This needs to be kept in mind as a policy is developed – any criticism of ultrasound for non-medical purposes must not also be applicable to medical ultrasound.

In the August edition of *Ultrasound Bulletin,* much of the opposition to the non-medical use of ultrasound was because of potential bio-effects. Opposition on the basis of bio-effects fails.

If limiting ultrasound exposure were of great importance, ASUM and other interested organisations should have policies that highlight the dangers of ultrasound. This has not occurred. In addition, some of the policies that are in place are not promoted by the parent organisation itself. Examples of some of the ways that diagnostic ultrasound is currently used by the medical profession include:

- Doctors, including obstetricians, commonly use ultrasound many times in pregnancy; I am unaware of any recommended limits on a number of examinations. Indeed, in many countries such as Germany, many ultrasound examinations are recommended – it may even be used at every antenatal visit. We do not know the number of times and the length of time that Australian women are scanned in pregnancy.
- Ultrasound examinations are commonly prolonged extensively to allow staff in training to develop skills.
- Ultrasound is used on pregnant women at meetings, sometimes for prolonged periods. This includes Doppler ultrasound.
- Doppler is commonly used in clinical practice in the first trimester and is promoted as a test for Down syndrome. Research papers using Doppler in the first trimester are published in the ISUOG journal (*Ultrasound in Obstetrics and Gynecology*) and presented at scientific meetings. Yet ISUOG's statement reads 'Spectral and colour Doppler may produce high intensities and routine examination by this modality during the embryonic period is rarely indicated'. Despite this contradiction with Doppler use early in pregnancy, ISUOG has shown no inclination to encourage compliance with their recommendation opposing its use.
- All diagnostic examinations have an element of patient entertainment, today often using 3D; the increase in exposure to provide patient entertainment varies between practices. I am unaware of this practice ever being discouraged; indeed most would consider patient communication and demonstration of fetal images to be an important part of a diagnostic ultrasound examination.

The confidence that diagnostic ultrasound does not produce harmful bio-effects is high, otherwise the widespread use of ultrasound, particularly in some of the above situations, should be strongly discouraged. It seems ridiculous to oppose one (non-medical) ultrasound examination in this environment.

The frequent use of B-mode and Doppler ultrasound in pregnancy for medical purposes should be contrasted with the use of a single ultrasound examination for non-medical purposes. Non-medical 3D ultrasound examinations are carried relatively late in pregnancy over a relatively short period of time. The power levels and timing of ultrasound exposure is low risk compared to medical uses.

Other objections to 'shopping mall' ultrasound are similarly questionable:

- While non-medical 3D ultrasound examinations may be said to trivialise ultrasound, so do we all in our daily practices when we attempt to satisfy patient needs by demonstrating fetal images.
- Concerns about missing abnormalities and potential communication problems are satisfied if there is appropriate information for customers in advance. Providers are unlikely to pretend that they offer a diagnostic service.
- While we probably would all agree that pregnant women would be wise to use their financial resources more usefully, we do not try to dictate how women should spend their money in other situations.

We need to be careful before encouraging legislation against 'shopping mall' clinics, particularly as the practices used in these clinics are the same, to a greater or lesser extent, as those in diagnostic practices. We would be asking for legislation to draw a very fine line between medical and non-medical services.

The development of 'shopping mall' fetal ultrasound is a sign that we must do more to address the needs of our patients.

To take a stand against 'shopping mall' fetal ultrasound reeks of self-interest.

While we should look at how the FDA and other overseas organisations are facing this issue, it is an area that we in Australia should develop our own philosophy.

I propose that:

1 We learn lessons from 'shopping mall' fetal ultrasound rather than opposing it.
2 Policies on limits to ultrasound exposure apply to both medical and non-medical uses of ultrasound.

Assoc Prof Lachlan de Crespigny

To the CEO of ASUM

Philips policy

Philips Medical Systems has globally adopted a policy of non-support for the use or sales of medical devices including ultrasound equipment for non-diagnostic purposes. As of July 1, 2005, Philips Medical Systems Australia has accordingly adopted this policy.

This decision has been made solely by Philips without any collaboration with ASUM or any other vendor.

Liz Jani
Business Line Manager – Ultrasound
Philips Medical Systems Australasia Pty Ltd

To the Editor

Giulia Franco Teaching Fellowship 2005

Recently, we hosted a meeting conducted by the 2005 ASUM Giulia Franco Teaching Fellow Martin Necas.

On behalf of the sonographers in the central west of NSW I would like to thank ASUM and Martin Necas for a very informative evening on the 5th November 2005.

Definitely one of the best educational meetings I have attended and many people have complimented Martin on his presentations and enthusiasm.

Many thanks for supporting rural sonographers.

Jackie Spurway
Orange

To the Editor

Chris Kohlenberg Teaching Fellowship 2005

On Friday 11th November we farewelled Peter Coombs at Alice Springs Airport. Peter is a dedicated teacher and he was virtually still presenting as we put him in the car to go to the airport.

GE generously sponsors the Chris Kohlenberg Teaching Fellowship and it is greatly appreciated by the ultrasound community in the Alice Springs' region. We all benefited from a very full, tremendous one and a half day timetable.

Peter has left us with new techniques and renewed enthusiasm. The program, which was appropriate for all skill levels, provided us with the opportunity to re-evaluate work protocols, as well as presenting us with a different look and understanding of Doppler physics. Our thanks go to GE and to all at ASUM for facilitating it.

I would also like to thank ASUM for the membership packages containing applications, flyers and magazines etc. They were well received and membership applications were taken home.

Once again, thanks you for the opportunity to have ultrasound education in Alice Springs.

Virginia Loy
Alice Springs

To the Editor

Giulia Franco Teaching Fellowship 2005

I wish thank ASUM and Toshiba, who sponsor the Giulia Franco Teaching Fellowship, for providing those of us in the central west of NSW with such an enthusiastic and knowledgeable speaker, in Martin Necas.

I am sure I speak for all who attended as to the excellence of the meetings. Martin is informative, energetic, easy to listen to and willing to answer all questions asked, holding a captive audience for many hours.

This series of lectures was very informative and most appreciated by everyone who attended.

Thanks again.

Katrina Stevens
Bathurst

Fetal iliac angle sonographic measurements as a predictor of Down syndrome in a mid-trimester population

Philip J Schluter PhD[ABC], Gary R Pritchard FRACOG[B]

[A]Faculty of Health and Environmental Sciences, AUT, Auckland, New Zealand
[B]Brisbane Ultrasound for Women, Ballow Chambers, Brisbane, Queensland, Australia
[C]Correspondence to Philip Schluter email philip.schluter@aut.ac.nz

Received for peer review on 18 October 2005. Accepted for publication without change on 28 October 2005

Abstract

Our objective was to report the appropriate threshold and adjusted effect size of mid-trimester iliac angle measurements associated with Down syndrome in a sonographically screened population.

A large prospective single-centre cohort study was conducted between March 1993 and December 2002 in South-East Queensland, on women first scanned between 15 to 22 weeks gestation. Receiver operating characteristic analysis and multivariable logistic regression modeling was used to relate karyotypically ascertained Down syndrome fetuses and their control counterparts against routinely collected demographic and sonographic findings.

Iliac angle measurements were available for 30 Down syndrome affected fetuses and 5310 unaffected pregnancies. Receiver operating characteristics analysis supported a ≥ 87° iliac angle threshold, yielding specificity of 80.0% and sensitivity of 89.6%. Crude analysis revealed that fetuses with iliac angle above ≥ 87° had a relative risk of Down syndrome of 34.6 (95% CI: 14.1, 85.0) compared to those < 87°. After adjusting for maternal age, gestational age, and routinely collected mid-trimester sonographic markers this relative risk estimate decreased to 9.1 (95% CI: 3.3, 24.8).

In a sonographically screened population of women between 15 and 23 weeks gestation, fetal iliac angle is a significant and important predictor for Down syndrome.

Key words: Down syndrome, iliac angle, multivariable model, sonographic finding.

Introduction

Widened iliac angles in second-trimester pregnancies have been associated with increased Down syndrome (DS) risk in a number of two-dimensional (2D) and three-dimensional (3D) sonographic studies[1–5]. However, substantial intra- and inter-examiner variability in 2D sonography was demonstrated by Grange et al. and lead them to question the utility of this measure in predicting DS[6]. Most investigations have been undertaken in high-risk or contrived populations with relatively small DS numbers. Various iliac angle thresholds have been considered. Most authors ultimately favour a 90° threshold[1,3–5] although, using 3D sonography, Lee *et al.* advocate a 87° threshold[2]. We could find no study that investigated widened iliac angle risk for DS in general or low risk populations although one study extrapolated their findings to low-risk pregnancies[1].

Estimating the risk of DS associated with widened iliac angles when other risk factors are also measured has not been evaluated using the most appropriate multivariable statistical methods. Instead DS risk is generally estimated using a series of univariately determined negative and positive likelihood ratios[7,8]. Because of the dependencies that exist between the routinely collected sonographic variables, measures of risk composed from these likelihood ratios can lead to substantially biased estimates that may lead to unnecessary invasive procedures and even the potential loss of normal fetuses[9,10].

Using a large prospective single-centre cohort study of 73 DS and 16,891 unaffected pregnancies in a general sonographically screened population, we recently reported the adjusted effect sizes of routinely collected mid-trimester demographic and sonographic findings[9]. The specific demographic and sonographic findings investigated included: maternal age (in years), gestational age (in weeks), thick nuchal skinfold (NSF), short humerus length (HL), short femur length (FL), presence of echogenic bowel (EB), presence of echogenic intracardiac focus (EIF), presence of renal pelvic dilatation (RPD), and presence of aneuploid associated anomalies (AAA). After demonstrating significant colinearity between short humerus and short femur measurements (which lead to the removal of FL from the multivariable model), we reported that a woman's increased risk of having a DS-affected fetus was:

Equation (1)

$$\exp([0.124 \times (\text{maternal age}-20)] + [-0.462 \times (\text{gestational age}-16)] + [2.100 \times \text{NSF}] + [2.304 \times \text{HL}] + [1.602 \times \text{EB}] + [1.975 \times \text{EIF}] + [1.281 \times \text{RPD}] + [4.473 \times \text{AAA}] + [0.465 \times (\text{gestational age}-16) \times \text{NSF}] + [-1.693 \times \text{HL} \times \text{AAA}])$$

This compares to a 20-year-old woman who is at 16 weeks of gestation without any sonographic findings in the above

variables (the reference). Nicolaides estimates a woman who is 20 years of age, 16 weeks of gestation, and having no identifiable major defects or sonographic findings in the variables listed above as having a risk of DS of 1 in 3510[8]. Thus, a risk estimate can be calculated for any woman with these routinely collected sonographic variables.

The question becomes, does the inclusion of a fetal iliac angle measurement increase the predictive ability of this previously published multivariable statistical model? In answering this question, we must first ascertain whether iliac angle measurements are significantly different between DS affected and DS unaffected fetuses in a sonographically screened population. Should such a difference exist, we must then determine a threshold for iliac angle measurements that has optimal specificity and sensitivity. Finally, a multivariable model must then be developed that also accounts for the previously determined important risk factors to ascertain whether the addition of iliac angle measurements significantly improves the prediction of DS.

Materials and methods

Participants

All eligible women attending a large Brisbane private clinic for a mid-trimester fetal ultrasound scan between March 1993 and December 2002 were included within the study, unless consent was refused.

Inclusion and exclusion

Women were included within the study if they had a singleton pregnancy, a valid last menstrual period (LMP) date, gestation was between 15 and 22 weeks, and complete ultrasonic imaging. Exclusions included anomalous fetal conditions that were not associated closely with DS (including diaphragmatic hernia, neural tube defects, renal anomalies, facial cleft, Dandy-Walker cyst), fetuses with aneuploidy but not DS (T18, T13, 45X, triploidy, sex chromosome disorders), women who had a scan before 15 weeks of gestation or who had previous first trimester screening with nuchal translucency, and women who were referred from another clinic because of an ultrasound finding or because the pregnancy was identified to have high risk on mid trimester biochemical screening or previous nuchal translucency screening.

Equipment and procedure

All examinations were performed by either an obstetric sonologist or sonographers with at least five years experience in obstetric ultrasonography. Examinations were performed with Toshiba SSA-240 (Toshiba, Tokyo Japan), Diasonics (Milpitas CA, USA), GE 700 (General Electric Medical Systems, Milwaukee, USA) and Voluson 730 (GE-Kretz, Zipf Austria) machines according to the Australasian Society for Ultrasound in Medicine (ASUM) standard protocol for the mid-trimester obstetric morphology scan[11]. Measurements were recorded at the time of the examination and stored on a custom database, Pacuser[12].

Definition of variables

Down syndrome was determined from amniocentesis for karyotyping or from karyotyping at postnatal follow-up if clinically indicated. With parents' consent, postnatal follow-up ascertainment was yielded from two mechanisms: First, cytogenetic laboratory managers and referring physicians notified the clinic's obstetric sonologist of undetected DS afflicted births as they occurred (the common practice over the timeframe of the study) and second, an organised annual review of records was conducted with all of the cytogenetic laboratory managers in Brisbane.

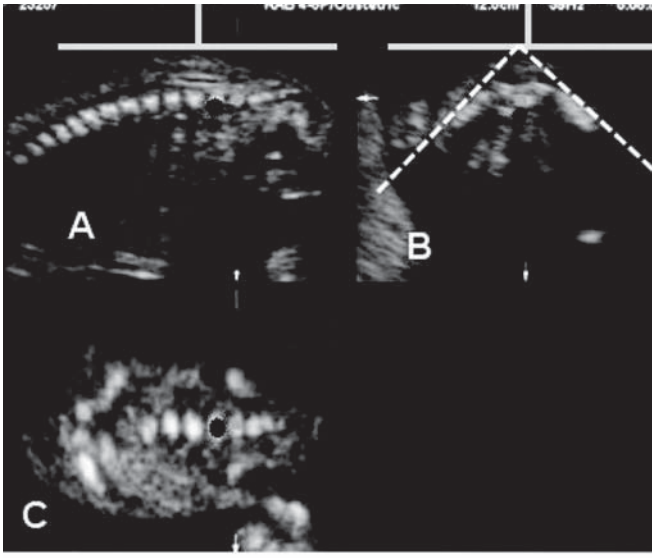


Figure 1 3D images used to measure the iliac angle

Mother's age and gestation were derived from date of birth, LMP, and the scan date, respectively. Nuchal skinfold (NSF) was considered thick at ≥ 6 mm in the standard suboccipital plane from skull edge to skin edge. Echogenic intracardiac focus (EIF) was considered present if intensely echogenic reflections potentially representing calcific deposits within the chordae tendinae were present in either or both cardiac ventricles. Renal pelvic dilatation (RPD) was indicated if measurements of the renal pelvis in the anteroposterior of the transverse plane of the abdomen ≥ 4 mm. Echogenic bowel (EB) was indicated if bowel reflection was as bright as adjacent pelvic bone, which was assessed by reducing the gain and time gain compensation and comparing them (this finding was not reported if evidence of previous bleeding existed). Biparietal diameter (BPD), which was measured perpendicular to the falx, was obtained at the widest part of the image with the cursor placed on the leading echogenic interface of the proximal skull bone and the leading echo of the distal skull bone (outer to inner). Femur length (FL) measurement was made using the method of Dye[13]. The long axis of the femur was obtained in a position that is horizontal (or ≤ 10° from the horizontal). The gain was reduced to limit side lobe artifact from the ends of the bone. The cursor was placed at the upper corner of each end of the diaphysis so that the cursor cross defines the shaft end as a right angle (measurement may on some occasions not overlap the full extend of the shaft). The same protocol was used to measure humeral length. Short FL was indicated if observed to expected FL measurement ratio was ≤ 0.93, where the expected FL equaled -0.9377 mm + (0.874 × BPD); short humerus length (HL) was indicated if the observed to expected humerus measurement ratio was ≤ 0.92, where expected humerus length equaled -6.809 mm + (0.802 × BPD). Aneuploid associated anomaly (AAA) was indicated if the measured lateral cerebral ventricle was > 10 mm,

Table 1 Sensitivity, specificity, positive predictive values (PPV) and negative predictive values (NPV) for iliac angle thresholds between 75° and 95° PPV and NVP estimates were derived assuming a DS prevalence of 1 in 800[14]

Iliac angle (°)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
≥ 75	100.0	29.2	0.2	100.00
≥ 76	100.0	34.7	0.2	100.00
≥ 77	100.0	39.7	0.2	100.00
≥ 78	96.7	44.7	0.2	99.99
≥ 79	96.7	50.9	0.2	99.99
≥ 80	96.7	56.7	0.3	99.99
≥ 81	86.7	64.5	0.3	99.97
≥ 82	83.3	69.5	0.3	99.97
≥ 83	83.3	74.5	0.4	99.97
≥ 84	83.3	79.2	0.5	99.97
≥ 85	80.0	83.1	0.6	99.97
≥ 86	80.0	86.8	0.8	99.97
≥ 87	80.0	89.6	1.0	99.97
≥ 88	76.7	91.5	1.1	99.97
≥ 89	73.3	93.8	1.5	99.96
≥ 90	70.0	95.1	1.7	99.96
≥ 91	56.7	96.8	2.2	99.94
≥ 92	53.3	97.2	2.3	99.94
≥ 93	46.7	97.7	2.4	99.93
≥ 94	46.7	98.0	2.8	99.93
≥ 95	36.7	98.3	2.7	99.92

Table 2 Frequencies, crude relative risk (RR) and multivariable RR estimates with 95% confidence intervals (95% CI) for iliac angle measurements associated with DS derived from logistic regression

	DS		Non-DS		Crude		Multivariable*	
Iliac angle (°)	n	(%)	n	(%)	RR	(95% CI)	RR	(95% CI)
< 87°	6	(20.0)	4760	(89.6)	1.0		1.0	
≥ 87°	24	(80.0)	550	(10.4)	34.6	(14.1, 85.0)	9.1	(3.3, 24.8)

*Multivariable analyses controlled for the factors and the associated estimates given in equation (1) above and previously published[9].

if any cardiac anomalies were noted, or if hydrops or fluid collections were found in body cavities.

Iliac angle (IA) was measured by one author (GRP) using 2D images. If it was not possible to obtain a 2D image in the correct plane then a 3D imaging dataset was obtained and 4D View™ software was used to obtain the appropriate plane. For 2D imaging, a symmetrical image of the transverse plane of the iliac wings, demonstrating both the widest angle and the longest length of the iliac bones, was obtained. This view was best obtained with the ultrasound beam perpendicular to the long axis of the fetal spine and perpendicular to the skin line, imaged posteriorly. It could also be obtained from an anterior aspect. The iliac angle was measured from the internal angle at the intersection of tangential lines drawn along the posterior aspect of the iliac crests.

The 3D measurement method consisted of obtaining a 3D data set with a 50° sweep across a sagittal view of the spine (Image A in Figure 1). Image A was rotated in the Z-plane to display a horizontal skin line. Image C was rotated in the Z-plane to obtain a horizontal spine. By translocation in Image A, the longest and widest angle of the iliac crest could be obtained in Image B. This angle was then measured in the same manner as the 2D images.

Statistical analyses

For the purpose of statistical analysis, all sonographic findings were given a value of 1 if present and 0 if absent. Receiver operating characteristic (ROC) analysis was undertaken assuming a binormal distribution and fitted using maximum-likelihood estimation. Sensitivity and specificity calculations on empirical data were undertaken using non-parametric ROC analysis. Positive predictive values (PPV) and negative predictive values (NPV) were calculated using a prevalence estimate for the general population of one in 800 births[14]. Logistic regression was used to investigate the crude association between fetal iliac angle and DS. Potential colinearity between iliac angle and the other sonographic variables was then assessed. Colinearity was deemed to have occurred when a component associated with a high condition index contributed strongly to the variance of two variables (variance proportion greater than 0.5), following the method advocated by Belsley *et al.*[15]. A multivariable main-effects model was then developed, adjusted for the

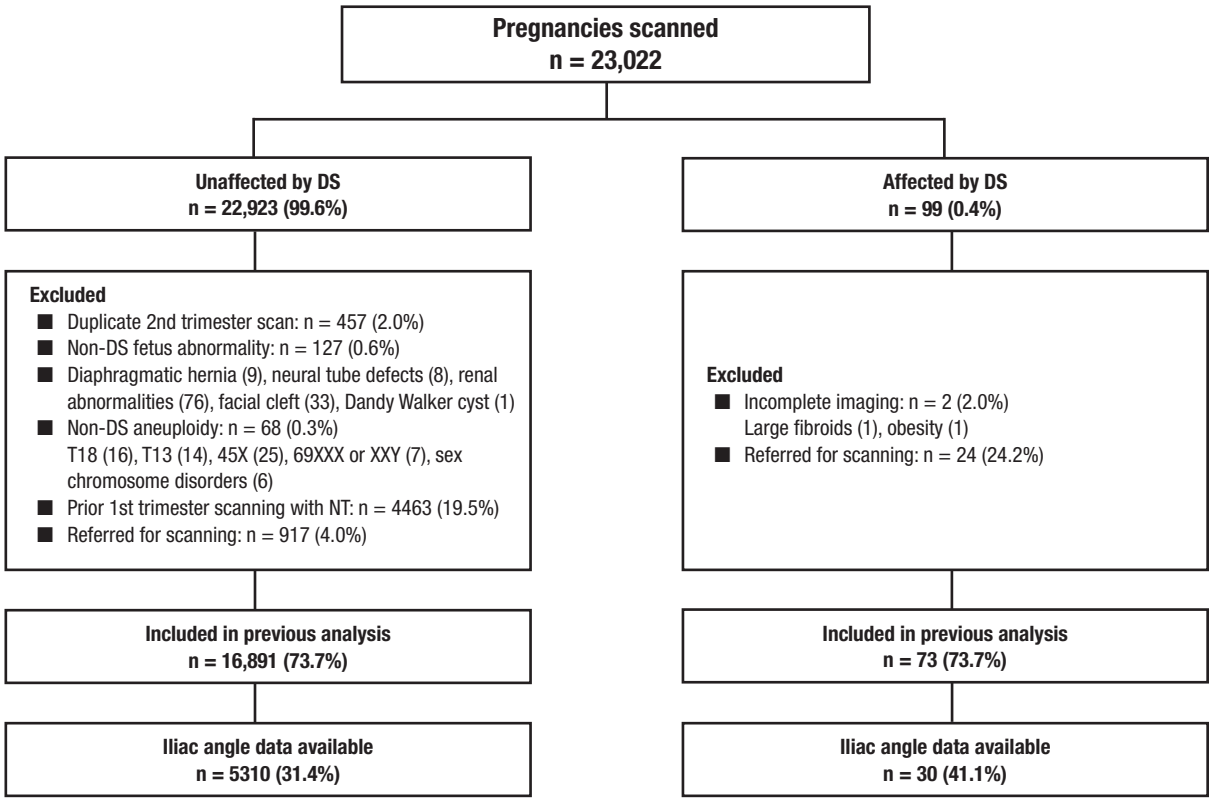


Figure 2 Sample recruitment characteristics

factors and their associated parameter estimates as given in equation (1) above and published previously[9]. Once the most parsimonious main-effects model was identified, all two-factor interactions with iliac angle were introduced into the model and stepwise elimination of non-significant terms were undertaken (based on the model deviance statistic[16]) until the final model was ascertained. Stata 8.0 was used for all computations and a significance level of $P < 0.05$ was used to define statistical significance.

The local University of Queensland Medical Research Ethics Committee provided clearance for this study (clearance 2004000527) and all women consented to participate.

Results

During the study period 23,022 mid-trimester pregnancies were scanned. However, as the systematic recording of iliac angles did not commence until June 2000, only 30 DS and 5310 DS unaffected scans had complete data available for analysis (Figure 2). 3D manipulation of the datasets was used from mid 2001. Approximately 5% of the cases required this method. Karotyping from amniocentesis was performed on 28 (93.3%) of the DS affected fetuses and 871 (16.4%) of the DS unaffected fetuses included within the study. The remaining two (6.7%) DS affected fetuses were ascertained from follow-up and postnatal karyotypes to confirm the DS diagnosis.

The average maternal age at presentation for those carrying DS affected fetuses, 36.3 years (standard deviation (SD) 4.2 years), was significantly higher than their counterparts carrying DS unaffected fetuses, 33.0 years (SD 4.7 years), $P < 0.001$. Similarly, the mean iliac angle measured from scanned DS affected fetuses, 90.8° (SD 6.3°), was significantly higher than in DS unaffected fetuses, 77.9° (SD 7.6°), $P < 0.001$.

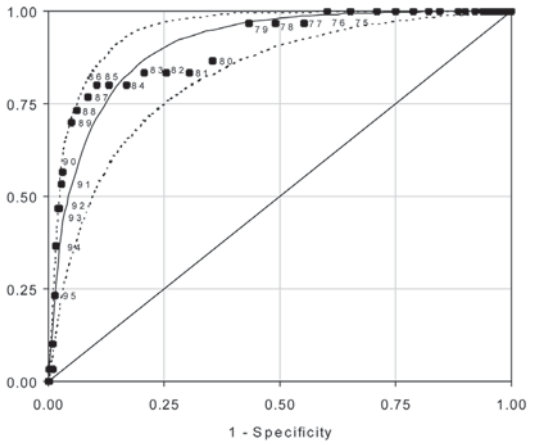


Figure 3 Receiver operator characteristic (ROC) curve and 95% confidence intervals (shaded region) for second trimester fetal iliac angles. Sensitivity and specificity estimates derived from the observed iliac angles between 75° and 95° are labelled

Receiver operating characteristic (ROC) analysis

Fitting the maximum-likelihood ROC model, assuming a binormal distribution of iliac angle, and the exact binomial confidence intervals (depicted by the shaded region) yields the ROC curve presented in Figure 3.

The area under the curve was estimated as 0.910 (95% CI: 0.867, 0.952), indicating that widened fetal iliac angles have a strong and significant discriminatory capacity.

When examining the empirical data, a ≥ 87° iliac angle threshold gave rise to sensitivity (the probability of a positive scan for a DS affected fetus) of 80.0% and specificity (the probability of a negative scan for a DS unaffected fetus) of 89.6% (Table 1).

Assuming a DS prevalence of 1 in 800, the percentage of fetuses with an iliac angle ≥ 87° who actually had DS (the

PPV) equalled 1.0% while the percentage of fetuses with measured iliac angle < 87° who were not DS affected (the NPV) equaled 99.97%.

Decreasing the threshold to ≥ 80° increased the iliac angle's sensitivity to 96.7% but decreased the specificity to 56.7%. This implies that 43.3% of DS unaffected fetus will give rise to a positive indication for this measure. As such, we preferred to use a threshold of ≥ 87° in iliac angle measurements to indicate increased DS risk.

Logistic regression analysis

Using the ≥ 87° threshold, 24 (80.0%) DS and 550 (10.4%) non-DS fetuses were indicated. Thus, compared to those with iliac angle < 87°, fetuses with iliac angle ≥ 87° were 34.6 (95% CI: 14.1, 85.0) times as likely of being affected by DS when no other variable was considered (Table 2).

However, when also adjusted for maternal age, gestational age, NSF, HL, EB, EIF, RPD, AAA, gestational age × NSF, and HL × AAA, the multivariable estimate of iliac angle relative risk (RR) reduced to 9.1 (95% CI: 3.3, 24.8). The discriminatory power, as measured by the area under the ROC curve, improved in the multivariable model with the addition of the iliac angle variable from 0.959 (when iliac angle was omitted) to 0.964 (when included).

There was no evidence of colinearity between iliac angle and the other variables included within the multivariable model, nor was there evidence of significant interactions apart from those already included (all $P > 0.05$). There was also no evidence for a lack of fit between the final model and the observed data (Hosmer-Lemeshow goodness-of-fit test, $P = 0.98$). Inter-observer variation between ultrasound examiners was tested in the multivariable model and no significant difference emerged (all $P > 0.05$). With the significance of the fetal iliac angle measurement in the multivariable model, we suggest that equation (2) below should be used to calculate a woman's adjusted risk of carrying a DS fetus between 15 and 23 weeks gestation:

Equation (2)

exp([0.124 x (maternal age–20)] + [-0.462 x (gestational age–16)] +[2.100 x NSF] + [2.304 x HL] + [1.602 x EB] + [1.975 x EIF] + [1.281 x RPD] + [4.473 x AAA] + [0.465 x (gestational age–16) x NSF] + [-1.693 x HL x AAA] + [2.203 x iliac angle])

Discussion

Sonography has been recognised as an effective tool in the prenatal identification of fetuses with DS[17, 18], yet it has been hampered by somewhat naïve statistical assessment of risk especially in low-risk patients[9]. Poor risk assessment can lead to devastating consequences for both the unborn fetus and his or her parents[10,19]. In Australia, 48% of hospitals providing maternity care offer no first trimester nuchal translucency screening[20] which suggests that the routine screening of all pregnancies using mid-trimester sonography would be an effective tool in the prenatal identification of fetuses with DS. However, such routine scanning would only confer benefit if sonographically determined risk factors for DS are appropriately measured and modelled in both high-risk and general populations. In an effort to redress this imbalance, using a large prospective cohort study, we report the adjusted RR for iliac angle measurements from a parsimonious statistical model that includes commonly collected demographic and mid-trimester sonographic variables associated with DS. The results of this investigation build directly on a recently published statistical mode[19].

The previously published model included observations from 16,964 complete scans of which 73 were DS affected. Because only a subset, 5340 (31%), of these scans also had iliac angle measurements, our multivariable investigations used the same factors and parameter estimates as those given in equation (1) in the development of the most parsimonious model included within this paper. Another approach would be to use only the 5340 'complete cases' (scans that had non-missing data for all demographic and sonographic variables considered) for the entire re-specification of the factors and parameter estimates of the multivariable model. However, in doing so, we would lose substantial statistical power and parameter stability and robustness. The deliberate two-stage approach we chose to take uses all the information available to us in defining the most statistically stable and robust model.

In terms of the iliac angle measurement, preliminary analysis revealed that the sum of the sensitivity and specificity estimates were highest using a ≥ 87° threshold and both terms were at least 80%. This threshold concurred precisely with that advocated by Lee *et al.*[2]. Ignoring all other confounding variables, the crude RR estimate between iliac angle and DS was 34.6 (95% CI: 14.1, 85.0). However, this calculation makes no account of the dependencies that exit between iliac angle and other risk factors. The multivariable modelling forcefully demonstrated this degree of dependency, with the adjusted RR estimate shrinking to 9.1 (95% CI: 3.3, 24.8). Despite the considerable shrinkage in RR estimates, fetal iliac angle remained statistically significant and improved the predictive ability of the statistical model in determining DS. From this we can conclude that fetal iliac angles represent another important predictive risk factor for DS in fetuses between 15 and 23 weeks gestation.

Strengths of our study include the fact that this is a large prospective study of 16,964 scanned pregnancies, 5340 of which have iliac angle measurements, strict well-defined inclusion criteria were adopted and adhered to throughout the duration of the study, experienced sonographers adopted a strict protocol on how measurements were defined, taken and recorded within a purpose-built database, DS case follow-up was actively pursued, and appropriate carefully conducted multivariable statistical analyses were undertaken. However, the study's results are limited by the low number of confirmed DS fetuses included within the sample, the potential loss on DS cases resulting from mis-matching or non-referral from physicians (perhaps through participants moving outside the study region), that whether iliac angle was measured using 2D or 3D imagines was not recorded on the database and that the screened population were private patients. While the loss of DS cases is thought to be negligible, the relatively small case numbers might impact on the robustness and parameter estimate stability of the final multivariable model. Hence, we recommend that the reported estimates should be confirmed by others using different populations. Over the timeframe of the study, iliac angle measurement using 3D imaging was only employed if 2D image was not possible. Unfortunately, whether the measurement was made using a 2D or 3D image was not recorded in the database and so comparisons cannot be made. However, it was established that only a very small

proportion of scans required 3D imaging (approximately 5%) and thus any biases in thresholds and measured associations are likely to be small. We opine that the recruitment of only private patients is unlikely to affect the general applicability of the study's results as public patients are unlikely to have different factors that predict DS.

In this study we partially answer the question posed by Lee and colleagues[2] who conclude by saying "that additional studies, however, will be required to determine [fetal iliac angles] usefulness as a diagnostic tool, either alone or in combination with other sonographic and biochemical markers, for identifying fetuses at increased risk of trisomy 21". The challenge for future research is to determine the usefulness of this measure when combined with first trimester and/or biochemical markers.

Acknowledgements

We thank Ms Teresa Clapham, Ms Margo Gill, Ms Helen Gofton, Mr Neil Pennell, and Ms Sue Williams for their expert ultrasound work at Brisbane Ultrasound for Women during the study period.

References

1 Massez A, Rypens F, Metens T, Donner C, Avni F. The iliac angle: a sonographic marker of trisomy 21 during the midtrimester: dependency of fetal lying? *Eur Radiol* 2003; 13: 2075–2081.

2 Lee W, Blanckaert K, Bronsteen R, Huang R, Romero R. Fetal iliac angle measurements by three-dimensional sonography. *Ultrasound Obstet Gynecol* 2001; 18: 150–154.

3 Shipp T, Bromley B, Lieberman E, Benacerraf B. The second-trimester fetal iliac angle as a sign of Down's syndrome. *Ultrasound Obstet Gynecol* 1998; 12: 15–18.

4 Bork M, Egan J, Cusick W, Borgida A, Campbell W, Rodis J. Iliac wing angle as a marker for trisomy 21 in the second trimester. *Obstet Gynecol* 1997; 89: 734–737.

5 Belics Z, Beke A, Csabay L, Szabo I, Papp Z. Sonographic measurement of the fetal iliac angle in trisomy 21, 18 and 13. *Fetal Diag Ther* 2003; 18: 47–50.

6 Grange G, Thoury A, Dupont J, *et al.*. Sonographic measurement of the fetal iliac angle cannot be used alone as a marker for trisomy 21. *Fetal Diag Ther* 2000; 15: 41–45.

7 Vintzileos A, Egan J. Adjusting the risk for trisomy 21 on the basis of second-trimester ultrasonography. *Am J Obstet Gynecol* 1995; 172: 837–844.

8 Nicolaides K. Screening for chromosomal defects. *Ultrasound Obstet Gynecol.* 2003; 21: 313–321.

9 Schluter P, Pritchard G. Mid-trimester sonographic findings for the prediction of Down syndrome in a sonographically screened population. *Am J Obstet Gynecol* 2005; 192: 10–16.

10 Benacerraf B. Should sonographic screening for fetal Down syndrome be applied to low risk women? *Ultrasound Obstet Gynecol.* 2000; 15: 451–455.

11 Australasian Society for Ultrasound in Medicine. Policies and Statements (Revised): D2. Sydney: ASUM; 1999.

12 Precise Accurate Convenient Ultrasound Examination Reporting (Pacuser) [computer program]. Version 1. Brisbane: Pacuser, www.pacuser.com.au; 1993.

13 Dye D. The Ultrasonic Measurement of the Fetal Femur [Master of Applied Science (Medical Ultrasound)]. Brisbane, Queensland University of Technology; 1992.

14 Thompson M, McInnes R, Willard H. Clinical cytogenetics. Thompson and Thompson genetics in medicine. 5th ed. Philadelphia: Saunders; 1991.

15 Belsley D, Kuh E, Welsch R. Regression Diagnostics: Identifying Influential Data and Sources of Collinearity. New York: Wiley; 1980.

16 Dupont W. Statistical Modelling for Biomedical Researchers. A Simple Introduction to the Analysis of Complex Data. Cambridge: Cambridge University Press; 2002.

17 Bromley B, Lieberman E, Shipp T, Benacerraf B. The genetic sonogram: a method of risk assessment for Down syndrome in the second trimester. *J Ultrasound Med* 2002; 21: 1087–1096.

18 Nyberg D, Souter V, El-Bastawissi A, Young S, Luthhardt F, Luthy D. Isolated sonographic markers for detection of fetal Down syndrome in the second trimester of pregnancy. *J Ultrasound Med* 2001; 20: 1053–1063.

19 Filly R. Obstetrical sonography: the best way to terrify a pregnant woman. *J Ultrasound Med* 2000; 19: 1–5.

20 Lawrence K, Crowther C. Survey of current prenatal screening for Down syndrome in Australian hospitals providing maternity care. *ANZ J Obstet Gynaecol*. 2003; 43 : 222-225.

Contrast ultrasound in the liver: a new relationship between ultrasound and MR/CT?

Peter Burns PhD

University of Toronto, Toronto, Canada
Correspondence to Peter Burns email burns@swri.ca

Introduction

Many of the accepted limitations of ultrasound in diagnosing blood flow, for example that capillary flow is undetectable or that power Doppler cannot be used in a moving structure such as the heart, have been challenged by the joint development of microbubble contrast agents for ultrasound and new nonlinear imaging methods such as pulse inversion Doppler.

In the heart, these have resulted in new examinations that show capillary perfusion of the myocardium in real-time, with the promise of revolutionising the role of ultrasound imaging[1]. But what about radiological applications? Here we review the experience in Toronto using these methods in the liver.

Evaluation of a focal liver masses is a complex issue which is often the major focus of a cross sectional imaging study. Two basic questions may be posed. First, 'what is it?' deals with characterisation of a known liver lesion. The second, 'is it there?' addresses the issue of detection.

Characterisation of a liver mass on sonography is based on its appearance on greyscale imaging and on vascular information obtained using Doppler. Conventional Doppler, however, often fails in the evaluation of a focal liver mass, particularly in a large patient, on a small or deep lesion, or on one with weak Doppler signals. Tissue motion artifact also hinders abdominal Doppler studies and a left lobe liver mass, close to the cardiac apex, is nearly always a failure for conventional Doppler.

Two remedies are available. The first is to inject a microbubble contrast agent which enhances the Doppler signal from blood. Although this use of the agents dominated their early application, it was not successful. Early clinical investigations of contrast agents for liver imaging used conventional colour and power Doppler; however, discriminating features of specific liver masses were not evident.

Furthermore, the advantages of enhancement of the signal from blood were offset by the artefacts of colour blooming and motion flash. The second is to exploit the peculiar properties of microbubbles[2] using specialised imaging techniques that preferentially detect the bubble echo but suppress the signal from background tissue. Harmonic[3,4] and pulse inversion imaging[5,6] are two such methods, but it is only since the widespread availability of pulse inversion imaging that new approaches to ultrasound examination of the liver have begun to emerge[7].

Liver mass characterisation methods

Liver lesion characterisation with microbubble contrast agents relies on imaging the microbubbles while they circulate within the vascular pool. Imaging is performed immediately following intravenous injection and has two objectives: to show the lesion vascularity and to demonstrate the relative vascular volume of the lesion compared to that of the adjacent liver.

Lesion vascularity

At low mechanical index (MI) settings of the system, weak pulses are emitted from the transducer, but by using pulse inversion technology, echoes can be detected effectively and any nonlinear, or harmonic components, separated and displayed. Such a method offers two advantages. First, it shows the bubbles in very sparse dilution, because the sound induces them into nonlinear oscillation, thereby creating harmonic echoes; yet it does this without disrupting the bubbles, which are often moving very slowly. Thus it shows bubbles within vascular structures in real-time. Second, the low MI sound does not produce much tissue harmonic echo, so the echo from the surrounding solid tissue is suppressed, producing a dark background. This is the low MI method we use for the real-time assessment of the liver and lesion vasculature. Vascularity assessments are performed immediately following the intravenous injection of a perfluorocarbon contrast agent such as Definity (Bristol-Myers Squibb Inc, Billerica, MA) or Optison (Mallinckrodt Inc, St Louis, MO) and last for about two minutes following a 0.1 mL bolus.

Our preference is for injection of small boluses of contrast agent, each followed by a saline flush. Low MI continuous imaging in the vascular phase allows for assessment of the presence of lesional vascularity, vessel number and distribution, as well as vessel morphology. These allow differentiation of specific liver lesions.

Relative vascular volume

At high mechanical index (MI) settings of the system, the ultrasound interacts with the bubbles in a quite different way. In pulse inversion imaging, at least two pulses are transmitted along each scanline. At high MI, the first pulse disrupts the bubble, producing a strong echo. The second pulse detects no bubble, so that the two echoes are very different. This difference produces a strong signal, proportional to the number of bubbles disrupted. If the bubbles are distributed

evenly in the vascular system, the brightness of the image corresponds to the volume of blood in each pixel. This is therefore a vascular volume image. Disrupting the bubbles has the advantage that it produces the strongest echo and is therefore the most sensitive way to detect an ultrasound contrast agent. It has the disadvantage, however, that it may take up to ten (or, in the case of a haemangioma, up to 100) seconds for new bubbles to wash into the scan plane. The method is, therefore, unsuited to real-time imaging.

Vascular volume assessments are most easily performed using some variation of an interval delay technique. Interruption of the imaging process for several seconds allows the entire vascular volume to fill with the contrast agent. By freezing the ultrasound machine for an interval, followed by a brief reinsonation at high MI, bubble destruction results in a brief and bright enhancement of the image as the bubbles accumulated during the delay are burst by the ultrasound beam. The intensity of the brightness is in proportion to the number of bubbles which have accumulated during the interval delay. Comparison of the relative change in the echo level of the liver lesion to the uninvolved liver will give a relative measurement of their vascular volumes[1].

The timing of the interval delay relative to the time of injection allows for assessment in the different phases of liver enhancement. We perform our first interval delay sequence at the peak of arterial enhancement, as shown on the low MI image. Scanning, following an interval delay of 8–10 seconds, will produce an arterial phase image. Scanning, following 50–70 seconds, is usually optimal for the portal venous phase image. Longer interval delays, up to several minutes, may be appropriate for the evaluation of lesions with slow internal flow such as haemangiomas[2].

Optimally performed with a large contrast agent bolus and a high MI, the interval delay technique also works with smaller injections over a range of MI selections. It is dependent on bubble destruction which is most efficient at high MI but continues to occur at MI levels which are in the midrange. It is only with very low MI techniques that bubble destruction does not occur.

Current technology developments offer the possibility that in the future, these relative vascular volume assessments will be made in real-time with very low MI techniques, which allow for continuous imaging without any bubble destruction[3]. Currently, however, bubble destruction following interval delay is the most sensitive reproducible method to determine a relative vascular volume assessment of a liver lesion. These interval delay techniques are more sensitive than low MI continuous imaging techniques for vascularity assessment. They are well performed with both air and perfluorocarbon agents as all agents will disrupt with a high MI.

The disruption of the accumulated microbubbles usually causes the liver to appear enhanced or brighter than at baseline. A hyper-arterialised mass will appear bright against a less bright liver after an arterial phase interval delay. Conversely, a hypo-perfused lesion will appear as a darker region in the enhanced liver on an arterial phase interval delay. To appreciate these differences optimally, storage of a brief cineloop of 10 to 30 frames is made.

Liver lesion characterisation

Using the above methods for vascular imaging of livers containing focal lesions, discriminatory features have been found to be associated with specific pathology[1,4,5].

Hepatocellular carcinoma

Using microbubble contrast agents, Hepatocellular carcinoma (HCC) is shown as a highly vascular lesion in the majority of patients studied. This lesional vascularity is usually diffuse and appears to be in excess of the adjacent liver parenchyma. Aberrant vascular morphology frequently consists of tortuous, corkscrew blood vessels. In real-time, during the wash in of the contrast, or following interval delay in the arterial phase, HCC shows as a hypervascular lesion appearing as a white ball against a less white but also enhanced liver parenchyma. Areas of tumour necrosis show as hypoechoic zones within the enhanced mass. A nonenhancing scar is also an inconsistent and infrequent observation. Portal venous phase interval delays of 50–70 seconds continue to show liver enhancement but with the lesion enhancement fading, similar to the portal venous phase on enhanced CT scan. The CT features of HCC are highly consistent with the findings on contrast enhanced ultrasound; a mass which is hypervascular in the arterial phase, with rapid washout in the portal venous phase of enhancement.

Metastastatic disease

Liver metastases are an inhomogeneous group of tumours whose vascularity depends on the primary lesion. Commonly encountered tumours from primaries within the GI tract, breast, and lung most often show as relatively hypovascular tumours. Lesional vascularity imaging often shows fairly sparse and straight vessels concentrated in the periphery of the lesion. Following interval delay, lesions are often weakly enhanced or show marginal enhancement with a non-enhancing centre which remains hypoechoic. As the lesion margin enhances, the lesion may appear both smaller and rounder on the interval delay image than on the baseline scan. Hypervascular metastases are seen with renal cell, neuroendocrine and carcinoid primaries and show hypervascular pattern of vascularity that is frequently similar to that seen with hepatocellular carcinoma. Interval delay in the arterial phase, therefore, shows an enhancing tumour that is frequently brighter than the adjacent enhancing liver parenchyhma.

Haemangioma

Haemangiomas are the most frequently encountered benign tumour of the liver, seen in 5–20% of the population. Their importance lies in their potential for confusion with more significant liver pathology. The greyscale appearance of a haemangioma is often suggestive of the diagnosis and two varieties of lesion are recognised. The typical haemangioma is a uniformly echogenic mass within frequent increased through transmission. These lesions are often small and frequently multiple. Atypical haemangiomas are a frequent variant of the above showing as a lesion with a mixed echogenicity, a hypoechoic centre and a scalloped echogenic rim, which may be either a thin rim or a thick rind.

Recent studies suggest that microbubble contrast agents have the ability to characterise haemangiomas with ultrasound[9,12,13].

In the arterial phase of enhancement with microbubble agents, haemangiomas usually show sparse or marginal vascularity, occurring in pools or puddles without

definition of lengths of vessels. Following interval delay in the arterial phase, a pattern of peripheral nodular enhancement, analogous to that described on CT scan, is evident. These enhancing nodules are typically brightly enhanced and appear whiter than the adjacent enhanced liver. Interval delay sequences performed with longer intervals of delay, up to several minutes, will characteristically show centripetal progression of the pattern of peripheral nodular enhancement. Our routine is to perform these delays at the peak of arterial enhancement, and then at 30, 60, 90 and 120 seconds following the saline flush at the end of the contrast injection. The identification of peripheral nodular enhancement in the arterial phase interval delay is the first clue to the presence of a haemangioma. However, occasional metastatic lesions may also show this pattern of enhancement on arterial phase interval delay. Therefore, performance of further interval delay sequences with progressive elongation of the delay interval is essential to show the centripetal progression of the enhancement of the haemangiomas indistinction to the lack of progression that is seen with a metastatic lesion.

Focal nodular hyperplasia (FNH)

FNH is not an actual neoplastic tumour but represents a hyperplastic response to an underlying vascular malformation in the liver. Histologically, it is made up of normal liver components, including hepatocytes and Kupffer cells. There are no normal portal veins and the central area is characterised by both a hyalinised scar and hyperplastic arteries. Recognised as a hypervascular tumour in the arterial phase of enhancement on CT and MR scans, the lesions also show characteristic scar and enhancement patterns. Vascular imaging with microbubble contrast agents shows FNH as a hypervascular lesion often showing a central stellate vascularity and one or more large and tortuous feeding arteries.[6] Following interval delay at the peak of arterial enhancement, FNH invariably shows greater enhancement than the adjacent liver and appears most often as a bright white ball against the enhanced parenchyma. A nonenhancing scar is frequently observed.

Based on these appearances it is a simple matter to construct an algorithm for the characterisation of a focal liver mass based on the contrast enhancement patterns on ultrasound. A recent study reports that such an algorithm, applied blindly by three independent readers, produced a positive predictive value for malignancy of 93% and a negative predictive value of 92%[7]. When these results were compared to those from CT and MR scans of the same patients, also read blindly by the same readers, good concordance was found between modalities in almost all cases. The important exception was in the prediction of malignancy from portal venous phase 'washout', where in about 25% of malignant lesions, ultrasound contrast reported washout but CT/MR did not[8]. This observation probably reflects a significant difference between the contrast agents used in these modalities, with the low molecular weight, diffusible tracers of iodine and gadolinium crossing the permeable endothelium of a tumour to 'leak' into the interstitium by the time the portal phase occurs, whereas the relatively large microbubbles remain within the vasculature, even when it is hyper-permeable.

Liver mass detection

Method

Levovist (Schering Ag, Berlin) is a contrast agent until recently available in Australia that has a liver specific phase, which follows the clearance of the contrast agent from the vascular pool. About three minutes after an intravenous injection of the agent, the bubbles have left the vascular pool, but appear to persist in the normal liver parenchyma, possibly within the sinusoids, which are areas of low shear stress, or possibly within the reticuloendothelial cells following phagocytosis. Although their exact location remains controversial, the significance of the phenomenon is established. A high MI sweep through the liver will produce a bright enhancement of the liver parenchyma, in proportion to the bubble distribution. The lack of enhancement of malignant lesions in the liver, including metastases and hepatocellular carcinoma therefore provides method for their detection. For example, metastases typically show as small dark defects on post vascular delayed scans allowing for the detection of both smaller and more lesions than on baseline scans[9]. A multi-centre trial recently conducted in Europe and Canada on 150 patients[10] showed comparable results in detection of metastases from Levovist scans to both triphasic CT and MR imaging. Our own experience has shown that hepatocellular carcinoma, which has a predilection for multifocal growth, as well as cholangiocarcinoma are both easily and reliably detected with post vascular scanning with Levovist.

Conclusion

Liver mass evaluation with ultrasound contrast agents is still in its early stages. Nonetheless, current and recent investigations suggest great promise for microbubble enhanced ultrasound in terms of both liver mass characterisation and liver mass detection. Contrast enhancement for CT and MR imaging is considered the standard of practice for liver mass evaluation, and one would not consider interpreting a scan performed without contrast. We believe that the same will soon be true for ultrasound.

Further reading:

For principles of ultrasound contrast imaging and instrumentation:

Becher H, Burns PN. Handbook of Contrast Echocardiography. Berlin: Springer, 2000. Available for free download at: http://www.sunnybrook.utoronto.ca/EchoHandbook/

For review of contrast ultrasound applications in radiology:

Bubbles in Radiology – The State of the Art. Symposium Syllabus, Toronto 2000: Available for free download at: http://www.sunnybrook.utoronto.ca/bubble/

References

1 Wilson SR, Burns PN, Muradali D, Wilson J, Lai X. HarmonicHepatic Ultrasound with Microbubble Contrast Agent: Initial Experience Showing Improved Characterization of Hemangioma, Hepatocellular Carcinoma, and Metastasis. *Radiol* 2000; 215: 153–161.

2 Kim TK, Choi BI, Han JK, Hong HS, Park SH, Moon SG. Hepatic tumors: contrast agent enhancement patterns with pulse-inversion harmonic US. *Radiol* 2000; 216: 411–417.

3 Tiemann K, Lohmeier S, Kuntz S, *et al.* Real-time contrast echo assessment of myocardial perfusion at low emission power: first experimental and clinical results using power pulse inversion imaging. *Echocardiography* 1999; 16: 799–809.

4 Ophir J, Parker KJ. Contrast agents in diagnostic ultrasound [published erratum appears in Ultrasound Med Biol1990;16(2):209. *Ultrasound Med Biol* 1989; 15: 319–333.

5 Burns PN, Wilson SR, Hope Simpson D. Pulse Inversion Imaging of Liver Blood Flow: An improved method for characterisation of focal masses with microbubble contrast. *Invest Radiol* 2000; 35: 58–71.

6 Uggowitzer M, Kugler C, Groll R, *et al.* Sonographic evaluation of focal nodular hyperplasia (FNH) of the liver with a transpulmonary contrast agent (Levovist). *Br J Radiol* 1998; 71: 1026–1032.

7 Wilson SR, Burns PN. An Algorithm for the Diagnosis of Focal Liver Masses Using Microbubble Contrast Enhanced Pulse Inversion Sonography. *Am J Roetgenol* 2005: In press.

8 Burns PN, Wilson SR. Enhancement Patterns of Focal Liver Masses on Contrast Imaging: Concordance of US with CT and MR Scan. *Radiol* 2005; In Press.

9 Blomley MJK, Albrecht T, Cosgrove DO, *et al.* Improved imaging of liver metastases with stimulated acoustic emission in the late phase of enhancement with the US contrast agent SH U 508A: early experience. *Radiol* 1999; 210: 409–416.

10 Blomley MJ, Albrecht T, Wilson SR, Burns PN, Lafortune M, Leen EL. Improved detection of metastic liver lesions using pulse inversion harmonic imaging with Levovist: amulticenter study. *Radiol* 1999; 213: 491.

Three-dimensional ultrasound in small parts

Leandro Fernandez MD

Director Sonolmagen, Education Center affiliated to Jefferson Ultrasound Research and Education Institute, Philadelphia and Director Laboratory of Vascular and Advanced Sonography, Instituto Medico La Floresta Caracas, Venezuela
Correspondence to Leandro Fernandez email Leandrofer@telcel.net.ve

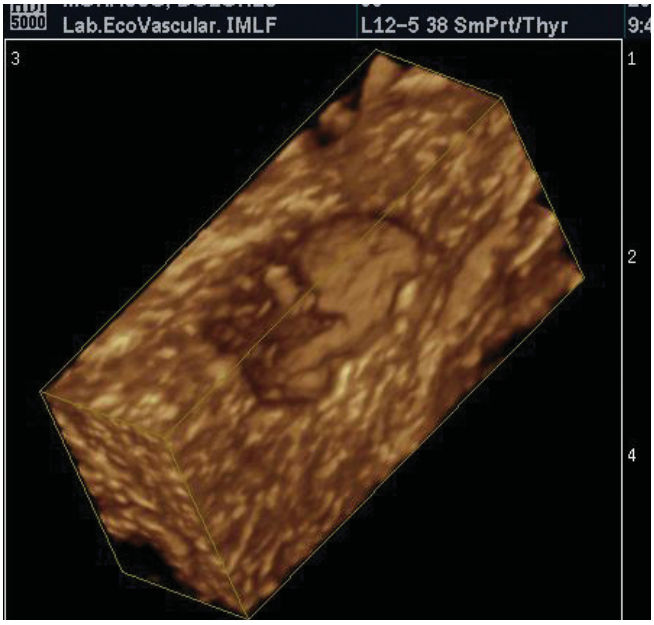


Figure 1 Complex cyst of thyroid

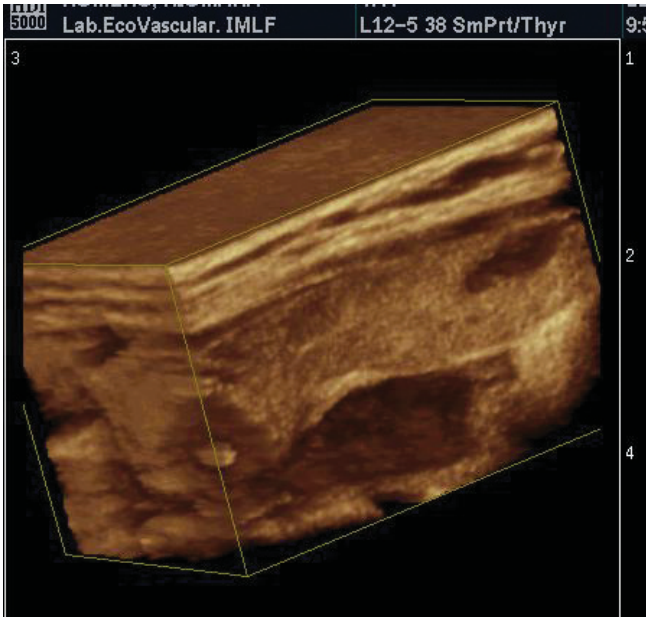


Figure 2 Parathyroid adenoma and left lobe thyroid lesions

Introduction

Three dimensional ultrasound (3D US) is a relatively recent technique in clinical practice[1], which has been used mostly in obstetrics and gynecology[2,3,4]. Although there is less experience with 3D US than in other areas of ultrasound, it is increasing day by day.

Unfortunately, most people still tend to believe that 3D US is only about getting nice pictures of baby faces, legs or genitalia. It is this belief and lack of information which has motivated us to present to you a set of some different and updated applications that have proved to be useful, as well as a range of other feasible and promising uses of this outstanding technology, not only in the already known applications in obstetrics and gynaecology[5,6,7,8] but also in the rest of the medical specialties[9].

There are six different types or renderings of 3D US:

- Vascular
- Volumetric
- Surface
- Multiplanar
- Niche mode (which we refer to as Echo-Tomography)
- VOCAL® (Virtual Organ Computer-aided Analysis)

These techniques can be widely used in diagnostic ultrasonography for small parts[10], among other medical areas.

The 3D US technique is an excellent tool for observing the spatial distribution of vessels[11] and, furthermore, the arterial and venous components can be clearly seen[12]. We can, therefore, explore focal or diffuse disorders when the vascular 3D US is used. The Multiplanar, Niche mode or Echo-Tomography and VOCAL are extremely useful in radiology, internal medicine or surgery because they help us define anatomical relationships[13], identify the segments affected, calculate volume[14,15] and perform follow-up of oncological patients.

The Echo-Tomography provides millimetric 'cuts' of any structure, defining the precise limits of a lesion or eventual tumoural invasion to other segments or organs. The VOCAL rendering is a very useful tool in these cases because it is able to automatically calculate the volume of a tumour or a given organ[16].

We can obtain an overall image of the small organs[17] and focus on the vascularity organisation[18]. It is possible to observe infarction areas inside the parenchyma with 3D US Power Doppler.

Virtual endoscopy: 3D US of cysts

This is a new application of 3D US in radiology[19]. By combining the volumetric and surface rendering, we are able to

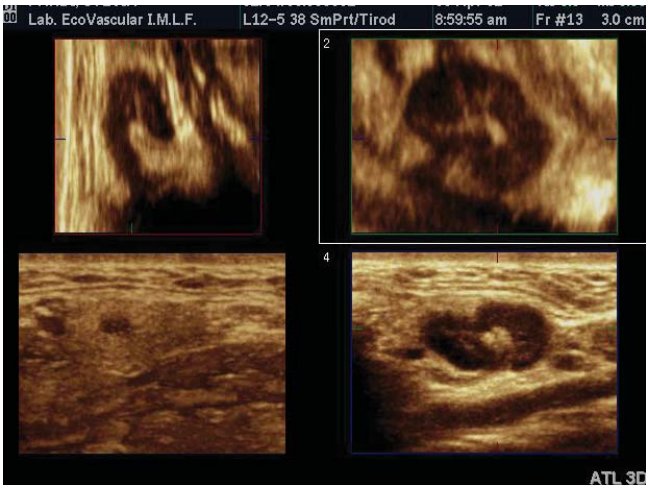


Figure 3 Reactive cervical lymph node

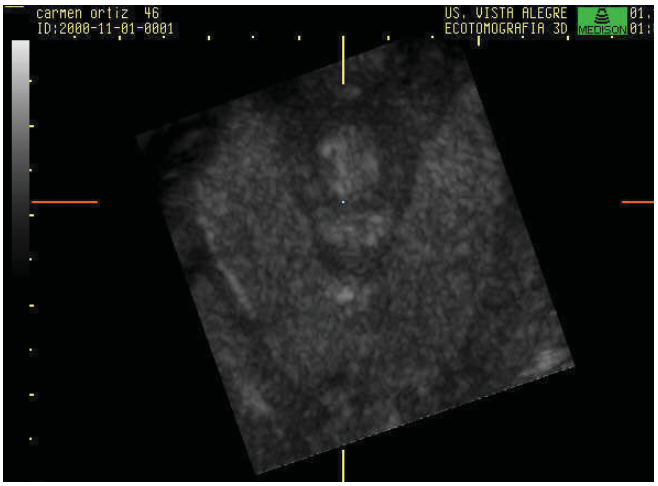


Figure 4 Virtual coronal plane of normal thyroid

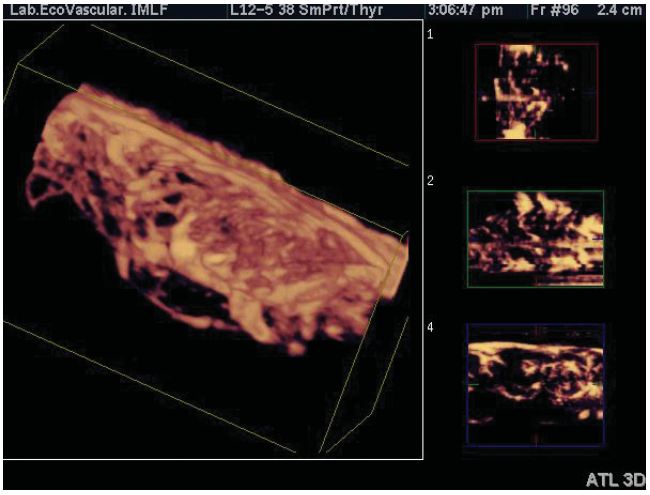


Figure 5 3D vascular ultrasound showing sub-acute thyroiditis

see, with remarkable detail, the internal surface of the lesion thereby detecting the presence of tumours, polyps, or any other disorders of the walls.

3D US in small parts: thyroid, parathyroid, parotid

The assessment of the thyroid, parotid and parathyroid glands is efficiently achieved with 3D US[10]. We can discriminate normal anatomical structures from pathological ones. The multiplanar presentation and Niche mode (Echo-Tomography) are useful in determining the extension – inside or outside the organs – of nodules, cysts or tumours.

The evidence of neovascularisation is better viewed with 3D US[20] and can probably suggest malignant origin of a neoplasm. Allowing for the spatial orientation and the number of vessels, it could be possible to determine the degree of potential malignancy in a given tumour.

The volume measurement is better assessed with 3D US[17] and given this, we can perform studies that follow growth in order to decide medical or surgical treatment. The VOCAL method makes it possible to obtain a proper after-treatment follow-up of focal disorders in thyroid and parathyroid.

Conclusions

Three-dimensional ultrasound is a new and outstanding technique that opens a new vision in diagnostic ultrasonography. It offers a more comprehensive image of anatomical structures and pathological conditions and also permits the exact spatial relationships to be observed.

New applications in internal medicine, surgery, urology radiology and many other specialties are emerging daily. These are coming from the curiosity of doctors from all over the world and from the necessity of assessing the human body with an accurate, non-invasive approach.

References

1 Candiani F. The latest in ultrasound: three-dimensional imaging. Part 1. *Eur J Radiol* May 1998; 27 (Suppl 2): 179–182.

2 Hata T, Aoki S, Hata K, Miyazaki K, Akahane M, Mochizuki T. Three-dimensional ultrasonographic assessments of fetal development. *Obstet Gynecol* 1998; 91 (2): 218–223.

3 Budorick NE, Pretorius DH, Johnson DD, Tartar MK, Lou KV, Nelson TR. Three-dimensional ultrasound examination of the fetal hands: normal and abnormal. *Ultrasound Obstet Gynecol* 1998; 12 (4): 227–234.

4 Viora E, Sciarrone A, Bastonero S, Errante G, Botta G, Campogrande M. Three-dimensional ultrasound evaluation of short-rib polydactyly syndrome type II in the second trimester: a case report. *Ultrasound Obstet Gynecol* 2002; 19 (1): 88–91.

5 Hafner E, Philipp T, Schuchter K, Dillinger-Paller B, Philipp K, Bauer P. Second-trimester measurements of placental volume by three-dimensional ultrasound to predict small-for-gestational-age infants. *Ultrasound Obstet Gynecol* 1998; 12 (2): 97–102.

6 Shih JC, Shyu MK, Lee CN, Wu CH, Lin GJ, Hsieh FJ. Antenatal depiction of the fetal ear with three-dimensional ultrasonography. *Obstet Gynecol* 1998 Apr; 91 (4): 500–505.

7 Pohls UG Rempen. A Fetal lung volumetry by three-dimensional ultrasound. *Ultrasound Obstet Gynecol* 1998 Jan; 11 (1): 6–12.

8 Song TB, Moore TR, Lee JI, Kim YH, Kim EK. Fetal weight prediction by thigh volume measurement with three-dimensional ultrasonography. *Obstet Gynecol* 2000; 96 (2): 157–161.

9 Campani R, Bottinelli O, Calliada F, Coscia D. The latest in ultrasound: three-dimensional imaging. Part II. *Eur J Radiol* 1998; 27 (Suppl 2): S183–187.

10 Fernandez LJ. *Ultrasound Med Biol* 2003; 29(5 Suppl): 43.

11 Bendick PJ *et al.* Three-dimensional vascular imaging using Doppler ultrasound. *Am J Surg* 1998; 176 (2): 183–187.

12 Fenster A *et al.* Three-dimensional ultrasound imaging of the vasculature. *Ultrasonics* (Netherlands) 1998; 36 (1–5): 629–633.

13 Linney AD *et al.* Three-dimensional morphometry in ultrasound. *Proc Inst Mech Eng* 1999; 213 (3): 235–245.

14 Van Leeuween MS *et al.* Planning of liver surgery using three dimensional imaging techniques. *Eur J Cancer* 1995; 31: 1212–1215.

15 Wolf GK *et al.* Volume measurements of localized hepatic lesions using three-dimensional Sonography in comparison with three-

dimensional computed tomography *Eur J Med Res* 1998; 3: 157–164.

16 Raine-Fenning N, Campbell B, Collier J, Brincat M, Johnson I. The reproducibility of endometrial volume acquisition and measurement with the VOCAL-imaging program *Ultrasound Obstet Gynecol* 2002; 19 (1): 69–75.

17 Berg S, Torp H, Blaas HG Accuracy of in-vitro volume estimation of small structures using three-dimensional ultrasound. *Ultrasound Med Biol* 2000; 26 (3): 425–432.

18 Fleischer AC, Wojcicki WE, Donnelly EF, Pickens DR, Thirsk G, Thurman GB, Hellerqvist CG. Quantified color Doppler sonography of tumor vascularity in an animal model. *J Ultrasound Med* 1999; 18 (8): 547–551.

19 Nakata N, Miyamoto Y, Tsujimoto F, Harada J, Tada S, Fukuda K. Ultrasound virtual endoscopic imaging. *Semin Ultrasound CT MR* 2001; 22 (1): 78–84.

20 Forsberg F, Rawool NM. Merton DA, Liu JB, Goldberg BB. Contrast enhanced vascular three-dimensional ultrasound imaging. *Ultrasonics* 2002; 40 (1–8): 117–122.

ASUM Ultrasound Bulletin 2005 November; 8 (4): 30–31

Outcome of chromosomally normal fetuses with nuchal translucency of 3.5 mm or more

Saeeda Albalooshi MBBS[A], *Ron Benzie* *MBChB, FRCs(c), FRANZCOG, ARDMS*[AB]

[A] *Christopher Kohlenberg Department of Perinatal Ultrasound, Nepean Hospital, University of Sydney, Penrith, New South Wales, Australia*
[B] *Correspondence to Ron Benzie email BenzieR@wahs.nsw.gov.au*

Abstract

The purpose of this study was to determine the outcome of chromosomally normal fetuses with a nuchal translucency (NT) of 3.5 mm or more at the first trimester screening scan.

All patients from January 2000 until March 2005 who had an antenatal screening test for Down syndrome in the first trimester (11–13 + 6 weeks) were reviewed. Those with a nuchal translucency of 3.5 mm or more, where the final result after serum screening remained in the high risk range, were offered genetic counselling and a prenatal diagnostic test, either chorionic villus sampling or amniocentesis.

A total of 5483 patients had nuchal translucency and serum antenatal screening testing. Of these, there were 119 cases of enlarged NT of 3.5 mm and above, where the results were in the high-risk range. Ninety-four (79%) cases of fetal chromosomal abnormalities were found. Twenty-five (21%) fetuses had enlarged nuchal translucency of 3.5 mm or more with normal chromosomes. These fetuses were followed up until delivery. No abnormalities were noted in 19 (76%) babies, however two babies were born preterm due to maternal reasons and one fetus developed hydropic changes due to parvovirus infection not related to NT findings. Five (20%) fetuses had abnormalities, 3 (60%) of them had cardiac defects, 1 (20%) had musculoskeletal defects and 1 (20%) had both cardiac and musculoskeletal defects.

In chromosomally normal fetuses, increased nuchal translucency may be associated with a wide range of fetal defects and genetic syndromes. Of this group, 76% were apparently normal at birth. However, where no anomaly is detected at birth, careful follow up is essential to avoid missing rare genetic or other defects.

Introduction

Abnormal accumulation of fluid behind the fetal neck is associated with chromosomal abnormalities (trisomy 21 or 18 in 75% of cases) as well as fetal cardiovascular and pulmonary defects, skeletal dysplasias, congenital infection, and metabolic and haematological disorders. The aetiology of why this fluid accumulation occurs is unknown but may be due to cardiac failure in cases of abnormalities of the heart and great arteries, venous congestion in cases of skeletal dysplasias, possibly due to constriction of the thoracic cage, altered composition of the extracullar matrix, abnormal or delayed development of the lymphatic system, failure of lymphatic drainage, fetal anaemia or hypoprotaeinemia or congenital infection.

Increasing nuchal thickness is associated with fetal anomaly, with a risk of 30% with a nuchal thickness of 3.5–4.4 mm, 50% for nuchal thickness of 4.5–5.4 mm, and 80% for nuchal thickness greater than 5.5 mm[1].

Materials and methods

The study was performed in our fetal medicine unit by reviewing the records of all patients with singleton pregnancies from January 2000 until March 2005 who had antenatal screening tests for Down syndrome between 11 and 13+6 weeks gestation. NT was measured according to the method described by Nicolaides *et al*.[2].

Patients with a nuchal translucency of 3.5 mm or more with serum screening tests in the high-risk range were offered prenatal diagnostic testing, either amniocentesis or chorionic villus sampling. Fetuses with cystic hygroma were excluded. The patients with a normal karyotype were included in the review and were followed up. We defined three subgroups according to the thickness of NT: between 3.5 and 4.9 mm; between 5.0 and 7.0 mm; and greater than 7.0 mm. We also defined three subgroups according to maternal age: under 30; between 30 and 35; and between 35 and 40.

The following outcomes of pregnancy were studied: malformation, spontaneous miscarriage, termination of pregnancy (TOP) and any abnormality at birth or birth of a healthy infant.

Results

There were 5483 fetuses who had first trimester screening tests for Down syndrome from January 2000 to March 2005. Of these, there were 119 cases with a NT of 3.5 mm or more and a positive serum screening test for which complete information was available and all had prenatal diagnostic testing. There were 94 cases of fetal chromosomal

Table 1 Outcome of fetuses with enlarged nuchal translucency and normal karyotype

NT (mm)	Fetuses	Termination of pregnancy	Malformation	Still-born	Preterm live-born	Term live-born
3.5–4.9	19	1 Velo-cardial-facial syndrome 1 Hydrops fetalis	1 Moderately severe absent pulmonary valve syndrome	1 22 weeks	1 26 weeks live (5.3%)	14 (73.7%)
5–7	3	1 Large VSD and non resolving thickened NT				2 (66.6%)
> 7	3		1 Cardiac defect and Achondro-genesis Type 2 1 Thanato-phoric dysplasia			1 (33.3%)

Table 2 Fetal abnormalities and matenal age

Age (years)	Fetuses	Fetal abnormalities
< 30 years	14	1 (7.1%)
30–35	7	2 (28.5%)
30–35	7	2 (28.5%)
35–40	4	2 (50%)

Table 3 Pregnancy outcome of 25 euploid cases, based on maternal age (above/below 30 years) and nuchal translucency (NT) measurement (above/below 5 mm)

Age	NT (mm)	Fetuses	Abnormalities
< 30 years	< 5	12	1(8.3%)
	> 5	2	0
> 30 years	< 5	8	2 (25%)
	> 5	3	3 (100%)

abnormalities and 25 cases of normal chromosomes.

The average age of patients was 29 years with a range from 21 to 39 years. The number of abnormalities according to maternal age is shown in Table 2.

The outcomes of pregnancy for the 25 fetuses with normal karyotypes were as follows: Three patients opted for TOP because of non resolving thickened NT (5 mm) and associated large ventricular septal defect (VSD) and the second fetus had velo-cardial-facial syndrome, while the third fetus developed hydropic changes. Two patients delivered preterm fetuses. One was a stillborn preterm infant at 22 weeks gestation that had no visible external abnormalities and the second delivered a preterm healthy baby at 26 weeks.

One fetus had moderately severe absent pulmonary valve syndrome diagnosed at an 18 weeks scan. Another had thanatophoric dysplasia. One fetus with an NT of 10.0mm had a VSD and Achondrogenesis type 2. The remaining fetuses were normal at the time of delivery (Table 1).

Discussion

The current study confirms previous reports indicating that among fetuses with enlarged nuchal translucency, the most common abnormality is aneuploidy, contributing to 79% of our cases. In the euploid fetuses, the most common anatomical defect associated with a large NT is cardiac anomaly, which we found in four fetuses (16%).

It is accepted that when isolated increased NT is diagnosed, genetic counselling is indicated for the parents.

At this stage, by using the logistic regression model currently presented in which data concerning NT measurement and maternal age are used, the probability of having an uncomplicated pregnancy outcome could be calculated. However, if a complete fetal investigation, including karyotype and detailed scans, shows no obvious abnormalities this counselling becomes even more challenging. Even at this stage, the background maternal age should be further taken into account as well as the presence of any other risk factors such as family history.

In our study, about 80% of pregnancies with a fetal nuchal translucency below 5 mm resulted in healthy live births. With a nuchal translucency of 5–7 mm, 66.6% of pregnancies also resulted in a good outcome. However, if the NT was 7 mm or more, only 33.3% pregnancies resulted in a normal baby.

A favourable prognosis was found in euploid fetuses with NT less than 5 mm and maternal age less than 30 years (Table 3).

These issues need to be further explored and more data collected as screening recommendations are developed.

Acknowledgment

We would like to acknowledge the audio visual department of Nepean Hospital for design and production of the poster on which this article was based.

References

1 Nicolaides KH. *Am J Obstet Gynecol* 2004; 191 (1): 45–67.

2 Nicolaides KH, Azar G, Byrne D, Mansur C, Marks K. Fetal nuchal translucency: Ultrasound screening for chromosomal defects in first trimester of pregnancy. *BMJ* 1992; 308: 867–869.

3 Snijders RJM, Noble PL, Sebire NJ, *et al*. UK multicentre project on assessment of risk of trisomy 21 by maternal age and nuchal translucency thickness at 10–14 weeks gestation. *Lancet* 1998; 352: 343–346.

4 Snijders RJM, Johnson S, Sebire NJ, *et al*. First trimester ultrasound screening for chromosomal defects. *Ultrasound Obstet Gynecol* 1996; 7: 216–266.

5 Tsipale P, Hiilesmaa V, Salonen R, *et al*. Increased nuchal translucency as a matter for fetal chromosomal defects. *N Engl J Med* 1997; 337: 1654–1658.

ASUM Ultrasound Bulletin 2005 November; 8 (4): 32–33

Prenatal diagnosis of a duplex kidney and ureterocele by 2D and 3D ultrasound

Deborah Wye GradDAppSc (MedSon), AMS[A] and Ron Benzie MBChB, FRCs(c), FRANZCOG, ARDMS[AB]

[A]University of Sydney, Nepean Hospital, Penrith, New South Wales, Australia
[B]Correspondence to Ron Benzie email BenzieR@wahs.nsw.gov.au

Abstract

Duplex kidney is a common congenital anomaly of the urinary tract that is more frequent in females. There are two collecting systems, with the upper pole ureter being prone to obstruction. If obstruction occurs it may result in cystic dilatation of the distal ureter producing an ureterocele within the bladder. Accurate prenatal detection of this anomaly, its severity and progression of obstruction throughout the pregnancy enables informed decisions to be made about antenatal care and allows early postnatal treatment.

In this case, an anechoic structure in the upper pole of the right kidney was seen on the 19-week morphology scan. There also appeared to be a normal renal pelvis in the middle of the kidney and these findings suggested either a dilatation of the collecting system or possibly a duplex kidney. Follow-up was recommended and at 27 weeks a prenatal renal scan diagnosed a duplex right kidney and an ureterocele within the bladder. 3D sweeps enabled calculation of kidney, bladder and ureterocele volumes. Subsequent scans were performed at 29 and 33 weeks gestation and showed similar findings with no increase in the upper pole dilatation.

Due to maternal insulin dependent diabetes, proteinuria and hypertension, the female baby was delivered by caesarean section at 34.5 weeks gestation. A postnatal renal ultrasound and micturating cystourethrogram confirmed the prenatal diagnosis.

This case provides an excellent example of the classical sonographic features of a duplex kidney and ureterocele. These features and the potential role of 3D ultrasound in the diagnosis of renal anomalies will be discussed.

Introduction

Duplex kidney is a congenital anomaly of the urinary tract with an incidence of 1:125 or 0.8%.[1] It occurs when the kidney is divided into two separate pelvicalyceal systems, with either partial or complete duplication of the ureter. The upper pole is prone to obstruction while the lower pole frequently exhibits reflux. Bilateral duplication occurs in about 40% of cases, and in unilateral duplication the right and left kidneys are equally affected[1]. Duplex kidneys are twice as frequent in females[1].

A ureterocele is a cystic dilatation of the terminal portion of the ureter which may be entirely within the bladder (intravesical) or may extend into the bladder neck or urethra (ectopic). It may arise from a single collecting system or from the upper pole of a duplicated system. Ureteroceles are bilateral in 10% of cases and are seven times more frequent in females[1].

Duplex kidneys and/or ureteroceles can be asymptomatic or may cause urinary tract infections, obstruction, renal scarring, loss of renal function and urosepsis. Treatment may involve prophylactic antibiotics or surgery.

Case report

A 25-year-old G2P1 with insulin dependent diabetes, and a history of preeclampsia in her previous pregnancy had a dating scan at eight weeks gestation and a low risk nuchal translucency scan and serum screen at 12 weeks 5 days. The 19-week fetal anatomy scan demonstrated an anechoic structure in the upper pole of the right kidney and a normal renal pelvis in the middle of the kidney. The findings suggested either a dilatation of the collecting system or possibly a duplex kidney. The fetal anatomy scan was otherwise normal. Follow-up was recommended.

At 27 weeks gestation, a fetal renal scan and growth assessment showed satisfactory growth, normal umbilical artery flows and normal amniotic fluid index (AFI) of 13.6 cm. There was a duplex collecting system within the right kidney (Figure 1). There was dilatation of the upper pole moiety (Figure 2) with an anteroposterior measurement of 15 mm. Colour flow and spectral Doppler demonstrated two main renal arteries (Figure 3). The right kidney was larger than the left with lengths being 4.7 cm and 4.1 cm respectively. A 1.6 x 1.4 x 1.4 cm cyst was seen within the bladder arising from the right ureteral orifice, consistent with a ureterocele (Figure 4) and the right ureter was mildly dilated (Figure 5).

3D volumes were obtained to enable accurate comparison and serial assessment of renal and ureterocele size with the GE Voluson 730 Expert. The right renal volume (Figure 6) was 19.5 cc (above the 95th percentile[2]), the left was 12.9 cc

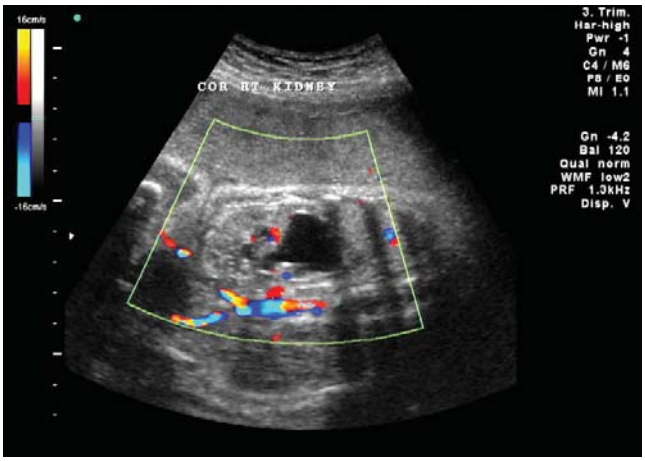


Figure 1 Duplex collecting system within the right kidney

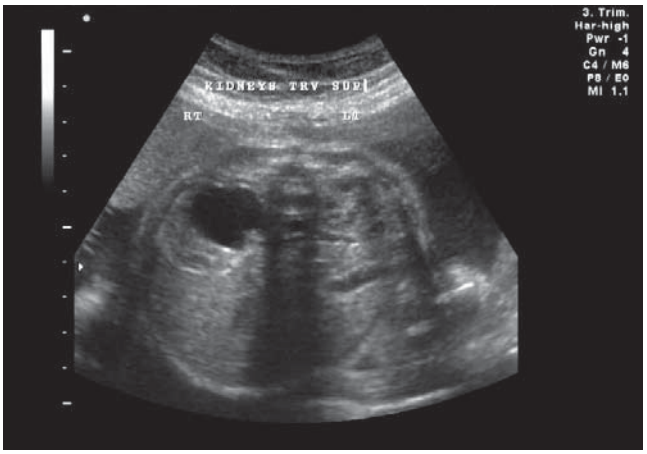


Figure 2 Dilation of the upper pole moiety

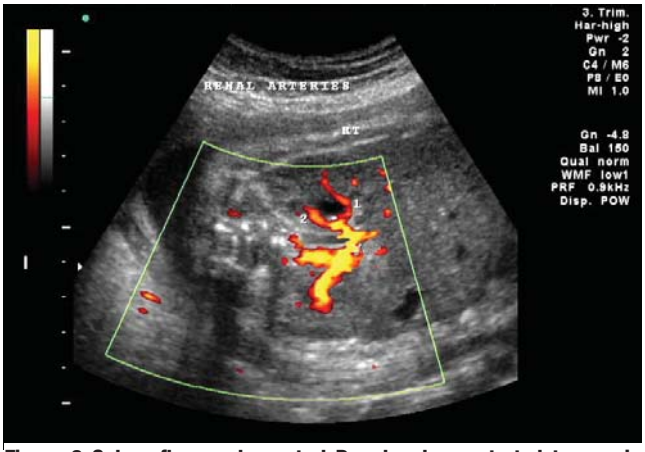


Figure 3 Colour flow and spectral Doppler demonstrated two main renal arteries

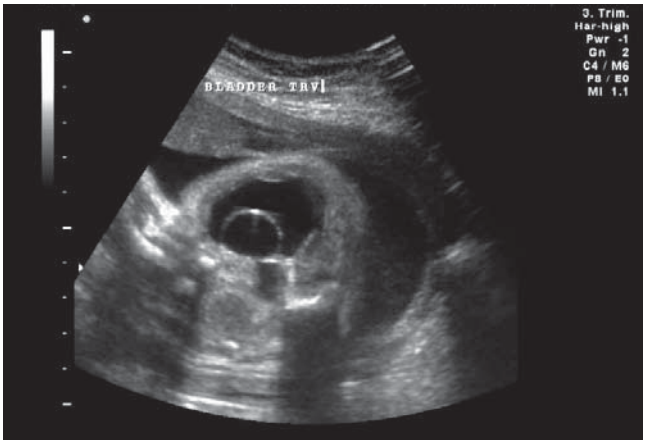


Figure 4 Cyst within the bladder consistent with ureterocele

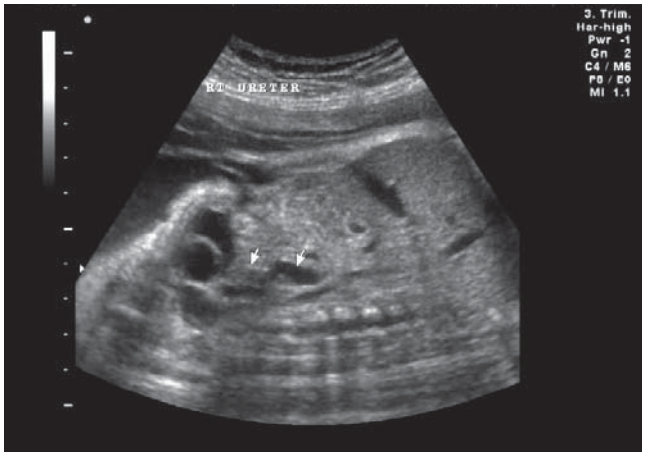


Figure 5 Right ureter mildly dilated

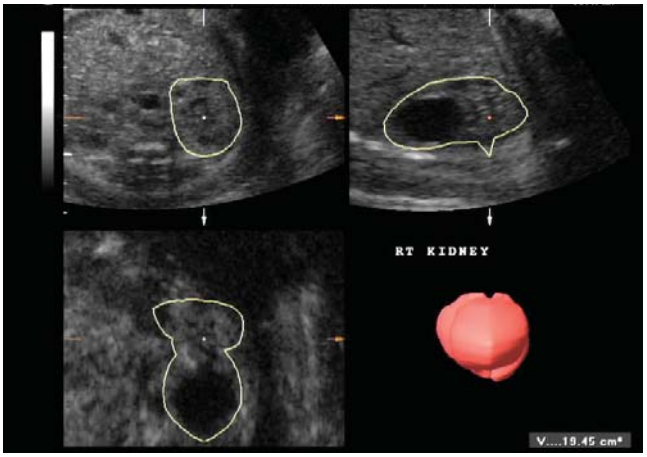


Figure 6 The right renal volume 19.5 cc

and the ureterocele (Figure 7) was 2.3 cc.

Serial assessments were performed at 29 and 33 weeks with 2D and 3D imaging to check for renal obstruction. The AFI was normal on both occasions (12.4 cm and 10.2 cm). The upper pole dilatation and ureterocele size and volume remained stable. The right kidney was consistently larger than the left. The patient was admitted to hospital at 34 weeks 4 days gestation due to proteinuria and hypertension and a caesarean section was performed the following day resulting in a live 3.2 kg female infant.

Postnatal examinations and treatment

At five days postpartum, a neonatal renal ultrasound confirmed the diagnosis (Figure 8). At seven weeks no vesicoureteric reflux was seen on a micturating cystourethrogram. At nine months a renal ultrasound revealed obstruction of the right upper moiety with the ureterocele now measuring 2 cm in diameter. Cystopic decompression is planned at ten months. If infections persist ureterocele excision and reimplantation of the right ureters will be performed.

Discussion

The following sonographic features may indicate the presence of a duplex kidney:

- identification of two separate, non-communicating renal pelves;
- renal length/volume > 95% for gestational age;

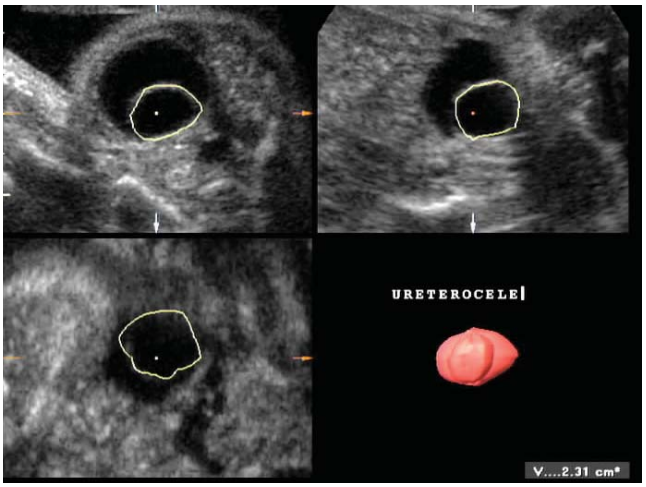


Figure 7 Left renal volume 12.9 cc, ureterocele volume 2.3 cc

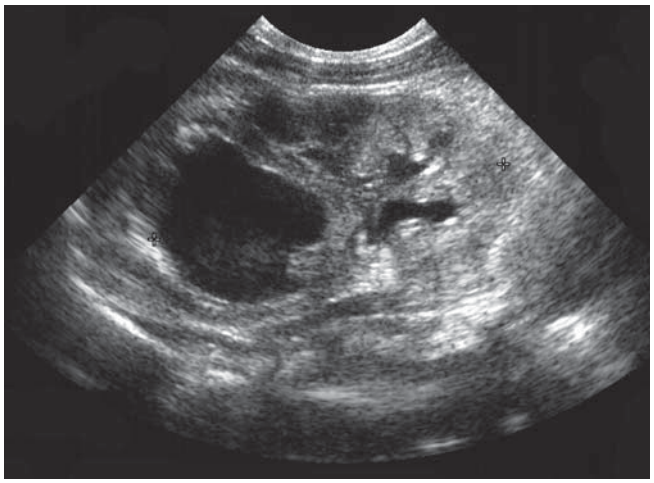


Figure 8 Neonatal renal ultrasound five days postpartum

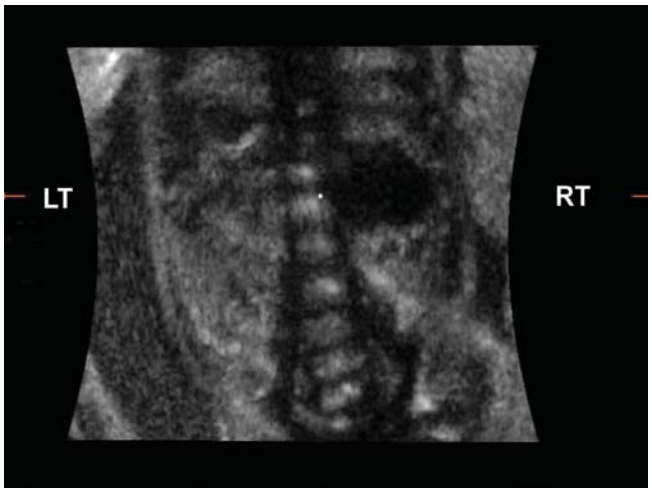


Figure 9 Two separate non-communicating renal pelves

- dilatation or cystic areas in an upper or lower pole;
- dilated ureters and;
- ureterocele – seen as a thin-walled, cystic structure within the bladder.

Whitten *et al.*[3] showed that detection of two separate poles or a ureterocele were strongly associated with a correct diagnosis and accuracy was increased when two or more features were seen. Abuhamad *et al.*[4] stated that the presence of a cyst-like structure in the upper pole of a long kidney and/or an ureterocele are the two most specific signs.

It must be emphasised that in the suspicion of a duplex kidney careful examination of the fetal bladder may be necessary to detect an ureterocele. It may be overlooked if the bladder is empty or if the bladder is full the ureterocele may be compressed.

In this case the diagnosis was primarily made from the 2D images, however 3D ultrasound was of benefit in obtaining serial renal and ureterocele volumes to monitor progression of the condition. It also allowed us to reconstruct slices of the kidney to ensure there were two separate, non-communicating renal pelves (Figure 9).

3D ultrasound may be of benefit in many renal conditions, both prenatally and in children and adults. It can obtain accurate volumes of the kidneys and bladder or of pathology and provide views unobtainable by conventional 2D imaging.

The simultaneous display of three orthogonal images enables the position of any pathology to be evaluated with respect to neighbouring organs. We have used 3D ultrasound prenatally to aid in diagnosis and assessment of: duplex kidneys, multicystic dysplastic kidneys, polycystic kidneys, a pelvic kidney, renal agenesis, and in abdominal masses to determine if they are of renal origin.

Conclusion

Accurate prenatal detection of a duplex kidney and ureterocele, their severity and progression of obstruction throughout the pregnancy enables informed decisions to be made about antenatal care and allows early postnatal treatment.

Acknowledgements

We would like to acknowledge the staff of the Medical Imaging department, Nepean Hospital for providing postnatal images; Dr C Abkiewicz for follow-up information and Audio Visual for design and production.

References

1 Gillenwater JY, Grayhack JT, Howards SS, Duckett JW (1991). Adult and Pediatric Urology (2nd Ed). Mosby Year Book: St Louis; 1991.

2 Fauchon D, Benzie R, Mein B, Al-Balooshi S, Thavaravy R. Three-dimensional ultrasound estimation of fetal renal volumes in the second and third trimesters. *Ultrasound Bull* 2005; 8 (2): 27–28.

3 Whitten SM, McHoney M, Wilcox DT, New S, Chitty LS (2003). Accuracy of antenatal fetal ultrasound in the diagnosis of duplex kidneys. *Ultrasound Obstet Gynaecol* 2003; 21: 342–346.

4 Abuhamad AZ, Horton Jnr CE, Horton SH, Evans AT (1996). Renal duplication anomalies in the fetus: clues for prenatal diagnosis. *Ultrasound Obstet Gynaecol* 1996; 7: 174–177.

Where is that pregnancy? A case of abdominal pregnancy diagnosed on ultrasound

HS Wong[AC], F Langdana[A], C Birchall[B], K Burns[B], S Parker[B], M Jaber[B], J Tait[B]

[A]Department of Obstetrics and Gynaecology, Wellington School of Medicine and Health Sciences, University of Otago, New Zealand
[B]Women's Health Service, Capital and Coast District Health Board, New Zealand
[C]Correspondence to HS Wong email hsoowong@wnmeds.ac.nz

Abstract

A case of abdominal pregnancy was diagnosed at 18 weeks gestation after fetal demise. The ultrasound findings in earlier gestation and at diagnosis are presented. Soft tissue around the gestational sac and artefact could mimic the uterine wall. The sonographic diagnosis of abdominal pregnancy may not be as easy and straight-forward as it seems, especially in early pregnancy. Ultrasound diagnosis of the condition reported in the literature are usually late in the pregnancy. The sonographic findings suggestive of abdominal pregnancy in early pregnancy are discussed.

Introduction

Abdominal pregnancy occurs with a frequency of 1:10,000 pregnancies[1]. The overall associated maternal mortality and perinatal mortality rate is estimated at 0–18%[2, 3] and 40–95%[2] respectively. Up to 60% of cases are unsuspected at the time of presentation as the clinical presentation is often non-specific[2]. Only about half are diagnosed in eight series of 163 cases, even with the use of ultrasound[3]. In another series, the sensitivity of clinical suspicion was estimated to be 68%, ultrasound 85% and x-ray diagnosis 93%[4]. The ultrasound findings of a case of abdominal pregnancy in first trimester and at the time of diagnosis in mid-trimester are presented. The findings suggestive of abdominal pregnancy in early gestation are discussed.

Case report

The patient was a 31-year-old, G4P3 Caucasian. A laparotomy and right ovarian cystectomy had been performed previously for benign ovarian cyst, followed by three caesarean deliveries. She was seen early in the index pregnancy. An ultrasound scan made at eight weeks gestation reported a single live intrauterine pregnancy with crown-rump length corresponding to the date (Figure 1a). A sonolucent area of 1 x 2 x 2 cm was noted inferior to the gestational sac. A scan was performed at 11 weeks gestation (Figure 1b) for nuchal translucency screening and showed a low risk for fetal aneuploidy. The placenta was noted to be posterior and a sonolucent area was again detected between the placenta and the 'uterine wall' (Figure 1c).

The pregnancy proceeded uneventfully, in particular there was no vaginal bleeding or abdominal pain. A morphology scan was performed at 18 weeks and showed the absence of fetal heart pulsation and with fetal parameters corresponding to 16 weeks gestation.

The patient was admitted into hospital for medical induction because of second trimester missed miscarriage. She was started on mifepristone followed by misoprostol orally. She experienced lower abdominal pain especially on the right side associated with moderate vaginal bleeding. After two days of failed medical induction, an ultrasound examination was repeated.

It was noted that the uterine cavity was empty and the fetus was in a gestational sac outside the uterine cavity (Figure 2a). The placenta overlaid the anterior uterine wall and the right adnexa (Figure 2b). The uterine scar appeared intact on transvaginal scan (Figure 2c). The diagnosis was abdominal pregnancy and was confirmed at laparotomy (Figure 2d). A gestational sac was noted in the lower abdominal cavity containing a macerated fetus with cord around the neck, the right arm and the left leg. There was a true knot in the cord which was thought to be the cause of fetal demise. The fetus was removed from the sac and the placenta was noted to be adherent to the anterior uterine wall, the right adnexa and the anterior abdominal wall. The placenta was left *in-situ*. Antibiotic prophylaxis was given during the procedure and postoperatively. Methotrexate was given intramuscularly postoperatively. The patient was discharged in good condition two days later. The serum beta-hCG level returned to normal two weeks after the operation. She remained well clinically.

Discussion

Angtuaco *et al.*, (1994)[2] listed the criteria for prenatal diagnosis of abdominal pregnancy from published literature, in order of decreasing frequency, as: demonstration of fetus or abdominal/pelvic mass outside the uterus, placenta outside uterus, oligohydramnios, close approximation of fetus to maternal abdominal wall, abnormal

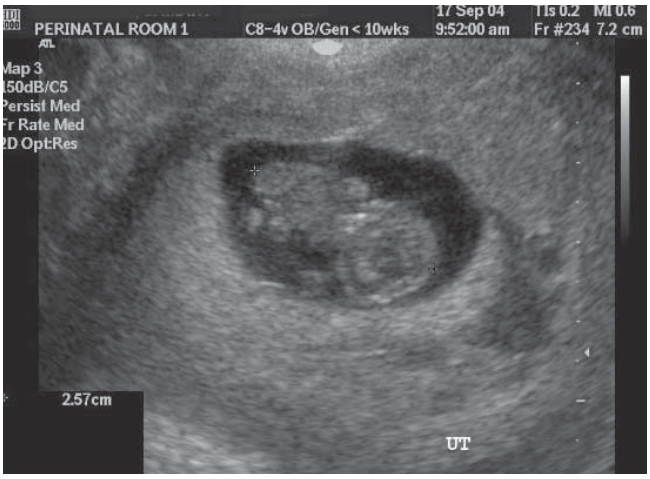


Figure 1a

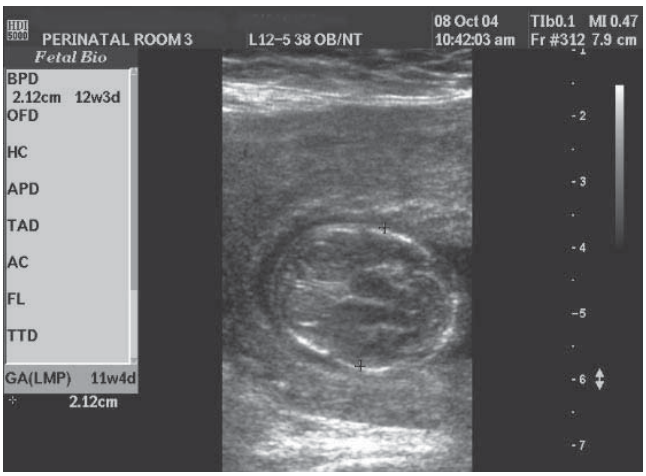


Figure 1b

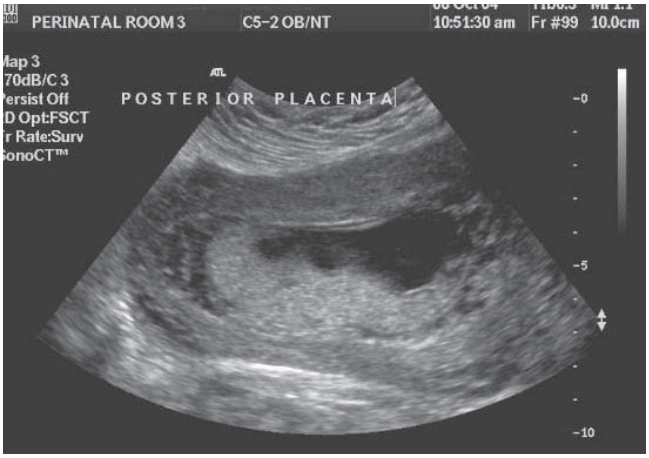


Figure 1c

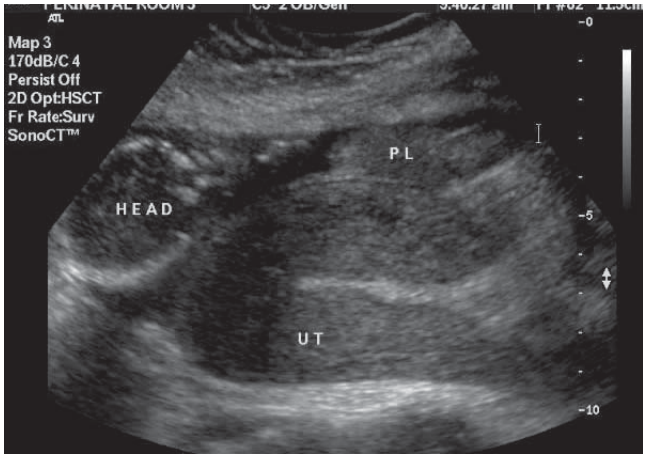


Figure 2a

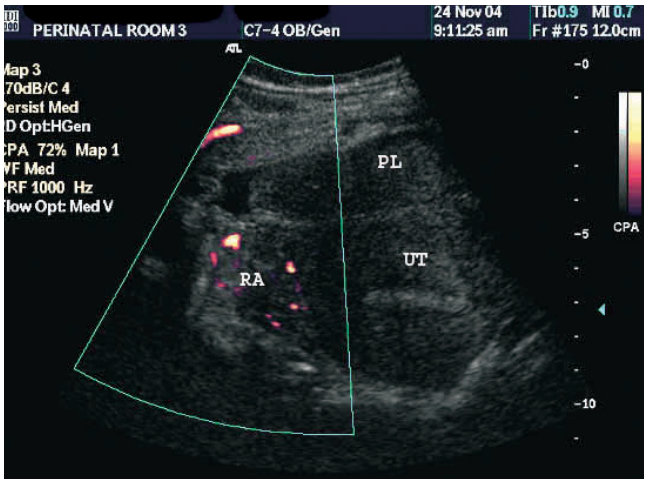


Figure 2b

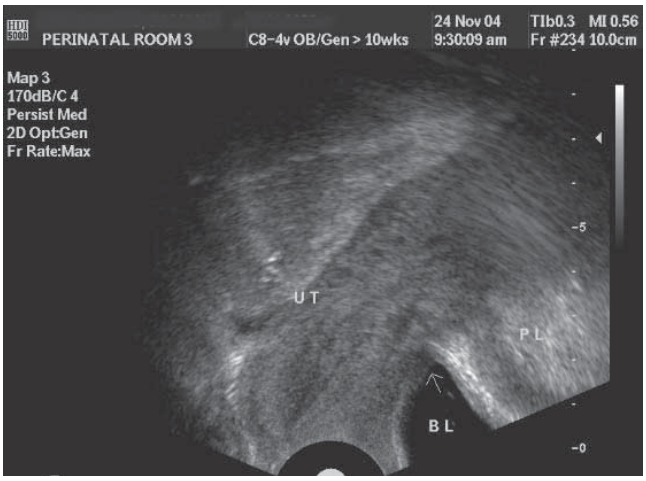


Figure 2c

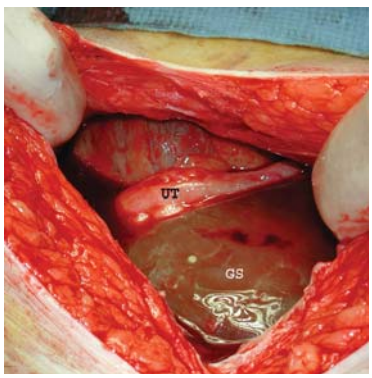


Figure 2d

Figure 1 On transvaginal scan at eight weeks gestation, the gestational sac was seen with a viable fetus inside (Figure 1a). In retrospect, the uterus (UT) was small and at the right lower corner of the picture and the endometrial lining could be identified. The placenta was lying over the anterior wall of the uterus. A sonolucent area was noted inferior to the gestational sac. At 11 weeks gestation, the placenta was reported to be posterior (Figure 1c). A sonolucent area was again noted between the placenta and the 'uterine wall'. The gestational sac appeared to be inside a layer of soft tissue mimicking the uterine wall (Figure 1b).

Figure 2 On transabdominal scan in sagittal section, a gestational sac containing a fetus and placenta (PL) was seen anterior and superior to the empty uterus (Figure 2a). On transverse section, the placenta overlaid the uterus and the right adnexa (RA) which was not overly vascular (Figure 2b). The previous Caesarean section scar in the lower segment, as indicated by the arrow, appeared intact (Figure 2c). At laparotomy, the gestational sac (GS) was noted in the abdominal cavity with the placenta attached to the anterior wall of uterus (UT), the right adnexa and the lower anterior abdominal wall (Figure 2d).

fetal lie, poor visualisation of the placenta, absence of myometrium between the fetus and urinary bladder and pseudo-placenta praevia appearance.

In our case, it is found that there is often a layer of soft tissue surrounding the gestational sac and artefact mimicking the uterine wall. Theoretically, if the uterus is identified, the extra-uterine location of the gestational sac would be recognised. However, the uterus may be small and inconspicuous in relation to the gestational sac in early pregnancy (Figure 1a). It is noticed that there is a sonolucent layer between the sac or the placenta and the alleged 'uterine wall' in the pictures taken in early pregnancy (Figures 1a and 1c) and this finding may alert the person conducting the ultrasound that the former may not be in direct contact with the latter. Moreover, the surface of the alleged 'uterine wall' is unusually irregular (Figures 1a, 1b and 1c). The cervical canal could not be identified inferior to the gestational sac in longitudinal scan (Figures 1a and 1c). The extra-uterine location of the pregnancy is more evident in later scan when the gestational sac, the fetus and the placenta are seen outside the uterus, which is more bulky at this stage (Figures 2a and 2b). This is consistent with the finding in the literature that the diagnosis is often established late[3].

Conclusion

Sonographically, the diagnosis of abdominal pregnancy is made when the location of the gestational sac is found outside the uterus and the rest of the genital tract. However, the diagnosis may not be easy in early pregnancy as the surrounding soft tissue and artefact may simulate the uterine wall. The findings of a sonolucent layer between the sac and/or the placenta and the 'uterine wall' which is unusually irregular and the non-identification of the cervical canal in its usual relationship to the gestational sac could be signs of abdominal pregnancy at this stage of pregnancy.

References

1. Atrash HK, Friede A, Hogue CJ. Abdominal pregnancy in the United States: frequency and maternal mortality. *Obstet Gynecol* 1987; 69 (3 Pt 1): 333–337.
2. Angtuaco TL, Shah HR, Neal MR, Quirk JG. Ultrasound evaluation of abdominal pregnancy. *Cri Rev Diag Imaging* 1994; 35 (1): 1–59.
3. Martin JN Jr. Sessums JK. Martin RW. Pryor JA. Morrison JC. Abdominal pregnancy: current concepts of management. *Obstet Gynecol* 1988*;* 71 (4): 549–557.
4. Mbura JS. Mgaya HN. Advanced abdominal pregnancy in Muhimbili Medical Centre, Tanzania. *Int J Gynaecol Obstet* 1986*;* 24 (3): 169–176.

ASUM Ultrasound Bulletin 2005 November; 8 (4): 38–39

Steroid-induced left ventricular failure

Justin O'Leary BExSc, DMU

Royal Prince Alfred Hospital, Camperdown, Sydney, New South Wales, Australia
Correspondence to J O'Leary email Justin_Oleary@hotmail.com

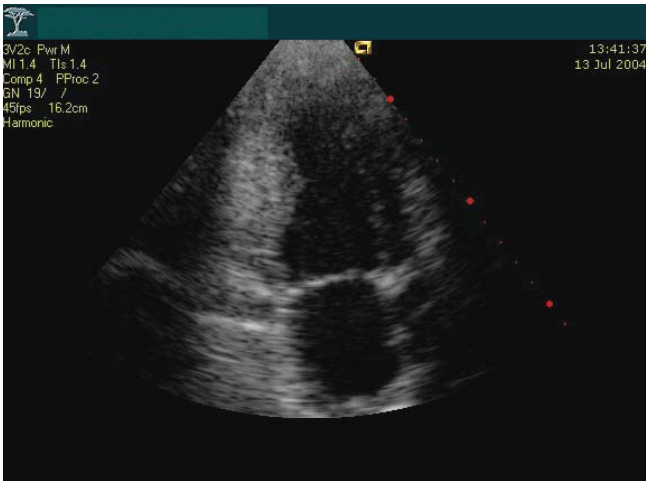


Figure 1 Parasternal long axis image of the left vertrical and left atrium demonstrating mild left ventricular systolic impairment with normal antero-septal regional wall motion and posterior hypokinesia

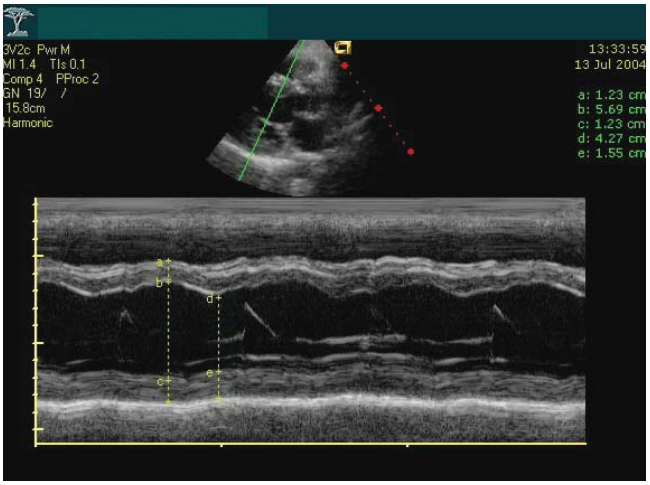


Figure 2 Parasternal left ventricular long axis M-mode demonstrating mild concentric hypertrophy and mild ventricular dilation with posterior hypokinesia

Clinical history

A 34-year-old male presented with a two-day history of central, non-radiating chest pain. ECG on admission showed ischaemic changes in the inferior and lateral leads. There was also evidence of myocardial damage in the cardiac enzymes (CK: 1375 u/L [normal range less than 200] and Troponin: 0.56 mcg/L [normal range less than 0.1 mcg/L]). On examination the patient was fit, normotensive non-smoker with a muscular build and with no family history of cardiac disease who self-administered anabolic steroids. An echocardiogram was requested to assess left ventricular function.

Materials and methods

An Acuson Cypress was used with a multi-frequency (1.5 – 3.0 MHz) phased array transducer with real time 2D (harmonic and non-harmonic), M-mode, colour flow, continuos and pulsed wave Doppler examination. A frequency of 1.7 MHz with harmonic imaging was selected for adequate penetration and resolution. Depth settings, focal zones, overall gain, TGC, colour and spectral Doppler settings were adjusted for optimum resolution. The mechanical index (MI) was 1.4 and the thermal index (TI) was 0.7–1.5. The total imaging time was 30 minutes.

Technique

The parasternal long axis view of the left ventricle showed moderately impaired systolic contraction with normal antero-septal wall contraction and severe posterior hypokinesis (Figure 1). The left ventricular walls appeared concentrically hypertrophied. The mitral and aortic valves appeared normal with normal excursion. The M-mode

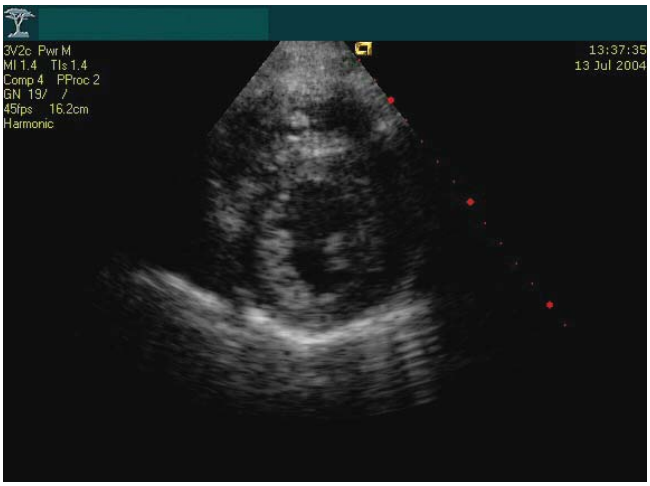


Figure 3 Parasternal short axis view of the left ventricle demonstrating mild concentric hypertrophy, posterior hypokinesia and mild cavity dilation

through the aortic valve demonstrated a normal sized aortic root and left atrium. The aortic valve cusp separation was normal.

M-mode through the left ventricle shows a mildly increased left ventricular end-diastolic dimension and reduced systolic thickening of the posterior wall (Figure 2). There was mild concentric left ventricular hypertrophy. Colour Doppler revealed no aortic or mitral regurgitation.

The right ventricular inflow view showed a normal tricuspid valve with normal valve excursion. The right atrium appeared normal in size. Colour Doppler revealed trivial tricuspid regurgitation. The right ventricular outflow tract and pulmonary valve appeared normal and the colour Doppler

and continuous wave Doppler across the pulmonary valve showed normal outflow velocities.

The parasternal short axis view confirmed normal pulmonary, mitral and aortic valve leaflets with no aortic regurgitant jet and trivial tricuspid regurgitation. The left ventricle visualised at the level of the papillary muscles showed hypokinesis impairment in systolic function.

Apical views confirmed the mitral valve and tricuspid valves to have normal excursion with normal left and right ventricular wall motion and normal atrial size. Colour Doppler of the mitral valve showed physiological mitral regurgitation and normal tricuspid and aortic flow.

The 2-chamber view showed a normal anterior wall but the inferior wall motion was moderately impaired with severe posterior wall dysfunction.

The subcostal 4-chamber view showed no evidence of pericardial effusion and colour Doppler across the interatrial septum shows no sign of an interatrial septal defect. There was a normal sized IVC with normal respiratory collapse (RAP = 5–10 mmHg). Subcostal short-axis views of the left ventricle confirmed mild segmental left ventricular impairment with posterior hypokinesia and moderate impairment of left ventricular function (Figure 3).

Suprasternal views showed a normal sized aortic arch diameter with normal descending aortic flows.

Discussion

The echocardiogram revealed a left ventricle that was upper normal size with mildly increased concentric wall thickness. The left ventricular function was mildly impaired with segmental dysfunction. There was basal to mid inferior and inferolateral hypokinesis and posterior akinesis. The thickness of the myocardium and the clinical settings suggested this was a recent infarct. The remainder of the ultrasound examination was essentially normal with normal sized atria and normal cardiac valves and Doppler flows.

A coronary angiogram showed a tight stenosis of the mid circumflex artery, which was dilated, and stented with a drug eluting stent. The patient was advised to avoid anabolic steroids as it was likely that their use had contributed to the premature development of coronary atherosclerosis.

ASUM Ultrasound Bulletin 2005 November; 8 (4): 40–54)

Abstracts 35th Annual Scientific Meeting 2004 Adelaide, South Australa – Part 1

An update from the Department of Health and Ageing

Mr Chris Sheedy, Department of Health and Ageing

The Australian Government manages the delivery of diagnostic imaging services under Medicare through Quality and Outlays Memoranda of Understanding (MoUs) with professional and industry bodies. There are four MoUs covering: cardiac ultrasound and cardiac angiography; obstetrics and gynaecological ultrasound; nuclear medicine imaging and the largest MoU covering all other services. This later MoU is the Radiology Quality and Outlays MoU.

The MoUs provide for the elective management of Medicare outlays for diagnostic imaging services and contain a number of quality objectives. They run for five years, until June 2008.

Under the Radiology MoU, the Government is funding the Royal Australian and New Zealand College of Radiologists to administer a Quality Use of Diagnostic Imaging; significant projects of interest to members of the Australian Society for Ultrasound in Medicine (ASUM) are professional supervision and role evaluation. ASUM, as a major stakeholder, would have significant role in these projects.

Understanding new technology in ultrasound

Professor Peter Burns, University of Toronto, Canada

The clinical application of ultrasound imaging continues to be propelled by innovation in its technical instrumentation, which in turn follows improvements in our understanding of the fundamental mode of action of ultrasound: ultrasound physics. Of course, there are refinements in the presentation of images – such as 3D and extended field of view imaging – which are attractive and may add to the clinical utility of the ultrasound examination. Perhaps more exciting, however, are technical developments that have arisen from new understanding of sound itself and its interaction with tissue. It is some of these that we consider in this presentation.

Uterine artery Doppler and biochemical marker assessment of placental function

Dr Peter Muller, Women's and Children's Hospital, SA, Australia

Preeclampsia and intrauterine growth restriction (IUGR) are major causes of perinatal morbidity and mortality. Abnormal placentation by failure of adequate trophoblastic invasion and physiologic remodelling of spiral arteries has been shown to be a histopathologic hallmark of preeclampsia and possibly IUGR. Dynamic (uterine artery Doppler) and biochemical (placental proteins, hormones, or fragments) markers may be used in the evaluation of abnormal placentation. High resistance Doppler velocimetry waveforms have correlated to abnormal trophoblastic invasion as seen in placental bed biopsies. The evaluation of using uterine artery Doppler (UAD) velocimetry as an early screening tool for preeclampsia and IUGR, however, has been mixed, with sensitivities ranging from 20–78%. This is far from adequate for the routine use in low-risk women. Improved early prediction of preeclampsia was found combining second-trimester maternal serum inhibin-A and UAD, both indirect markers of inadequate trophoblastic invasion. Other maternal biochemical markers have shown some predictive value for pregnancy complications. These include maternal serum AFP, circulating angiogenic factors such as vascular endothelial growth factor (VEGF), placental growth factor (PlGF), soluble Flt-1, and free fetal DNA. Recently, first trimester UAD and PAPP-A have independently shown some predictive value for pregnancy complications. If no association exists between these biochemical markers and UAD, and we continue to see studies that find these having predictive value for the later development of preeclampsia or IUGR, then they may in the future be used as independent, but additive, predictors of these abnormal pregnancy outcomes.

Can early pregnancy multiple marker screening, much the same as we use for aneuploid screening, improve our prediction of obstetric complications. Recent evidence shows promise in our heading in this direction.

Intra-amniotic band-like structures differentiation

Mr Martin Necas, Tristram Clinic, New Zealand

Band-like structures are commonly seen within the gestational sac during antenatal ultrasounds. Most of these structures are perfectly benign, however, their differentiation from more sinister pathology can be tricky. Correct differentiation is essential not only from the viewpoint of pregnancy management, but also from the point of prognosis and patient anxiety. For example, misreporting a benign synechial band as an amniotic band is not an uncommon error.

What conditions can produce the appearance of intra-amniotic bands? By order of probable incidence, they include: a wide variety of synechiae (intrauterine scars), circumvallate placental edge, chorionic elevation associated with bleeding, chorio-amniotic separation, uterine fusion variants (septateuterus) and, lastly, and perhaps most importantly amniotic band syndrome. There are a great many other structures which produce bizarre band-like appearances on ultrasound. Most of these can be differentiated quite easily after a careful review of their structure of origin, shape, location, associated findings, and mother's clinical history. All of the above sonographic entities will be presented in detail along with demonstrative images.

Fetal Doppler assessment of IUGR

Dr Nayana Parange, University of Adelaide, SA, Dr Chris S Wilkinson, Women's and Children's Hospital, SA, Australia

The theoretical basis and clinical utility, as well as the limitations, of Doppler ultrasound for the evaluation of fetal wellbeing will be discussed. Some illustrative clinical examples, from cases managed at the fetal medicine unit at the Women's and Children's Hospital in Adelaide will be presented. These cases will focus on growth restricted fetuses.

Ultrasound and early atherosclerosis prevention: carotoid IMT

Dr Joseph Polak, Tufts University School of Medicine, New England Medical Center, United States

Purpose

To review the use of high resolution ultrasound imaging and carotid intima-media thickness (IMT) as a surrogate of cardiovascular disease.

Methods

Review of the literature to evaluate the role of Doppler ultrasound imaging for the diagnosis of hemodynamic significant stenosis of the carotid arteries and the selection of patients who might benefit from invasive interventions. Description of how high-resolution ultrasound imaging can be used to estimate the presence of early atherosclerotic disease and identify high-risk individuals who would then receive interventions to minimise atherosclerosis progression.

Results

The process of validating the use of carotid IMT as a surrogate measure of cardiovascular disease has undergone three major steps. The first is confirmation of the correlation between IMT and known cardiovascular disease. The second is the ability of carotid IMT to predict future cardiovascular outcomes such as stroke and myocardial infarction in asymptomatic individuals. The third is confirmation that a change in IMT is associated with a therapeutic intervention that lowers cholesterol and alters outcomes. While all these three steps in the validation process have taken place, the widespread use of carotid IMT measurements is dependent on the consistency and precision of IMT measurements. The quality of the imaging device, the training of the sonographer, the phase of the cardiac cycle and the quantitative software used to perform the IMT calculation affect the precision of the measurement.

Conclusion

Carotid IMT measurements can serve as a surrogate for cardiovascular disease. The methodology is close to reaching the reliability needed for clinical use.

Doppler ultrasound in renovascular hypertension

Dr Leandro Fernandez, Laboratorio de Ecografica Vascular, Venezuela

Renovascular hypertension is a curable cause of arterial hypertension. Therefore, its early detection is considerably important. This disease is the most frequent cause of secondary hypertension in specialised reference centers.

The emergence of color Doppler and later developments such as the power Doppler and sonography with echo-enhancement, have made possible a precise study of renal circulation, both in the parenchyma as well as in the renal artery and vein.

In the assessment of the renal artery it is necessary to measure the flow speed. Therefore, it is very important to adequately place the volume sample into the vessel, in addition to an accurate adjustment of its angle. Nowadays, the assessment of the renal artery has become a feasible procedure in most cases. If we get normal results there is no need for further exploration. Conversely, if we get adverse results, it is vital to continue with an angiography in order to solve alterations through the use of endovascular procedures such as angioplasty or the placement of stents.

The typical sonographic findings in hypertension caused by stenosis of the renal artery are the following:

1 Generally, the affected kidney presents a reduced size. However, there are cases where size is normal.
2 Acceleration of systolic peaks with a rate equal to or greater than 200 cm/sec in the stenosis site. Through the use of color Doppler the phenomenon of aliasing in the stenosis site (and posterior areas) can be clearly revealed.
3 Parvus-tardus pattern in the post-stenotic segment, in severe stenosis cases.
4 RAR greater than 3.5; AI less than 3.0 m/sec^2 and AT greater than de 100 ms.
5 Absence of detectable flow in kidneys smaller than 9 cm. is an indication of a total occlusion.

The dynamics of veins, popular misconceptions

Mr Robert Ziegenbein, Monash University, Vic, Australia

Ultrasound has confirmed its place in assessing patients with primary venous incompetence by identifying superficial varices and their major communications with the deep venous system as well as identifying venous obstruction. The purpose of the ultrasound test is to define those veins which are competent or incompetent by identifying the presence of significant reflux. Execution of the test is familiar to many, but varices appearing to have no proximal or deep communication and incompetent veins with no varicose dilation are examples which make interpretation confusing.

Many published articles rely on changes of venous volume, venous pressure or morphology to explain the development of incompetence. Reliance on these specific aspects of venous function has contributed to confusion in interpreting ultrasound observations. In addition to these measurements, other observations contribute to our understanding of varicose veins. These include biochemical and pharmacological analysis and newer technologies such as ultrasound which provide important information about venous structure and function. These observations have taken place at different times over many years, making it difficult to assimilate their meaning into the broader context of understanding venous physiology and pathology. This has caused misinterpretation in some of the published literature in recent years. It has also contributed to some popular beliefs about normal and abnormal vein functions which are ill founded and also contribute to the confusion surrounding the ultrasound examination.

This presentation will highlight aspects of venous structure and pressure changes that help to explain varicose vein formation and discuss anomalies between these theories and ultrasound observations of primary varicose veins. The contribution of biochemical and pharmacological studies to understanding varicose vein formation will also be discussed.

Fetal teleultrasound consultations: clinical value and cost-effectiveness

Prof Fung Yee Chan, University of Queensland, Qld, Ms Barbara Soong, Mater Mothers Hospital, Qld, Dr David Watson, Townsville Hospital, Qld, S Bloomfeld, Townsville Hospital, Qld, Assoc Prof Robert Cincotta, Mater Mothers Hospital, Qld, Dr John Whitehall, Townsville Hospital, Qld, Australia

Background

Telemedicine can enable patients living in regional and remote

areas easy access to subspecialist opinion. Teleultrasound provides tertiary real-time ultrasound consultations using standard telephone lines. Our group has evaluated the many technical challenges for such a service[1,2]. The clinical value and costs for such a program needs to be assessed.

Objective

To evaluate the clinical value and cost effectiveness of a tertiary fetal teleultrasound consultation service.

Methods

Patients requiring tertiary ultrasound consultations were recruited from north Queensland by their attending obstetricians. Clinicians from the referral site established an initial diagnosis and management plan. Using standard ISDN lines, real-time ultrasound images were transmitted to Maternal Fetal Medicine Subspecialists in Brisbane. Any diagnostic and management variations were noted. Pregnancy outcomes were obtained and the costs of the teleultrasound consultations were calculated.

Results

Two-hundred tertiary consultations had been carried out on167 patients. 76.3% involved fetuses with major anomalies or complications. The consultations resulted in some modifications to the clinical diagnosis in 38.5% and a management plan in 35.5% of the cases. Pregnancy outcomes have been obtained in 97.5% of the pregnancies, with only two cases having some minor diagnostic variations. The mean line cost per teleconsultation is $A40. This is much lower than the cost of air-transfer.

Conclusions

Tertiary real-time fetal teleultrasound consultations are accurate, clinically useful and cost effective.

References

1 Chan FY, Soong B, Watson D *et al.* Real-time fetal ultrasound by telemedicine in Queensland – a successful venture? *J Telemed Telecare* 2001; 7 (Suppl. 2): 7–11.

2 Chan FY, Soong B, Watson D, Whitehall J. Real-time fetal ultrasound by telemedicine in Queensland – a successful venture? *J Telemed Telecare* 2001; 7 (Suppl. 2): 7–11.

What is the best videocompression alogorith for digital fetal ultrasound videoclips?

Dr David Watson Mater Mothers Hospital Qld, Dr Igor Kromin University of Queensland, Qld, Prof Fung Yee Chan Mater Mothers Hospital, Qld, Dr Laz Kastanis, Mater Womens Hospital, Qld, Ms Alison Lee-Tannock, Mater Mothers Hospital, Qld, Dr Greg Duncombe, Mater Womens Hospital, Qld, Dr Glenn Gardener, Mater Mothers Hospital, Qld, Prof Alan Chang, Mater Misericordiae Health Services, Qld, Australia

Background

New generation of ultrasound machines can acquire videoclips of fetal images digitally. Uncompressed videoclips are however, large (file size about 190 MB for a 5-second clip).

Aim

To find the best video compression algorithm for fetal ultrasound videoclips, without compromising clinical image quality.

Methods

Six 5-second digital videoclips of normal fetal cranial morphology were obtained. Three clips were then compressed using compression/decompression algorithms (CODEC): PICVideo (TM) M-JPEG, PICVideo™ Wavelet2000, Cinepak,MPEG-1, and DivX 5.2. For each CODEC, except Cinepak, four quality settings (1–4) were selected to yield different file sizes. A total of 17 compressed files per videoclip were produced (file size range: 120 KB to 32 MBs). The processed videoclips were identified and shown to five experienced clinicians in random order. Each clinician assessed the quality of the clips using a seven point scale. Analysis of inter-observer variability was conducted using Wendall W test for concordance. Comparison of the image quality between the compressed videoclips was performed using Kruskal-Wallis one-way analysis of variance.

Results

There was very close agreement between the observers: concordance was 0.92 ($P < 0.0001$). As a whole, compression reduces the overall quality of the video clips ($P = 0.0004$). When image quality using specific CODECs were compared to the uncompressed clip, there were significant reduction in quality for the following clips: DivX (1), (2), Wavelet (1), (2), MPEG (1) all with $P = 0.001$, MPEG (2) $P = 0.01$, MPEG (3) $P = 0.05$. There were four compressed videoclips that scored similar to the uncompressed originals: Cinepak, DivX (4), MJPEG (4) and Wavlet (4). The original uncompressed file size was194MB. File size after compression for these four videoclips were as follows; Cinepak:7.3MB, DivX (4):0.4MB, MJEG (4):31.8MB, and Wavelet (4): 6.5MB. Their respective file sizes as compared to the original were: 3.8%, 0.2%, 16.4%, and 3.4%.

Conclusion

The best video compression algorithm that results in no significant deterioration of clinical image quality, and with the smallest file size is DivX (4), followed by Wavelet (4), Cinepak, and MJEG (4).

'Ensure the Essure': combining new technology in 3D ultrasound with new technology in fertility control

Dr Gary Pritchard, Brisbane Ultrasound for Women, Qld, Dr Andrew Cary, Gold Coast Obstetrics and Gynaecology, Qld, Prof John Kerin, Adelaide Endometriosis and Gynae-Endoscopy Centre, SA, Ms Fiona Jones, Gold Coast Research: Brisbane Ultrasound for Women, Qld, Australia

Purpose

To demonstrate the use of Transvaginal 3D contrast rendered imaging to accurately locate the precise placement of the Essure permanent birth control devices within the uterus.

The Essure device is a dynamically expanding microinsert consisting of a flexible stainless steel inner coil, a dynamic outer coil made from titanium and centrally enclosed polyethyleneterephthalate (PET) fibres. The latter fibres cause a benign local tissue in-growth when placed in the human body thereby causing permanent tubal closure.

Contrast rendering is an application of 3D ultrasound, where the differing echotexture of tissues can be used to gain a superior appreciation of their boundaries.

Method

Transvaginal ultrasound was performed using Voluson 730 and a 5-9 MHz endocavity probe. A standard uterine volume data set (VDS) and data sets of both adnexal were obtained and stored. In addition, two further VDS were collected using the mid portion of the device as the starting point for collection.

All data sets were analysed off line using 4D View software from GE Kretz.

Results
Due to the ability of the VDS to manipulate image planes, a C plane view is obtained. The distance from the cornua to the proximal end of the device was measured. By placing the rendering line of the region of interest (ROI), an accurate assessment of the position and length of the device is obtained over 360 degrees. The landmarks of the device are seen.

Conclusions
3D ultrasound with contrast rendering provide a superior assessment of the positioning of Essure devices compared to traditional methods – x-ray and B-mode 2D imaging.

Spectral Doppler should be performed at a fixed angle: the evidence

Mr Peter Coombs, Monash Medical Centre, Vic, Australia

Purpose
The frequency of the ultrasound pulse is changed by its impact with moving blood cells. The amount of change ('frequency shift') depends on the four factors expressed in the Doppler equation i.e.

- Velocity of the blood (v)
- Transmitted frequency (f)
- Angle at which the blood impacts with the sound (cos)
- Speed of sound in tissue (c) (Change in frequency (fs) = 2 vfcos/c). The spectral Doppler waveform is a time-based representation of the change in this frequency.

In clinical ultrasound, this frequency shift is used to calculate velocity. The ultrasound system makes the reasonable assumption that the transducer frequency and speed of sound in tissue are known. The only parameter left to sonographer discretion is the angle of impact, which is determined by anatomy, transducer manipulation and beam steering. Colour flow imaging is used to perform angle correction.

The dominant practise in Australia is to calculate velocity using angles of insonnation of 60˚ or less. The commonly held belief is that measurement variation across this velocity range is minimal. Accuracy is improved with decreasing the angle because of the smaller changes that occur in the lower values of cosØ. While theoretically this might makes sense, it depends on the sonographer being able angle correct to the direction of flow.

Normal blood flow has a laminar profile enabling accurate angle correction. However, stenoses create vortices and turbulence within the flow, obviating any possibility of angle correction. The error is dramatic and will significantly affect stenosis classification. To avoid such error, most international research, clinical practise and consensus statements insist on the use of a fixed angle. When local audit is not performed, the fixed angle must be 60º.

Method
This paper will describe the rationale and current practise for angle correction. This will be compared to published literature in carotid classification (1) and fetal MCA and a range of clinical examples. These will highlight the significant velocity variation that occurs at different angles of insonnation.

Conclusion
Stenotic and post stenotic blood flow should only be measured at a fixed angle to avoid significant error.

QRS duration alone misses cardiac dyssynchrony in s ubstantial proportion of patients

Ms Rebecca Perry, Flinders Medical Centre, SA, Dr Michael Coombes, Flinders Medical Centre, SA, Assoc Prof Derek Chew, Flinders Medical Centre, SA, Dr Carmine De Pasquale, Flinders Medical Centre, SA, Dr Rob Minson, Flinders Medical Centre, SA, Prof Phil Aylward, Flinders Medical Centre, SA, Dr Majo Joseph, Flinders Medical Centre, SA, Australia

Introduction
Tissue synchronisation imaging (TSI) is an emerging technology that uses tissue Doppler velocities to determine the time to peak velocity of regions of the myocardium. The determinate for utility of cardiac resynchronisation therapy (CRT) has initially been based on the QRS duration. Our objective was to determine the prevalence of dyssynchrony in a cardiomyopathic population referred for echocardiography irrespective of QRS duration.

Methods
Forty-seven consecutive patients with significant left ventricular dysfunction (Simpson's ejection fraction ≤ 35%) referred to the Flinders Medical Centre Echocardiography Department underwent TSI in the apical 2, 4 and long axis views using a GE Vivid 7. The times to peak of opposing walls at a basal and mid level were taken to determine regional dyssynchrony. Dyssynchrony was defined as a difference in time to peak contraction of > 100 msec. An ECG was also taken to assess QRS duration.

Results
Of the 47 patients, 24 (51%, 95% CI: 36.1–65.9%) had a QRS duration of < 120 msec. Overall, 36 patients (77%) demonstrated significant dyssynchrony. Among those with a QRS duration of < 120 msec, significant dyssynchrony was evident in 19 (40%). Dyssynchrony was as common among those with QRS duration of < 120 msec (17 patients (36%)). Of the patients with dyssynchrony, 17/36 (47%, 95% CI: 30.14–64.5%) would have been missed if QRS criteria were used alone.

Conclusion
A substantial proportion of patients have dyssynchrony by TSI, but do not have a QRS duration of greater than 120 msec. These patients may benefit from CRT but on traditional criteria for CRT would be excluded from the therapy. Expanding the criteria for CRT to include echocardiographic parameters may extend the benefit of this technology to a greater population in need. Validation of CRT in this context will need further randomised comparison.

Coronary artery wall thickness of the left anterior descending artery using high resolution transthoracic echocardiography – intra- and inter-operator variability

Ms Rebecca Perry, Flinders Medical Centre, SA, Dr Carmine De Pasquale, Flinders Medical Centre, SA, Assoc Prof Derek Chew, Flinders Medical Centre, SA, Ms Lynn Brown, Flinders Medical Centre, SA, Dr Andrew Hamilton, Flinders Medical Centre, SA, Professor Phil Aylward, Flinders Medical Centre, SA, Dr Majo Joseph, Flinders Medical Centre, SA, Australia

Introduction
The ability of angiography to detect early atherosclerotic

changes in the coronary arteries is limited by arterial remodelling. Failure to detect early atherosclerosis may represent a missed opportunity for pre-emptive treatment. The optimal method for detection of subclinical coronary atherosclerosis would be non-invasive, inexpensive and would focus on the arterial wall rather than the lumen. A recent study has shown that high-resolution transthoracic echocardiography (HRTTE) can be used to visualise and make accurate measurements of the proximal left anterior descending artery (LAD) wall. Moreover, these measurements differ between patients with coronary disease and normal volunteers.

Methods

We used HRTTE to visualise and measure the LAD anterior and posterior wall thickness and vessel luminal and external diameters to determine the intra- and inter-operator variability of these measurements. Thirty volunteers without a history of cardiac disease underwent a HRTTE assessment of their LAD by two different operators on three separate occasions.

Results

The correlations for intra-operator variability were = 0.86 ($P < 0.001$), r = 0.86 ($P < 0.001$), r = 0.81 ($P < 0.001$) and r = 0.85 ($P < 0.001$) for anterior and posterior wall thickness and luminal and external diameters respectively. The correlations for inter-operator variability were r = 0.68 ($P < 0.001$), r = 0.82 ($P < 0.001$), r = 0.76 ($P < 0.001$) and r = 0.70 ($P < 0.001$) for anterior and posterior wall thickness and luminal and external diameters respectively.

Conclusion

HRTTE measurement of the LAD vessel is reproducible within and between operators in normal volunteers. This technique therefore warrants further study as a potential screening modality for subclinical coronary atherosclerosis.

Benign breast disease

Dr Wes Cormick, Canberra Imaging Group, ACT, Australia

Increased imaging frequencies and better tissue characterisation allow improved imaging and a better understanding of benign breast changes.

Imaging techniques are also important. With males and young females, a significant amount of the breast is behind the nipple. Placing the probe directly on the nipple causes shadowing and loss of most of the information. Rolling the nipple, or compressing it between the hand and probe allows this region to be properly imaged.

The presentation will focus on the correct techniques and the range of findings in some of the benign breast conditions. These include, gynecomastia, infant and adolescent breasts and the spectrum of fibrocystic changes.

Advanced sonography of near field skin and subcutaneous structures

Dr Leandro Fernandez, Laboratorio de Ecografica Vascular, Venezuela

The use of 10 MHz plus transducers allows for a convenient observation of the skin structure and of several organs and lesions located on the superficial tissues. Many ultrasound units are equipped with 10, 12, 13 and even 17 MHz transducers, all capable of performing Doppler explorations, some of them having the equipment necessary to perform three-dimensional reconstructions.

The skin and the subcutaneous cellular tissue can also be assessed using near field sonography. Several kinds of lesions can be distinguished by employing these techniques: tumoral lesions, abscesses, fistulae, foreign bodies, as well as very superficial lesions, such as melanoma. The expansion of the tumor toward deep planes can be easily assessed. Superficial veins and the lymphedema are detected without difficulty.

Doppler sonography allows us to determine the degree of vascularity of a given lesion. The use of special very-high frequency transducers in the 20–100 MHz range, makes for a meticulous evaluation of the dermis, and it is also very useful in the evaluation of morphea, sclerodermia or systemiceritematous lupus, among others, where sonographic changes such as pharmacological responses can even be observed.

Gall stones and bile ducts – making the most of ultrasound

Professor Robert Gibson, University of Melbourne and Royal Melbourne Hospital, Vic, Australia

The task of diagnosing or excluding gall bladder (GB) stones or their complications is often simple but the high prevalence of stones and the costs of misdiagnosis make this a critical area of abdominal ultrasound 'to get right'.

Gall bladder stones

False negative results can be minimised by:

- using several windows and patient positions (including erect and even semi-prone);
- turning down gain and ambient lighting;
- scanning slowly through the GB, matching focal zone with level of likely stones;
- using higher frequency probes and harmonics and;
- looking carefully through sludge

Differentiation from polyps:

- small stones may mimic polyps, but seldom the reverse. Absence of mobility does not of itself indicate a polyp. Even subtle shadowing indicates a stone. If it is not clearly a polyp then the report should comment that some polypoid lesions represent stones. Repeat US may be sensible depending on clinical likelihood of stones.

Bile duct stones (Choledocholithiasis)

Of patients undergoing cholecystectomy 8–15% have CBDS. Predictors of duct stones include bile duct diameter, which should be reported as a numerical value (largest measurable lumen diameter).

Sensitivity for detection of CBDS overall is about 50%, being lower in non-obstructed ducts (non-jaundiced patients), but the positive predictive value is very high

Sensitivity can be increased by:

- taking time and looking at the 'hard to see parts';
- using several windows to the duct, including right anterior approach for upper duct and left anterior approach through pancreas for lower duct;
- filling the gastric antrum and duodenum with water;
- scanning both longitudinally and transversely;
- not relying on seeing a shadow (CBDS often do not shadow).

Causes of US false positive diagnosis of CBDS include:

- side-lobe artefacts from duodenal gas;
- gas in juxta-ampullary diverticulum;

- bile duct gas;
- pancreatic calcification.

Elastography: work in progress

Prof Byung Ihn Choi, Seoul National University Hospital, Korea

Elastic material has a resting shape, it changes its shape when a stress is given and restores its shape after the stress is removed. Elasticity is the degree of shape change of a given material. Elasticity imaging is a new technique for studying the stiffness of tissue, is similar to that obtained with manual palpation, but more sensitive and less subjective and can more easily be compressed with other image modality. Imaging for elastic properties can be divided into strain imaging and modulus imaging technique. Clinical elastography system must track tissue motion in more than two dimensions, involves software changes only without any external equipment, and data acquisition techniques should be similar.

In this review, preliminary results of in vitro gelatin phantom and cow liver studies and in vivo animal studies including mouse liver tumor, several kinds of human tumors with Elastoscan in Accuvix XQ will be presented.

In summary, elastography may be useful in evaluating the stiffness of a lesion, deciding the boundary of a lesion, increasing the confidence of existence of a lesion and making a diagnosis of a lesion according to its stiffness.

Carotid plaque: is characterisation useful?

Dr Joseph Polak, Tufts University School of Medicine, New England Medical Center, United States

Purpose

To review the natural history of carotid artery plaque formation, the criteria for carotid plaque characterisation and present data on the possible existence of a vulnerable and high risk plaque in the carotid artery.

Methods

Review of the process of atherosclerosis plaque deposition and the effects of blood flow and shear stress at the carotid bifurcation. Describe current schemes used to characterise atherosclerotic plaques. Summarise data on the link between plaque characteristics and risk of stroke.

Results

Early atherosclerotic plaque forms at the branch points of arteries at regions of low shear stress or cyclical variations in shear stress linked to blood flow. LDL cholesterol deposits in the artery wall, then oxidises and incites inflammation and cell growth. The intermediate carotid plaque is lipid laden and similar to coronary artery plaque. The pathophysiology of cardiovascular events in the carotid circulation is different from that in the coronary arteries.

Plaques in the carotid artery mostly embolise platelets or plaque material. Coronary plaques rupture and cause thrombotic occlusion of the artery. Despite these differences, a high-risk plaque can be identified with ultrasound. Echolucent (hypoechoic) plaques carry excess risk for stroke. In addition, surface contour of the plaque has prognostic significance. More recently, echolucent plaque has been linked to risk of stroke during carotid stent placement. Magnetic resonance imaging also shows findings consistent with findings on carotid ultrasound images.

Conclusion

Plaque characterisation identifies high-risk plaques that can be managed with more aggressive medical therapies.

The role of duplex ultrasound following lower extremity endovascular intervention

Ms Jenifer Kidd, Gosford Vascular Laboratory, NSW, Australia

Conventional vascular surgery comprises bypassing or replacing diseased arteries and veins by open operation. In contrast, endovascular technology involves passing the instrumentation along the lumen of the vessel, treating localised disease by balloon angioplasty, subintimal angioplasty, stents or even vascular grafts compressed into the catheter and released to cover or bypass the diseased vessel. As endovascular methods replace conventional open surgical techniques in the treatment of many peripheral vascular diseases, there has been an accompanying change in the diagnostic work-up.

Most of the specific information to plan endovascular intervention can be derived from the duplex ultrasound study and is the initial investigation of choice to determine the presence, location and extent of arterial occlusive disease. This information allows the interventionalist to plan the site of arterial puncture and predict the likely success. The accuracy of duplex scanning is now such that diagnostic angiography can be used more selectively and retains an essential role during the endovascular procedure. Duplex ultrasound imaging is ideally suited for documenting the results of endovascular intervention and remains the modality of choice for continued follow-up surveillance.

Foam echosclerotherapy of the small saphenous vein

Dr Anne Padbury, Lasers in Medicine, SA

Introduction

Varicose vein surgery of the small saphenous vein (SSV) is technically demanding with a high failure rate and a significant associated morbidity. Recently ultrasound guided sclerotherapy (UGS) with sclerosing foam has shown promise as an alternative treatment for varicose veins. The aim of this study is to validate this new technique in patients with isolated SSV reflux.

Methods

Consecutive patients presenting with isolated sapheno-popliteal junction reflux to a specialised phlebology service were treated with foam UGS and follow up data collected prospectively. Patients were reviewed at two, four and six weeks and further sclerotherapy performed as required. At six months post procedure a final assessment was made of patient satisfaction. An independent observer documented the clinical and sonographic success of the procedure.

Results

A total of 14 patients and 15 limbs were treated. Primary success was achieved in all patients (SSV injected and obliterated). At six months, nine (60%) had total occlusion, five (33%) near total occlusion with a recurrent SSV present in one only. Minor varices were present in five (33%) and skin discolouration in two (13%). There was no evidence of sural nerve impairment, skin ulceration or deep vein thrombosis during the study period.

Conclusions

Foam UGS of the SSV is a feasible procedure with low morbidity, high (82%) sonographic success with excellent

overall patient satisfaction. Randomised controlled studies are certainly warranted to compare the efficacy and durability of this procedure with surgical intervention.

Multimodality imaging of cerebrovascular disease, the role of ultrasound

Dr Joseph Polak, Tufts University School of Medicine, New England Medical Center, United States

Purpose

To review the principles, strengths and limitations of imaging modalities for cerebrovascular disease.

Methods

Description of the principles, strengths and weaknesses of the different modalities. Review of the key literature. Presentation of typical cases with multi-modality imaging.

Results

The consistency and dependability of carotid ultrasound has reduced the need for arteriography in most patients undergoing carotid artery surgery. While arteriography is still considered the gold standard, it has a significant complication rate. Magnetic resonance angiography (MRA) is an alternative and complementary imaging technique. Time-of-flight imaging MRA shares with Doppler ultrasound a sensitivity to blood flow phenomena and has artefacts in cases of both very slow as well as high blood flow velocities. With contrast enhanced MRA (CEMRA), gadolinium, a paramagnetic complex, is injected and a digital arteriogram is created. The resultant image resembles a traditional arteriogram. Possible limitations of the technique are related to the rapid transit of blood flow through the region of interest and the need to time image acquisition appropriately. An increasingly popular imaging technique is contrast enhanced computed tomographic angiography (CTA). Rapid injection of traditional iodine containing contrast agent and acquisition with a multi-detector helical scanner permits the acquisition of high-resolution images of the carotid artery as well as of the intracranial circulation.

Conclusion

In combination, all of these imaging techniques contribute to the evaluation of the carotid artery. Selection of the appropriate technique is often predicated on the availability of each of these modalities.

Growth patterns, macrosomia, intervention and birthweight differences between Chinese and Caucasian populations

Ms Sue Westerway, University of Sydney, NSW, Dr Rob Heard, University of Sydney, NSW, Dr Jonathan Morris, University of Sydney, NSW, Australia

Objective

The objective of this study was to compare rates of fetal macrosomia (birth weight > 4000 g) and birth complications for both Chinese and Caucasian women. It also aimed to describe and compare the normal growth pattern in Chinese and Caucasian fetuses in the third trimester and to determine if any ultrasonic fetal measurement identified those babies that were macrosomic.

Population

The sample population used was from the Royal North Shore Hospital and Hornsby Ku-Ring-Gai Hospital in Sydney's Northern Health region. Only Chinese immigrant and Caucasian women were included.

Methods

Data used were extracted from the Northern Suburbs Area Health Service OBSTET database. Significance of trends was assessed using $\chi 2$ test. One-hundred Chinese and Caucasian women were included in the study. At each antenatal visit from 28 weeks an ultrasound was performed to measure the biparietal diameter, head and abdominal circumference and long bone lengths. Scatter graphs for each fetal variable were superimposed onto ASUM fetal measurement graphs to assess any variations from the mean.

Results

The results show a rise in macrosomic babies born to Chinese immigrants from 4% of total Chinese births in 1992 to 9.8% in 2000 ($p = 0.02$). There was no significant difference in the rate of macrosomia amongst Caucasian women with respective rates of 11% and 14% for the same periods. The PPH rate increased significantly in both Chinese immigrants and Caucasian women ($P < 0.001$). There were 2472 fetal measurements performed. The abdominal circumference was the most significant variable, showing that measurements above the AC reference graph mean resulted in a birth weight above 3600 g ($P = 0.0000001$).

Conclusion

Australia has a multicultural population and yet the normal ranges defined for many obstetric investigations do not adjust for ethnicity. The application of values derived from a Caucasian population to other ethnic populations may be inappropriate and conceal important pathologies. Ultrasound measurement of the fetal abdomen after 34 weeks gestation may identify Chinese fetuses that are larger than 3600 g and at risk of macrosomia with associated complications.

Serum screening markers and pregnancy outcomes

Mr Robert Cocciolone, Women's and Children's Hospital, SA, Australia

Purpose

To show the relationship of 1st and 2nd trimester screening markers, pregnancy outcome and use in obstetric ultrasonography.

Methods

1st and 2nd trimester markers and algorithms are used to determine whether a pregnancy has a lesser or greater than expected chance of being affected with either Down syndrome (DS) or an open neural tube defect(NTD). Markers used are free beta-hCG, Papp-A and nuchal thickness in 1st trimester and AFP, free beta-hCG and unconjugated estriol in 2nd trimester. In the case of Down syndrome the likelihood ratio derived from these markers is used to adjust the age risk at delivery. For neural tube defects an AFP cut off of ≥ 2 multiples of the population median is used.

Results

In addition to DS and NTD other adverse pregnancy outcomes are often observed with highly suggestive marker-profiles, these include Trisomy 18, Turners syndrome, triploidy, twins, non-viability and multiple fetal abnormalities. As individual markers adverse outcomes often result where there is a raised AFP or free beta-hCG and lowered levels of either Papp-A or unconjugated estriol.

Conclusion

A better understanding of the relationship between marker profiles and pregnancy outcomes can provide ultrasonogra-

phers and obstetricians with supporting information useful for patient management.

Acute fetal cardiac and other haemodynamic redistribution after intrauterine transfusion for treatment of severe red blood cell alloimmunisation

Dr Nayana Parange, University of Adelaide, SA, Dr Chris Wilkinson, Women's and Children's Hospital, SA, Dr Peter Muller, Women's and Children's Hospital, SA, Prof Gustaaf Dekker, Women's and Children's Hospital, SA, Australia

Objectives

To investigate the haemodynamic alteration in intracardiac and other fetal shunts as a response to the acute stress of fetal transfusion.

Study design

Prospective observational study.

Methods

The PI of fetal ductus arteriosus, PI of foramen ovale, PIV of ductus venosus and RI of middle cerebral artery (MCA), and umbilical artery (UA) were measured by Doppler ultrasonography before and after intrauterine transfusions.(10 at the time of writing the abstract).

Results

The PI of fetal foramen ovale and fetal ductus arteriosus showed a rising trend after transfusion. The PIV and S/D ratio of Ductus venosus showed a significant decrease after transfusion. The peak systolic velocity of MCA dropped significantly as expected. Surprisingly, alterations were also seen in the PI of umbilical artery after the procedure.

Conclusions

The human fetal cerebral response to transgression transfusion has been well documented. However, the change in PI of fetal intracardiac shunts suggests that the changes and mechanism of fetal adaptation to stress may be more complex than previously thought. Implications of these findings will be discussed during the presentation.

Ultrasound assessment of the brachial artery to determine endothelial function in pregnancy

Ms Ann Quinton, University of Sydney at Nepean Hospital, NSW, Dr Colleen Cook, University of Sydney at Nepean Hospital, NSW, Prof Michael Peek, University of Sydney at Nepean Hospital, NSW, Australia

Introduction

Doppler and B-mode ultrasound can be used to calculate flow-mediated dilatation (FMD) after increasing blood flow through the brachial artery. This increased blood flow, or reactive hyperaemia, results in shear stress on the endothelial cells lining the brachial artery causing them to release nitric oxide, relax and the artery dilates. This dilatation can be measured with ultrasound, is referred to as FMD and is a marker of stimulated endothelial function.

Aim

The aim of this work was to use an ultrasound technique to develop normal range parameters of endothelial function inhuman pregnancy.

Method

This was a longitudinal study of women studied five times throughout their pregnancy at 11–14, 18–20, 22–24, 28–32 and 36+ weeks. A group of healthy non-pregnant women were controls. Resting blood flow in the brachial artery was calculated using Doppler ultrasound. The brachial artery was visualised using ultrasound and the diameter measured. Increased flow was induced by inflating a blood pressure cuff on the lower arm to 200 mmHg for 5 minutes and releasing it. Doppler ultrasound measured the degree of reactive hyperaemia and a post occlusion artery diameter measurement was made with B-mode ultrasound. The percentage difference in brachial artery diameter (FMD) was calculated. Fetalbiometry, umbilical and uterine artery Doppler studies were performed to assess pregnancy normality.

Results

Currently 53 normal pregnant women and 15 non-pregnant women are enrolled. Thirty-five pregnant women have had studies completed to 36+ weeks. The mean ± SEM FMD ranges from 7.9 ± 0.6 at 11–14 weeks, increasing to 9.6 ± 0.8 at 28–32 weeks, then decreasing to 6.6 ± 0.9 at 36+ weeks. The mean ± SEM FMD for the non-pregnant controls was 8.3 ± 0.9. Fetal biometry, umbilical and uterine artery Doppler studies were within the normal range for all pregnant women.

Conclusion

This safe non-invasive ultrasound technique has been well tolerated by all the women. The results in normal pregnancy demonstrate FMD is in agreement with the normal physiology of pregnancy.

Development of Australian customised fetal growth charts

Associate Professor Max Mongelli, Nepean Hospital, NSW, Australia

Background

The assessment of fetal growth disturbances is generally carried out using unadjusted growth charts. This fails to take into account the physiological variation in fetal size due to maternal characteristics.

Objectives

To develop customised antenatal fetal growth charts for Australian populations.

Methods

The local computerised obstetric database was used to identify eligible women with singleton pregnancies. The following pregnancy characteristics were included: birthweight, gestational age, maternal height and weight at booking, parity and ethnic origin. Multiple regression analysis was used to determine the growth coefficients applicable to Australian women. Computer software was compiled to generate customised growth charts using these coefficients.

Results

A total of 14,769 cases met the criteria. 88% were European, 2.4% Indian/Pakistanis, 2.3% Polynesians, 1.9% Middle Easterns, 1.0% Chinese, and other smaller groups including Africans, Malays, Philippinos; 38% were primiparas. Polynesian and Chinese babies were on average 33–37 g heavier than Europeans, whereas Africans were 296 g lighter. The positive correlation of maternal weight and height with birth weight is similar to that described in UK populations.

Conclusions

The physiological determinants of fetal growth initially described in UK women are also noted in a multi-ethnic

Australian population. It is hoped that the freely available computer software will improve clinical screening for feta growth anomalies.

Comparison of soluble flt1and placental growth factor with abnormal uterine artery doppler velocimetry in the second trimester

Dr Peter Muller, Women's and Children's Hospital, SA, Australia, Dr Andra James, Duke University Medical Center, United States, Dr Amy Murtha, Duke University Medical Center, United States, Dr Bryan Yonish, Duke University Medical Center, United States, Prof Gustaaf Dekker, University of Adelaide, SA, Australia

Objective

Circulating angiogenic factors such as vascular endothelial growth factor (VEGF) and placental growth factor (PlGF), and their interaction, may be associated in the vascular remodelling of spiral arteries in normal pregnancy. Soluble Flt1, an antagonist of VEGF, has been shown to be up regulated in patients with preeclampsia, while PlGF has been shown to be decreased in women before the onset of preeclampsia. The purpose of this study was to compare maternal soluble Flt1and PlGF levels in the second trimester with a dynamic marker of abnormal placentation, abnormal uterine artery Doppler velocimetry (Ab UAD).

Study dsesign

A prospective cohort of women, 16 to 24 weeks estimated gestational age (EGA), with singleton pregnancies, underwent UAD velocimetry and phlebotomy. Ab UAD velocimetry was defined as bilateral notches with mean resistance index (RI) of > 0.55, unilateral notch with mean RI of > 0.65, or mean RI of > 0.70. Maternal soluble Flt1 and free PlGF were measured by ELISA in samples from women with Ab UAD and a control group with normal UAD velocimetry(controlled for EGA). Mann-Whitney Rank-Sum test was used to compare the population of soluble Flt1 and free PlGF of Ab UAD with control.

Results

There were 222 study subjects, of those 34 with Ab UAD velocimetry (15%) and 34 controls were chosen for this analysis. Mean EGA of subjects in each group was 17.9 weeks. Mann-Whitney Rank-Sum test suggested that there is no difference in the distributions in PlGF ($p = 0.59$) (median 191 pg/mL, 187–337 pg/mL) vs. control (median 171 pg/mL, 169–289 pg/mL) or soluble FLt1 ($p = 0.36$) (median 0.78 ng/mL, 0.28–3.2 ng/mL) vs. control (median 0.72 ng/mL, 0.22–1.98 ng/mL) for abnormal UAD.

Conclusion

Concentrations of maternal soluble Flt1 and free PlGF in the second trimester are not altered in women with Ab UAD velocimetry. Soluble Flt1 and PlGF may not be involved interfering with the normal early vascular remodeling of spiral arteries.

Fetal vascular malformations

Mr Martin Necas, Tristram Clinic, New Zealand

Fetal vascular malformations are rarely talked about as a distinct group of abnormalities. Instead, they are often discussed as abnormalities within particular fetal anatomy systems: neural tube, gastrointestinal, or as part of scenarios which may lead to non-immune hydrops. The aim of this presentation is to highlight the common vascular abnormalities of the fetus, describe their appearance, sonographic diagnosis, and role of Doppler in their evaluation. Overall, fetal vascular abnormalities are considered rare and include: arterio-venous malformations and hemangiomas, cord anomalies, placental vascular issues, vascular problems of twinning (not discussed in this presentation). When a vascular malformation is suspected, the sonographer should answer the following key questions:

- What is it? Is it supposed to be there?
- Where exactly is the lesion situated?
- Which vessels come into it?
- Which vessels go out of it?
- Are there abnormal vascular channels in the periphery of the lesion?
- Is the local vessel resistance and velocity altered?
- Does the lesion affect systemic circulation?
- Is there cardiomegaly and signs of CHF?
- Are there any signs of hydrops?
- Are any associated anomalies on detailed anatomy survey?

Fetal arterio-venous malformations

Arterio-venous malformations are abnormal connections between the arterial and venous sides of the circulation, effectively bypassing the capillary bed. As a consequence the local vascular resistance is dramatically reduced. The lesion typically demonstrates profound vascularity with high velocity low resistance arterial inflow, arterial flow disturbance and turbulence, and surrounding vascular engorgement. Local steal phenomena also take place, but these may be difficult to prove on ultrasound during foetal life. High volume blood shunting can lead to polyhydramnios, tendency towards high output cardiac failure and in severe cases hydrops. While AVMs can occur literally anywhere, the most common sites include brain (Vein of Galen aneurysm) and liver (Hemangioedothelioma). Other lesions which may be involved in vascular shunting are large placental chorioangiomas, and infrequently sacro-coccygeal teratomas. Non-shunting hemangiomas and lymphangiomas can also be detected on ultrasound.

Umbilical cord anomalies

Anomalies of the umbilical cord are reasonably common. Two vessel cord, umbilical vein varix and cord cysts can be detected on ultrasound. Nuchal cord and cord knots are difficult sonographic diagnoses. Another rare anomaly of the cord is persistent right umbilical vein which can be associated with other structural malformations. A range of anomalies affect the ductus venosus as well such as extrahepatic communication between the UV and IVC, ductus agenesis, or direct connection between the UV and RA.

Placenta

Interesting vascular findings in the placenta include chorioangiomas, large venous lakes, velamenous cord insertion, vasa previa, and placenta acreta or percreta.

Doppler ultrasound (color, power, and spectral) is a key diagnostic tool in evaluating fetal vascular, cardiovascular, or placental vascular problems. There are a number of other areas where Doppler is particularly useful. For example, presence of right-sided diaphragmatic hernia may be confirmed by visualising the hepatic veins in the fetal chest. Independent vascular supply of pulmonary sequestrations is also an excellent diagnostic sign. Doppler ultrasound is excellent at dif-

ferentiating vascular from avascular problems for example: Vein of Galen aneurysm versus arachnoid cyst, hemangioendothelioma versus choledochal cyst, chorioangioma versus placental hematoma and so on.

The genetic sonogram – can we adjust risk?

Dr Peter Muller, Women's and Children's Hospital, SA, Australia

The current practice of screening for the aneuploid fetus includes combined first trimester screening or second trimester maternal serum screening. The morphology ultrasound has, also, been shown to have some impact on detecting the aneuploid fetus. Some authors have advocated an ultrasound scoring system based on maternal age. This, however, ignores the results of current aneuploid screening, and may overestimate ones risk. These ultrasound 'soft' markers may have more weight than is indicated, resulting in a patient proceeding with invasive testing that may not be truly indicated. Thus, using Baysean principles, that is the prior risk for having an aneuploid child, can be used to determine a risk adjustment based on ultrasound findings. Various authors have suggested likelihood ratios for the different ultrasound markers. Although a finding on ultrasound that is associated with aneuploidy will inevitably increase the prior risk, a normal morphology ultrasound should intuitively decrease the prior risk. Patients may, however, be falsely reassured by a normal ultrasound as they decline definitive testing. Indeed, if all patients with high risk results from first or second trimester screening decline amniocentesis after a 'normal' morphology ultrasound, our aneuploid detection rate will decline. Patients desire the opportunity for the prenatal diagnosis of the aneuploid fetus, but this desire conflicts with the wish for avoiding the risk of invasive testing. Recent literature suggests that we may be able to accommodate these patients by using a morphology ultrasound as a means for aneuploidy risk reduction. The FASTER Trial, a prospective trial comparing different forms of screening for fetal aneuploidy, suggested a likelihood ratio of 0.4 for a normal second trimester morphology ultrasound. In a recent survey, a majority of US Maternal-fetal sub-specialists use a conservative likelihood ratio of 0.5.

Chronic liver disease and portal hypertension

Prof Robert Gibson, University of Melbourne and Royal Melbourne Hospital, Vic, Australia

Ultrasound is the most widely used imaging modality in patients with known or suspected chronic liver disease or suspected portal hypertension, being of value in a range of diagnostic and therapeutic areas.

The role of ultrasound in regard to chronic liver disease includes:

- detection of steatohepatosis and cirrhosis. Hepatic vein wall 'nodularity' is a new sign of cirrhosis, which may be the most sensitive imaging sign to date;
- guided liver biopsy;
- surveillance for and targeted biopsy of possible hepatocellular carcinoma (HCC);
- guidance for ablative treatments for HCC and;
- work-up prior to transplantation.

The role of ultrasound in regard to portal hypertension includes:

- evaluation of presence and cause;
- assessment prior to and monitoring after portosystemic shunts (including TIPS) and;
- research role in the pharmacological manipulation of portal venous flow using Doppler flowmetry.

The ultrasound signs of portal hypertension are:

- demonstration of portosystemic collateral veins – paraumbilical vein observed in up to 85%;
- reversal of flow in the portal vein – present in about 5% of patients;
- portal vein enlargement – diameter > 13 mm is suggestive of portal hypertension;
- decreased flow in portal vein – no reliable threshold values
- ascites – not invariable and not specific and;
- splenomegaly – present in only 50–60%. Ultrasound generally allows assignment of patients into one of the three aetiological groups – prehepatic, hepatic, posthepatic.

(1) Prehepatic: common causes are portal vein thrombosis, tumour invasion (e.g. hepatocellular carcinoma) or compression (e.g. pancreatic carcinoma).

(2) Hepatic: e.g cirrhosis, hepatitis, steatohepatitis.

(3) Posthepatic: hepatic venous out flow obstruction (Budd Chiari syndrome) can occur anywhere between hepatic venules and right atrium.

Potential pitfalls in evaluation of neck cysts and abscesses

Dr Rhodri Evans, The Clinical School at Swansea University, United Kingdom

If a structure in the neck looks like a cyst on ultrasound it probably isn't. The common cysts of the neck look solid not cystic. This talk will look at the characteristic features of the common cysts and point out the pitfalls that await the unwary. The mimics of cysts will be highlighted and the sonographic signs that avoid mis-diagnosis are discussed.

The fascial anatomy of the neck provides a route for infection to spread from the neck to the chest. Cervical sepsis can cause profound morbidity and ultrasound guided intervention can be timely and appropriate in this group of patients.

The surgical alternative will result in significant morbidity. Common pathways of spread and interventional techniques will be presented.

Ultrasound in breast cancer – actually making a difference

Dr Wes Cormick, Canberra Imaging Group, ACT, Australia

Breast cancer is the commonest cancer in females in our society. If it can be diagnosed and resected before it has spread then it can be cured. Current screening programs focus on finding tumors as early as possible to improve outcome.

Breast cancer is a heterogenous group of pathologies accounting for the variety of imaging features. The most frequent type is intraductal carcinoma. Being able to diagnose this when it is small is becoming possible due to advances in resolution and tissue characterisation with ultrasound.

Understanding the benign ductal changes and general duct pattern in a breast allows one to detect a change is this pattern, hopefully picking up ductal carcinomas earlier.

I will discuss the range of anatomy and pathology that occurs in the breasts at the level of the ducts, and their ultrasound appearance.

Real-time 3D ultrasound

Prof Peter Burns, University of Toronto, Canada

Even though ultrasound is essentially a one-dimensional imaging method (meaning that it gathers information from tissue one line at a time), since the beginning of its clinical use efforts have been made to render images in three dimensions. These have included numerous off-line computerised devices that combine images from successive scan planes into surfaces and volumes, motorised and manual translational machines that move the transducer so as to provide these images and ingenious tricks (one of the earliest, of course, from the much-missed Ultrasonics Institute in Sydney) that convert a sequence of real-time two dimensional images from a freehand transducer into a single 3D image.

Most recently, motor-driven curvilinear arrays have been coupled to on-board software in an ultrasound scanner have been used in obstetrics to create pleasing images of the surface contours of the fetus. This so called 'baby face' imaging has created something of a fad and given rise to numerous dubious clinical as well as technical claims, amongst which is its somewhat grandiose self-proclamation as '4-dimensional' imaging. In fact, it is nothing more than a well-made automation of the one-dimensional methods that have been with us for several decades.

3D Ultrasound for hepatobiliary diseases

Prof Byung Ihn Choi, Seoul National University Hospital, Korea

Three-dimensional (3D) ultrasound (US) has recently gained much attention in the evaluation of a variety of clinical, primarily obstetric, application. Limited abdominal, pelvic, cardiac, ocular, and vascular applications have also been described.

Two-dimensional US examinations are limited primarily by the subjectivity of the examiner. In addition, the examiner must interpret multiple 2D US images and must mentally integrate this information to develop a 3D impression of anatomic or pathologic structures. With a 3D US system, transducer motion is mechanically controlled and standardised, and the 3D integration is achieved by means of a computer system. Although each examiner must gain experience with the operation of the system and with the interpretation of 3D images, the computer-generated image acquisition and display aid the examiner by decreasing subjectivity. The goal of 3D US imaging is to overcome limitations of 2D US by providing an imaging technique that reduces the variability of the conventional technique and allows the diagnostician to view the anatomy in 3D. One disadvantage of 2D US imaging relates to the subjectivity of the conventional exam, which results from the dependence on the experience and knowledge of the diagnostician to manipulate the US transducer, mentally transform the 2D images into a 3D tissue structure and make the diagnosis or perform an interventional procedure. The reason for 3D US is that 3D information in the evaluation of lesions including volume measurement, localisation and mapping is easy to understand, efficient, accurate, objective and reproducible. Therefore the advantage of 3D US is easy understanding of 3D information, more photo-realistic due to advanced rendering, third plane obtainable, and increased patient throughput by offline rendering. This review article provides brief description of basic principle of 3D US, and describes the clinical utility of 3D US in hepatobiliary diseases.

Doppler and 3D ultrasound of carotid artery

Dr Leandro Fernandez, Laboratorio de Ecografica Vascular, Venezuela

Ultrasound is, nowadays, the method of choice for the initial evaluation of carotid arteries. As a technique, it has the added advantages of being non-invasive, portable, and radiation-free; and has a low relative cost when compared to other imaging methods. Together, all these features make Doppler ultrasound an excellent diagnostic tool to assess carotid arteries.

The main objectives in the assessment of carotid arteries are the search for atherosclerotic disease and the evaluation of the intimae-media complex. This method allows us to determine the degree of obstruction of vessels, as well as the potential for clot formation of atheromatous plaques. The evaluation of the intimae-media complex is of great importance because, when a thickening process occurs in this complex, this finding is directly associated with the presence of endothelial disease and, in turn, evidence of coronary disease may be available.

Doppler ultrasound allows us to analyse the hemodynamic patterns in each vessel. The use of Colour Doppler shows the characteristics of flows both in normal and in pathological conditions. Velocities above 230 cm/sec, show the presence of severe stenosis greater than or equal to 70%.

Three-dimensional ultrasound offers a new means for the visualisation of images as it allows spatial and volumetric representation of blood flow, as well as the ability to observe the internal surface of vessels, that is, the ability to detect irregular patterns or atheromatous plaques. In addition to these features, it is possible to calculate the volume of these plaques through the use of multiplanar three-dimensional ultrasound.

In this lecture, the normal patterns of carotid ultrasound will be reviewed, and the current criteria for the classification of stenosis. Furthermore, some applications of three-dimensional ultrasound will be discussed.

Medical disorders in pregnancy: who may need ultrasound?

Prof Pippa Kyle, Christchurch Women's Hospital, New Zealand

Medical disorders in pregnancy may arise from preexisting conditions such as diabetes or epilepsy or, as with pre-eclampsia, they may arise de novo in the first pregnancy. Several medical disorders contribute significantly to maternal mortality and morbidity and, for this reason, the aim to optimise medical care in pregnancy has been focused upon. However, the often parallel detrimental effect of these conditions on fetal and perinatal outcome is now recognised and, increasingly, understanding and implementing monitoring of the fetus is an integral component of caring for women with these complicated pregnancies. Ultrasound in an essential tool in being able to monitor and diagnose abnormalities in the fetus, which both facilitates ongoing pregnancy management but also timing of delivery.

Understanding of the mechanisms for fetal involvement in some of these conditions underscores the type of ultrasound investigation required. Certain conditions such as preeclampsia, and thrombophilias and vascular disease, may cause early placental dysfunction so that monitoring

of viability in the first trimester, growth and the functional effects secondary to intrauterine growth restriction are required. Prediction of abnormality may be possible by uterine Doppler investigation. Other conditions, or their treatment, increase the risk of congenital malformation, which means that specifically timed investigations to assess fetal anatomy are required. Knowledge of the type of defects expected with a certain condition or medication focuses both the timing and type of ultrasound investigation. Protocols in the medical disorders clinic linking with ultrasound investigation may facilitate optimal care, but individualisation is important due to the variety of presentation.

3D in obstetrics – ultrasound hype or hope?

Dr Gary Pritchard, Brisbane Ultrasound for Women, Qld, Australia

The technological advances that have resulted in the development of 3D and 4D ultrasound have taken our ability to assess, inspect and manage pregnancy to a new level.
From a medical scientific perspective the major advance is the availability of the volume data set (VDS). We have an ability to acquire US data somewhere, to store it, transmit it elsewhere easily and effectively re-do the whole scan again, to answer a question, give an opinion, investigate new findings etc. at virtually any time or any place. We also now have the ability to observe surface characteristics, some of which may be important in recognising patterns of fetal abnormality. In addition, we have an opportunity to observe the feta movements, expression, perhaps moods as never before. From an investigator-behavioural perspective, this is a new frontier. A view is possible now of fetal growth and development from the start to the end of pregnancy. New knowledge about the fetus and its environment becomes available.

It is no wonder that parents feel this excitement. To know and wonder about their baby, to see it move, to see expression, is now available to them. Basic human emotions is involved – love, hope, joy, excitement. Given these instincts, are we correct in calling 3D and 4D scans – 'entertainment'. The emotion is much more profound. No amount of regulation, registration or censure will prevent parents from satisfying this desire.

As ethical practitioners, we must adapt to the new technology, and put in place mechanisms that allow both aspects of pregnancy ultrasound, the precise medical science and parental wonder and desire, to co-exist in a safe way.

Sonographic detection and assessment of ectopic pregnancy

Ms Jane Fonda, University of Sydney, NSW, Australia

Ectopic pregnancy occurs when the fertilised egg is implanted outside the normal position within the endometrial cavity of the uterus. The most common location for this to occur is in the outer third of the fallopian tube, however, it may be located in the ovary, the cervix or in the abdominal cavity. Pain and/or bleeding may be the first clinical indications of the presence of an ectopic pregnancy. Methodical scanning is paramount in all ultrasound examinations. This is particularly significant when scanning for an ectopic pregnancy which may be a life-threatening situation for the woman. Earlier and more definitive diagnosis is possible with transvaginal sonography than with transabdominal scanning alone. When the patient presents with the onset of the subacute signs of lower abdominal discomfort followed by vaginal bleeding an ectopic pregnancy must be ruled out or confirmed. The clinical history in conjunction with the ultrasound findings should alert the sonographer to the possible presence of an ectopic pregnancy. The combination of a positive beta-hCG and an empty uterus requires thorough scanning of the entire pelvic area. The presence of the embryo outside the uterine cavity with a fetal heart beat is a definitive diagnosis. There may be inconclusive evidence of a heterogenous mass in the adnexa and free fluid to indicate the possibility of an ectopic pregnancy. A 'pseudosac' maybe present within the uterine cavity and although this may initially appear to be the gestation sac it will lack the echogenic trophoblastic ring, presence of the yolk sac, fetal pole and cardiac motion. Ectopic pregnancies may occur within the isthmus or interstitial portion of the uterus or within a previous caesarean scar. Although these are not common when rupture occurs, there will be marked internal haemorrhage, sudden acute abdominal pain, low blood pressure and fainting. The entire uterus should be assessed for the presence of any abnormality in shape including thorough evaluation of the endometrial cavity including the cornual regions. In this presentation interesting cases will be discussed and the pitfalls highlighted.

New Strategies for trisomy 21 risk assessment in the first trimester

Mrs Vanessa Pincham, Dr Andrew McLennan and Mrs Jennifer Alphonse, Sydney Ultrasound for Women, NSW, Australia

Trisomy 21 (Down syndrome) occurs in 1.2/1000 live births in Australia and accounts for 60% of all chromosome abnormalities in live born babies. The addition of first trimester maternal serum biochemistry (PAPP-A and free beta HCG) to NT assessment allows a Down syndrome detection rate of approximately 90%, with a false positive rate of around 5%.

Features of the fetal profile, such as the presence/absence of the nasal bone and the length of the maxilla, may be included in the risk algorithm to enhance trisomy 21 detection. Cicero et al. (2003) assessed the fetal profile of 3829 fetuses and postulated the inclusion of nasal bone assessment had the potential to maintain an 85% detection rate for Trisomy 21 but lower the false positive rate to 1%. However there may be difficulties in image acquisition and evaluation, especially with nasal bone assessment.

A recent study by Nicolaides et al. (2005) has evaluated the potential of a new risk orientated two stage approach to first trimester screening. After first trimester combined screening, those who fall into an intermediate risk category (between 1/100 and 1/1000) could have a further assessment of risk including:

1 Presence or absence of the nasal bone
2 Presence or absence of tricuspid regurgitation
3 Normal or abnormal Ductus Venosus waveform

CVS could be considered if the final adjusted risk became 1in 100 or more after this second phase of screening. Individual risk-orientated two stage screening for trisomy 21 can potentially identify more than 90% of affected fetuses for a false positive of 2–3% in the first trimester of pregnancy.

This presentation will provide an update on nasal and maxillary bone image acquisition and evaluation as well as examine the potential for newer risk assessment strategies for trisomy 21 in the first trimester.

Epidemiology of cardiovascular disease, the role of ultrasound

Dr Joseph Polak, Tufts University School of Medicine, New England Medical Center, United States

Purpose

To review the contributions of ultrasound imaging to our understanding of atherosclerosis.

Methods

Review of the literature and personal experience in applying ultrasound imaging techniques by incorporating them into large epidemiological studies of atherosclerosis. Major emphasis is given to studies such as the Framingham Heart Study, the Cardiovascular Heart Study (CHS) and the Multi-Ethnic Study of Atherosclerosis (MESA).

Results

The epidemiology of atherosclerosis research had its birth when a group of investigators established the Framingham Heart Study in a small community at the outskirts of Boston Massachusetts. The Framingham study documented the importance of cardiovascular risk factors and linked them to outcomes such as stroke and myocardial infarction. Ultrasound was first used with echocardiography, documenting the impact of blood pressure, and left ventricular hypertrophy on outcomes. Carotid ultrasound was then used to document the linkage between long-term exposure to risk factors and the build up of plaque in the carotid arteries. It was also used to prove that homocysteine levels were associated with increased risk of atherosclerosis.

Further work with carotid IMT (intima-media thickness of the carotid wall) measurements made in the Cardiovascular Health Study helped define the concept of sub-clinical atherosclerosis. More recently, linkage of IMT has been made to certain loci on chromosomes. Other methodologies such as measurement of carotid distensibility and brachial artery reactivity are helping in the study of factors responsible for the development of atherosclerosis and hypertension.

Conclusion

Application of ultrasound imaging in epidemiology continues to have very significant contributions to our understanding of atherosclerosis and arteriosclerosis.

Contrast ultrasound in the liver: a new relationship between ultrasound and MR/CT?

Professor Peter Burns, University of Toronto, Canada

Many of the accepted limitations of ultrasound in diagnosing blood flow, for example that capillary flow is undetectable or that power Doppler cannot be used in a moving structure such as the heart, have been challenged by the joint development of microbubble contrast agents for ultrasound and new nonlinear imaging methods such as pulse inversion Doppler. In the heart, these have resulted in new examinations that show capillary perfusion of the myocardium in real-time, with the promise of revolutionising the role of ultrasound imaging. But what about radiological applications? Here we review the experience in Toronto using these methods in the liver.

Evaluation of a focal liver masses is a complex issue which is often the major focus of a cross sectional imaging study. Two basic questions may be posed. First, what is it? deals with characterisation of a known liver lesion. The second, is it there? addresses the issue of detection. Characterisation of a liver mass on sonography is based on its appearance on greyscale imaging and on vascular information obtained using Doppler. Conventional Doppler, however, often fails in the evaluation of a focal liver mass, particularly in a large patient, on a small or deep lesion, or on one with weak Doppler signals. Tissue motion artifact also hinders abdominal Doppler studies and a left lobe liver mass, close to the cardiac apex, is nearly always a failure for conventional Doppler. Two remedies are available. The first is to inject a microbubble contrast agent which enhances the Doppler signal from blood. Although this use of the agents dominated their early application, it was not successful. Early clinical investigations of contrast agents for liver imaging used conventional colour and power Doppler; however, discriminating features of specific liver masses were not evident. Furthermore, the advantages of enhancement of the signal from blood were offset by the artefacts of colour blooming and motion flash. The second is to exploit the peculiar properties of microbubbles using specialised imaging techniques that preferentially detect the bubble echo but suppress the signal from background tissue. Harmonic and pulse inversion imaging are two such methods, but it is only since the widespread availability of pulse inversion imaging that new approaches to ultrasound examination of the liver have begun to emerge.

References in Ulrtrasound Bulletin 8(3) November 2005

Optimising the duplex evaluation of aortic endografts

Ms Jenifer Kidd, Gosford Vascular Laboratory, NSW, Australia

The endovascular method of repairing an abdominal aortic aneurysm involves the transfemoral placement through a small incision in the groin (access site) of an endograft within the aneurysm sac. The endograft is anchored in place by a self-expanding metal frame that supports all or part of the fabric of the endograft. Successful endovascular graft deployment is based on successful exclusion of the aneurysm sac from the general circulation. The endoluminal method of aneurysm repair has proven to be a much less invasive method, with lower perioperative mortality and better survival compared with conventional open operation.

Failure to isolate the aneurysm from the circulation where flow is demonstrated outside the graft has been defined as ‘endoleak’. There is considerable variation in the reported incidence of endoleak with a range between 2.4 and 44%. The incidence is partly dependent on the diagnostic methodology used and vigilance of the surgical team. Close surveillance is mandatory after endovascular grafting as rupture is still possible if an endoleak is present, as the aneurysm is then perfused at systemic arterial pressure. Endoleaks may also occur as a late phenomenon and there is as yet no general agreement on the frequency with which surveillance should be performed.

A successful endoluminal program therefore requires regular surveillance and contrast-enhanced CT scanning has been the usual method for checking for endoleak. More recently however, colour duplex ultrasound (CDU) imaging has emerged as an alternative imaging modality that can compliment other imaging modalities with its advantages of low cost and low risk. CDU can accurately monitor aneurysm

size, demonstrate endograft patency, detect endoleak, limb dysfunction eg. limb occlusion, kinking and in some cases graft migration. CDU can provide dynamic and haemodynamic information not available with other testing methods. The technique however is operator dependent, can be time consuming and certain aspects of device failure (ie. wire fracture) cannot be demonstrated.

Duplex ultrasound scanning protocol:

- Use a high-resolution colour duplex ultrasound unit with a low frequency transducer(s) 2.5–5 MHz. The patient should fast overnight to minimise intestinal gas and schedule the study for a morning appointment (in our lab we ask our patient's to have a very light breakfast of tea and toast). The test will take approximately one hour.
- Obtain operative information before the examination on what type of aortic stent graft has been used as there are three basic types:

1 Straight tube graft
2 Bifurcated graft
3 Uni-iliac graft (occlusive device positioned in contralateral iliac artery to prevent retrograde flow from entering aneurysmal sac and a femoro-femoral crossover graft to restore flow to that limb)

- Explain the procedure to the patient and perform the examination with the patient in the supine position with the head slightly elevated. Also use the left lateral decubitus position for imaging the proximal and distal extent of the aortic graft. For the obese patient and the patient with excessive bowel gas you may have to position the patient in various positions using other windows to visualise the endograft.
- Commence the study using B-mode imaging in thetransverse plane and identify the aorta at the level of thesuperior mesenteric artery. Look for the reflective metal struts of the aortic stent graft, which in some grafts can be visualised above the level of the renal arteries. The proximal extent of the graft (material) can be seen as a hyperechoic signal along the aortic lumen and identified just below the level of the renal arteries. This is the superior attachment site. If the stent graft is uni-iliac or a bifurcated graft then the inferior attachment site(s) would be the native common or external iliac artery.
- In the transverse plane take maximum diameter measurements of the aneurysm sac. Over time there should be a decrease in the size of the residual sac. Any increase in size suggests flow to the sac and therefore a continued risk of rupture.
- With spectral Doppler record a PSV in the suprarenal aorta and confirm patency of the renal arteries. Do a transverse measurement of the aorta at the renal level and measure the distance of the superior attachment in relation to the renal level in the longitudinal plane for detection of possible graft migration. Then scan from the superior attachment to the inferior attachment site(s) in both transverse and sagittal planes in B-mode. The addition of harmonic imaging improves image quality and contrast resolution and will aid in diagnostic accuracy.
- Using colour and spectral Doppler access the stent graft looking for any perigraft flow, graft stenosis, thrombosis or kinking recording flow velocity through the body of the graft and graft limb(s). Optimise colour settings to avoid excessive artefact so that you are confident in differentiating between a true endoleak and colour artefact. The addition of power Doppler may be useful in detecting perigraft leak.
- It is important for the examiner to be aware of potential sites of perigraft leak. A true leak will have reproducible arterial waveforms with different spectral Doppler characteristics, compared to flow within the aortic end graft. Try to determine source of leak and identify the flow direction.
- Assess the patency of the native iliac and femoral arteries beyond the endograft and perform spectral Doppler analysis. Identify and document complications following endograft placement (ie. stenosis, occlusion, haematoma or pseudoaneurysm at access site).

Classification of endoleak

1 Type I – inadequate or ineffective seal at the proximal or distal attachment site(s).
2 Type 2 – collateral blood flow can fill the residual aneurysmal sac in a retrograde manner (IMA or lumbar artery) demonstrating flow outside the endograft without attachment site connection.
3 Type 3 – flow from modular disconnection, an inadequate seal at the modular junction or through a defect in the graft fabric.
4 Type 4 – graft porosity.
5 Type 5 – flow visualised but site unidentified.

The long-term outcome of the endovascular method and the durability of the prosthesis is unknown with structural device failure and complications reported in the literature. Colour duplex ultrasound imaging is an accurate modality to detect early and late endoleak and device complications after endoluminal aortic surgery. The test is emerging as the diagnostic test of first choice for surveillance allowing CT scanning and aortography to be used more selectively to plan secondary intervention. Further investigation is required to confirm the accuracy of this test and the optimal intervals for surveillance programs.

Arterial neovascularisation in recanalising venous thrombus: a progress report

Ms Kathryn Busch, Camperdown Vascular Laboratory, NSW, Professor Geoffrey White, Royal Prince Alfred Hospital, NSW, Ms Alison Burnett, Royal Prince Alfred Hospital, NSW, Ms Deb Coghlan, Camperdown Vascular Laboratory, NSW, Professor John Harris, Royal Prince Alfred Hospital, NSW, Australia

Introduction

At this meeting last year, we reported a phenomenon of arterial neovascularisation (ANV) that was detected on ultrasound examinations of patients with deep venous thrombosis (DVT). The process is characterised by the appearance of small pulsatile vascular channels occurring within and around thrombosed veins. This new finding may be part of the normal recanalisation process.

Aims

We studied a series of 40 consecutive patients to determine how frequently ANV could be detected and to try to determine whether there was an association with eventual recanalisation of the thrombosed vein and favourable clinical outcome.

Methods

All patients were imaged with a Philips HDI 5000 ultrasound system. The ANV process was characterised by the appearance of new, low resistive arterial vessels within the wall of the thrombosed vein, often extending into the lumen and/or the surrounding tissues. The extent of ANV was graded, and changes in grading were noted on any subsequent examinations.

Results

There were 27 patients with DVT and 13 patients with superficial thrombophlebitis (STP). ANV was most prominent at 2–3 months. The phenomenon was present in 73% of patients examined and 94% of cases with thrombus aged less than 1year old, but was rarely seen after one year. It was more common with STP (100%). We do not yet have sufficient progress data to determine a relationship to patient outcomes.

Conclusions

Recent improvements in colour duplex imaging resolution and sensitivity have enabled the recanalisation process of veins to be detected and viewed in more detail. The ANV process may result from an inflammatory reaction and is possibly mediated by various angiogenic chemokines. Our ongoing experience confirms that ANV can be readily imaged using high-end colour duplex ultrasound technology and is a common feature of the recanalisation process of thrombosed veins.

Everyday challenges in being a safe practitioner of obstetric ultrasound examinations

Ms Karen Pollard, Charles Sturt University, NSW, Professor Gail Whitford, Charles Sturt University, NSW, Dr Elaine Dietsch, Charles Sturt University, NSW, Dr Hans Swan, Charles Sturt University, NSW, Dr Trevor Beckwith, Charles Sturt University, NSW, Australia

This PhD research project seeks to explore the influences on sonographers involved in obstetric ultrasound scanning with regard to the application of safety principles associated with ultrasound bioeffects. The paper outlines the journey to date with an explanation of the selected critical incident methodology that will be used to determine those factors that impact on the sonographers' everyday scanning practice.

The preliminary data collection of this qualitative study involved two focus group interviews with heterogeneous groups of senior sonographers to debate the issues that will inform the remainder of the study and develop the broad-brush themes.

One-on-one in-depth interviews will follow on from the focusgroups with a diverse group of six to ten sonographers. These sonographers will be asked to share a story about an event or situation they experienced regarding biosafety issues and a funnelling technique will then be used to provide insight on the influences on sonographers to act/ behave/ think and decide as they do with regard to safety and their ability to undertake safe practice.

These critical incident narratives will contribute to knowledge pertaining to the nexus of professional practice, environment and safety considerations of obstetric ultrasound.

Book reviews

Ultrasound in Obstetrics and Gynecology

Editor Eberhard Merz
Publisher Thieme
Year 2005
ISBN 3-13-131882-1
Cost $A403.70

This 633-page textbook describes the use of ultrasound in modern obstetric practice. The 25 contributors to the textbook have a wealth of experience in this field and it will provide a very good guide to practitioners using ultrasound for diagnosis and treatment. It would guide sonologists to the appropriate diagnosis when there is a fetal abnormality. The textbook is divided into 11 sections and 51 chapters. Each chapter provides a wealth of information and very appropriate illustrations. At the end of each chapter there is a comprehensive list of references available for the interested readers.

The first section entitled *Ultrasound in obstetrics* describes the technique for performing the ultrasound examination and the role of ultrasound in screening for high-risk pregnancy. It also describes the normal and abnormal development of early pregnancy as 'seen' through ultrasound images.

The second section *Abdominal ultrasound* goes into detail, the normal development of the fetus in the second and third trimester and the associated biometry that we use in everyday ultrasound practice.

The third section entitled *Ultrasound examination of fetal anomalies* described the types of abnormality detectable.

There is also a very interesting section dealing with ultrasound of placenta, umbilical cord and amniotic fluid and a section dealing with ultrasound in multiple pregnancies.

The section on *Doppler ultrasound* is particularly interesting as it describes the use of Doppler ultrasound in modern obstetrics and in the management of at-risk pregnancies.

Chapter 45 describes the use of 3D ultrasound together with a critical appraisal of its present place. There is a good summarised section on invasive diagnosis and treatment in pregnancy, including the role of fetal therapy in modern obstetric practice.

Last but not least, the section on *Safety, genetic and ethical aspects of prenatal ultrasound diagnosis* is very useful. It provides the ethical framework under which obstetric ultrasound operates.

Chapter 51 contains a comprehensive collection of biometry and tables, which serves as a very good reference for any sonologist performing ultrasound in obstetrics.

In summary this textbook is very well written, provides a wealth of information and a very up to date review of sonography in modern obstetrics. It is very well illustrated, often with matching clinical photographs of the pathology so that the reader can compare the ultrasound images to the anatomical specimen. It is a vitally important textbook to have in any department performing obstetrics ultrasound.

Dr Andrew Ngu
Co-Deputy Director
The Royal Women's Hospital
Carlton Victoria

Color Doppler Sonography in Gynecology and Obstetrics

Editors WO Schmidt and A Kurjak
Publisher Thieme
Year 2005
ISBN 1-58890-179-3
Cost $A302.50

This textbook contains a very detailed review of the state of Doppler ultrasound in obstetrics and gynaecology. It is beautifully presented with 378 pages, 90 tables and 579 illustrations, many of which are in colour. Some of the transvaginal images are, however, presented with the probe at the bottom. This can be somewhat disorientating as it is not the way we are used to viewing transvaginal images in Australia.

Although the title indicates the subject matter is colour Doppler, a considerable amount of the text is devoted to other subjects. Usefully, the text explores both Power and Pulse wave Doppler and there are also two particularly good chapters, which summarise the essence of B-mode and Doppler ultrasound physics.

There are, however, some chapters unrelated to ultrasound, for example: the chapter on the structure of the human placenta. There are also five chapters at the end of the book which relate to breast imaging.

The textbook is divided into five sections and 40 chapters. The sections are: *Physical and technical principles; Infertility evaluation and assisted reproduction; Obstetric ultrasound; Specific obstetric problems*; and *Gynaecological ultrasound*.

Each chapter is divided into many subheadings and the use of these subheadings with multiple colour illustrations and ultrasound images greatly improves the readability of the text, making it easy to find a particular topic of interest. Some of the chapters were, however, repetitive; for example: the chapter *Colour Doppler ultrasound and fetal echocardiography* contains some overlap with the next chapter entitled *Use of colour Doppler in echocardiography*.

This textbook contains a very comprehensive and well-illustrated review of the role of Doppler sonography in obstetrics and gynaecology. Much of the information contained within the textbook is beyond the scope of general imaging specialist due to its level of detail and this book would primarily be of use to a very limited market of clinicians with a highly specialised interest in obstetric and gynaecological imaging.

Dr Michael Bethune
Melbourne Women's Ultrasound
Melbourne Victoria

Step-by-Step Ultrasound in Infertility

Authors Kuldeep Singh and Narendra Malhotra
Publisher McGraw-Hill
Year: 2005
ISBN 0-07-144658-3
Cost $A70.40

Dr Singh is a consultant ultrasonologist with a special interest in obstetric sinology and conducts training courses in ultrasound in New Delhi, India; Dr Malhotra is a practicing obstetrician and gynecologist with a special interest in high-risk obstetrics ultrasound.

Their book is a pocket size easy

reference book accompanied by a CD containing all the pictures and images from the book.

Step-by-Step Ultrasound in Infertility briefly covers the physiology of reproduction and, through 11 sections systematically covers all the ultrasound and other tests utilised in diagnosing causes for infertility including the ultrasound assessment of the male partner.

There are a number of flow charts to help you through the process of diagnosis in different situations.

Although the book details how to use the information that ultrasound provides, there is no information on ultrasound technique or on how to produce the images shown in the book. I would therefore recommend it for those wanting to use it in a clinical setting as a guide to what tests they should be performing and how to interpret the results rather than someone wanting to perform ultrasound examinations

Mrs Roslyn Savage
Southernex Imaging Group
Brisbane Queensland

Making Sense of Vascular Ultrasound. A Hands-on Guide

Authors Kenneth Myers and Amy Clough
Publisher Arnold
Year 2004
ISBN 0340 91009 2
Approx Cost $A99.00

This locally authored text is a very welcome addition to existing texts on vascular Doppler ultrasound. It succeeds in its intention of being a practical, hands-on, ready reference in the course of day-to-day vascular ultrasound practice, aimed particularly at those who are training or relatively new to the field of vascular ultrasound.

While each section is concise, the range of subjects covered is more comprehensive than in many other vascular ultrasound texts. Initial chapters cover the subjects of principles of vascular ultrasound, performing a scan, setting up a vascular diagnostic service and vascular physiology and pathology. Subsequent chapters are devoted to extracranial cerebrovascular disease, trans-cranial Doppler, lower limb arterial and venous disease, venous thrombosis and chronic venous insufficiency, upper limb vascular disease, renovascular diseases, splanchnic circulation, penile vascular ultrasound and ultrasound-guided interventions.

Each chapter is well illustrated by selective ultrasound, greyscale, colour and pulse wave traces as well as liberal use of clear schematics illustrating anatomy, including variations, and pathology.

The authors are an experienced vascular surgeon and sonographer with large experience in vascular ultrasound particularly in lower limb studies.

Much of the emphasis is on practical tips and pitfalls for the sonographer. In addition, there is much that is useful in understanding the normal physiology, vascular pathophysiology as well as dot points about what the referring clinician needs to know, the latter being particularly well done in the section on chronic venous insufficiency of the lower limb.

This text would be my first choice for a bench-top text for departments and practices performing vascular ultrasound, particularly if performing lower limb studies.

Prof Robert N Gibson
University of Melbourne
Melbourne Victoria

Obstetric Ultrasound: How, Why, and When

Editors Trish Chudleigh and Basky Thilaganathan
Publisher Churchill Livingstone
Year 2004
Approx Cost $A116.00

This is the third edition of a very popular textbook, its reputation established on a concise, easy to understand, pragmatic approach to the subject.

Obstetric Ultrasound: How, Why, and When has appealed to many professionals who need a basic start-up book, and includes midwives, medical students, obstetricians, as well as sonographers and sonologists.

The information has been kept up to date with clear images and graphics. There are now 264 pages in total with contributions from invited authors and therefore the book is in danger of defeating its purpose by being too long-winded. I don't think this new edition has done this though the addition of further physics information was the last thing most readers of this book need.

Most of the additions are useful with an especially useful new chapter on how to discuss the findings of the ultrasound examination. This includes a useful discussion on how to give bad news.

Other topics include first trimester problems with a useful guide to vaginal scanning, infertility, routine screening, fetal growth and abnormalities, invasive procedures and Doppler.

I like the book because it continues to be edited by professionals who are still involved in clinical scanning, and thus avoids the pitfalls of many books written by academics.

There are lots of useful tips like 'A gentle touch is well worth developing whether scanning abdominally or vaginally. The lightest pressure of the probe is sufficient to produce the majority of images', 'Avoid terminology like transonic, hypoechogenic, acoustic shadowing, etc in reports. Though possibly useful to your colleagues they are unlikely to provide a GP, midwife, or specialist with useful information.'

Dr Alistair Roberts
Insight Radiology
Auckland New Zealand

New titles available from the Video Library

DVD Video Prof. Yves Ville Lecture Series
Catalogue no. (1) 157, (2) 158, (3) 159
Cost (purchase): Members, $A198.00; Non-members, $A495.00. Rental available.

Dr Yves Ville is Professor of Obstetrics and Gynaecology at the Universitè Paris, France. He is well known for his expertise in twin pregnancy, particularly in the area of monochorionic twins and twin-twin transfusion.

This collection, on 3 Video DVD/s comprises digital recordings of talks presented at the ASUM Multidisciplinary Workshop in March 2005. Titles: (1) Twin Pregnancy (2) Twin-Twin Transfusion; (3) Antenatal Assessment of CMV.

DVD Video Peter Burns Lecture Series – 1 Advanced Applications & Technology in ultrasound (Peter Burns, April 2004)
Catalogue no. 154. Rental only.

Dr Burns is well known in the Ultrasound industry for his entertaining and informative presentations. This lecture will include information on the latest techniques and clinical applications including RF ablation guidance, diagnosis of focal liver lesions and more.

Dr Burns will introduce new harmonic imaging technology as well as the latest in wide band Doppler imaging and ultrasound contrast development.

DVD Video Cranial ultrasound and MRI correlation in the newborn infant (FANZCR, 2005)
Catalogue no. 155. Rental only.

DVD Video Historical Collection (2005)
Catalogue no. 156. Rental only.
The Historical Collection is a collection of short movie clips dating back from 1950 through to 1990 showing examples of medical ultrasound scanning techniques.

2006 DMU EXAMINATION DATES

DMU Part I & II Exemption Application Closing Date 14 January
DMU Part I & II Waiver Application Closing Date 14 January
ASAR Student Status Application Closing Date 21 January
DMU Part I & Part II Examination Application Closing Date 31 January
DMU Prep Course – Gold Coast 22– 26 March
DMU Part II Practical Examination Period May – October
DMU Part I & Part II Written Examinations 29 July
DMU Part II Oral Examination Period 3–29 October
DMU Part I Supplementary Written Examination 4 November

2006 DMU EXAMINATION FEES

DMU Part I

APP & PHY
$A900.00 + GST = $A990.00

APP
$A600.00 + GST = $A660.00

PHY
$A600.00 + GST = $A660.00

Supplementary APP & PHY
$A600.00 + GST = $A660.00

Supplementary APP
$A300.00 + GST = $A330.00

Supplementary PHY
$A300.00 + GST = $A330.00

DMU Part II

Complete Part II
$A1700.00 + GST = $A1870.00

Component charges were not available at the time that the Ultrasound Bulletin went to press but are listed on the ASUM website at www.asum.com.au/dmu.htm or may be obtained by calling the ASUM office tel +61 2 9958 7655

2006 DDU DATES AND FEES

Part I Examination Fee $A990.00 (includes GST) for ASUM Members $A1254.00 (includes GST) for Non members
Part II Examination Fee $A1760.00 (includes GST) for ASUM Members $A2024.00 (includes GST) for Non members
Part II Casebook Fee $A330.00 (includes GST)
Application forms may be downloaded from our website www.asum.com.au
Fees quoted above are from July 1 2005 and may be subject to change.

INFORMATION PERTAINING TO THE NEXT EXAMINATIONS

2006 Part I
The Part I Examinations for 2006 will be held on Monday 15 May 2006 with applications closing on Monday 20 March 2006.

2006 Part II
Casebooks for 2006 Part II DDU Examination must be submitted by Monday 16 January 2006 and accompanied by the prescribed fee of A$330.00 for all participants.

The Written Examination for Part II will be held on Monday 15 May 2006 with the closing date being Monday 20 March 2006.

The Oral Examination for Part II will be held on Saturday 17 June 2006 in Sydney. The Oral Exam for Cardiology candidates will be in Melbourne on Thursday 15 June 2006.

RESULTS
Examination results will be mailed to candidates early July succeeding the DDU Board of Examiners meeting.

The Ultrasound Bulletin publishes information relating to changes in fees, examination dates, regulations, etc.. Members are kept up to date with this and other related information by automatically receiving the Ultrasound Bulletin.

Applications for research funding to be presented at WFUMB 2009

ASUM is seeking to support research which builds on the body of existing research findings and extends our knowledge of the applications, efficacy and safety of clinical ultrasound.

Applications are particularly invited in the areas of:

1 High frequency ultrasound.
2 Therapeutic ultrasound applications.
3 Tissue elasticity.
4 Obstetric growth parameters pertinent to the whole Australian and/or New Zealand population.
5 Flow Mediated Dilatation and/or Intima Media Thickness Studies.

Projects in other areas will be considered, however it is unlikely that applications for projects that duplicate existing findings, or studies, will be successful except where it is judged that these are necessary to validate the findings of other studies. Send applications to:

The Chairman
ASUM Research and Grants Committee
2/181 High Street
Willoughby NSW 2068 Australia

Enquiries to: Mr Keith Henderson
email khenderson@asum.com.au

ASUM 35th Annual Scientific Meeting was the best ever

Stephen Bird, Anna Parsons, David Rogers, Peter Burns, Joseph Polak

All work and no play...

The local Adelaide faculty has a proud tradition of producing Annual Scientific Meetings which showcase high quality scientific content carefully wrapped up in a social program which provides a uniquely South Australian experience. The recently held 35th ASUM Annual Scientific Meeting in Adelaide continued this tradition in fine form with over 550 delegates from Australasia and further abroad enjoying a great meeting.

The brand new Adelaide Convention Centre situated in the heart of Adelaide's cultural precinct proved to be the perfect venue, combining elegant auditoriums with panoramic views over the River Torrens, Elder Park, Festival Theatre and the Adelaide Oval. Following a long day of lectures, many of our interstate and overseas guests took advantage of our beautiful spring weather by enjoying a stroll along the banks of the River Torrens or a hop, skip and a jump to into Rundle Mall for some retail therapy.

The key ingredient that sets the ASUM Annual Scientific Meeting apart from other meetings on the annual calendar is the quality of the scientific program. As co-convenor of the meeting, it is a great pleasure and privilege to invite presenters from around the world to headline each subspecialty component of the scientific program. The highly respected faculty we invited worked tirelessly during the meeting presenting many papers and engaging with our registrants to pass on their wealth of knowledge.

We would like to thank our invited faculty for making our meeting so memorable:

Peter Burns: As always a shining star at the meeting, the guru of cutting edge technology and proud owner of the best professorial haircut I have ever seen.

Rethy Chhem: The 'backbone' of the MSK program including the 'all you can eat MSK Sunday'.

Rhodri Evans: The head and neck specialist who not only educated us but entertained us in his very popular lectures and live scanning workshops.

Anna Parsons: Our keynote gynae speaker who deserves special thanks not just for her excellent presentations, but also for her dedication to the meeting. Anna travelled half-way around the world suffering from a nasty stomach bug to take her place at the lectern in Adelaide, a commitment for which the organising committee will be forever grateful.

Joseph Polak: Ever since reading Joseph's first book I decided I would invite him to Adelaide if I ever had the opportunity. My chance arrived and Joseph was brilliant, not only headlining our vascular program but, apparently, also on the dance floor.

Pippa Kyle: Obstetrics is arguably the most important component of any ASUM Annual Scientific Meeting program and rather than looking across the world we found the answer to our prayers just across the Tasman in Christchurch. Pippa did a fantastic job as our central figure of the all-important obstetric program.

Martin Necas: The dynamo sonographer from New Zealand once again impressed an Australian audience with his extensive knowledge across subspecialty areas and relaxed presenting style.

Robert Gibson: The consummate generalist, and most worthy recipient of the Ultrasonics Institute, Ultrasonics Laboratory Fellowship. Robert gave a fabulous series of lectures emphasising the continuing important role ultrasound has to play in gastrointestinal and hepatobiliary imaging.

Leandro Fernandez: WFUMB Councillor and, as we have discovered, a Latino dancing specialist at the gala dinner. Leandro provided presentations on a wide range of topics as well as adding some real South American pizzazz to the meeting.

Byung Choi: Convenor of the next major international ultrasound meeting, WFUMB 2006 in Seoul. Byung provided an insight into applications of 3D ultrasound in hepatobiliary imaging which are still in their infancy in Australasia.

I would also like to acknowledge and thank our local and national faculty for providing many excellent presentations, which complimented our keynote speakers so well and completed our scientific program. Special thanks must go to Wes Cormick who


WFUMB' 2006
WFUMB 2006 SEOUL
May 28 - June 1, 2006
www.wfumb2006.com


ASUM 2005


ASUM: Promoting Excellence in Ultrasound
Internet Cafe
Australasian Ultrasound


7

Images from the Adelaide ASM

presented a wide range of papers across a diverse selection of topics in a manner that could best be described as 'Edutainment'. If there is ever an individual to emerge with a cult following after an ultrasound meeting such as this, Wes is your man.

As always in Adelaide, when a big meeting comes to town the local faculty are keen to assist in any way they can. There are far too many individuals who have helped out in the planning and running of the meeting to mention them all, however, some do deserve special thanks.

- Roger Davies: Co-convenor
- Cheryl Buckingham: Skills Day Convenor
- Leah Kallos: Social program Coordinator

Our Local Organising Committee

- Anne Delon
- Kaye Burgess
- Jane Copley
- Julie Olsen
- Denise Roach
- Amanda Walsh
- Rosie Franklin

Thanks must also go to Peter Muller for his invaluable assistance in putting together the local faculty component of the obstetric and gynaecology scientific program.

Apart from a valuable learning experience, we also attempted to provide a showcase of South Australia's world-renowned food wine and arts. The food throughout the meeting was predominantly prepared from fresh local ingredients, including our wonderful West Coast oysters, Barossa Pate, Adelaide Hills cheeses and Spencer Gulf prawns. The wine throughout the meeting was sourced from the Barossa and Clare Valleys as well as Coonawarra and McLaren Vale wine districts. I trust everyone who attended the meeting went home with a sense of the unique food, wine and arts lifestyle that those of us lucky enough to live in Adelaide take for granted.

It is not possible to run a successful meeting with high quality international speakers without generous support from the trade and I would like to thank our Gold Sponsors:

- GE Healthcare
- Philips
- Toshiba

Thanks must also go to the many other sponsors who participated in the trade exhibition to make the meeting possible.

From a co-convenor's perspective I have witnessed first hand the hard working and dedicated nature of our society's office staff as well as our meeting secretariat ICMS. The amount of work, which takes place behind the scenes, is staggering and the end result is a conference that runs like clockwork.

If you came to the meeting I hope you enjoyed the experience and have taken home fresh knowledge, inspiration and memories of Adelaide. I will see you all at the 2006 Annual Scientific Meeting in Melbourne, which promises to be another fabulous event.

Stephen Bird
Co-convenor

The challenge for the future: 2005 ASUM–ISUM Scholarship

Australasian Society for Ultrasound in Medicine
ASIA LINK PROGRAM

Dr Taufik Jamaan, Asia Link scholarship recipient from ISUM (Indonesia) and Dr Caroline Hong ASUM CEO

Dr Taufik Jamaan receives his scholarship plaque from Immediate Past President Dr Glenn McNally

It was an honour to accept the ASUM-ISUM Scholarship Program 2005, especially for me as a young specialist obstetric gynaecologist from a developing country. As a member of the Indonesian Society for Ultrasound in Medicine (ISUM) I am very enthusiastic as a result of my experiences while on this scholarship.

I arrived in Sydney on 28th September on a rainy Sunday morning, with a hectic two- week schedule ahead of me.

Nepean Hospital

In my first week I learned about 3D ultrasound at the Nepean Hospital under the supervision of Prof Ron Benzie and the ultrasound team in the Chris Kohlenberg Department of Perinatal Ultrasound. As a referral hospital and training centre, the Nepean Hospital routinely does scanning for the first trimester (for congenital anomaly screening, nuchal translucency) and serology laboratory tests if necessary. There are four scanning rooms with GE ultrasound machines (Voluson 730 Expert 4D real time).

I was instructed in many ultrasound procedures including amniocentesis chorionic villous sampling (CVS), hysterocontras, salphingography (Hycosy) etc., which were all very interesting. I would like to thank everyone very much for their hospitality and guidance.

On the weekend, I went on a refreshing tour of the city of Sydney and was taken up to the fantastic Blue Mountains. I would like to thank David Fauchon, a sonographer at the Nepean Hospital, for taking me to the mountains and showing me the panoramic views, including the famous Three Sisters and then finishing off the day with a nice dinner.

Royal Hospital for Women

In my second week, I moved to the Royal Hospital for Women (RHW). I learned 3D ultrasound under the supervision of Dr Glenn McNally and his staff.

The mornings were spent doing hands-on scanning and after lunch I spent time observing in the data room.

I was shown about 500 scan results, which was wonderful, and I observed a lot of cases, including: extremities/cardiology defect in the fetus, twin pregnancy after IVF procedure, extrauterine pregnancy in the scar caesarean section, cervix incompetency, fluid leakage in the PROM case, etc. I also visited the delivery, neonatal room and the surgery room and was shown how to set up. Every day, I observed and discussed things that I had never seen before.

ASUM Secretariat

On the last day, I visited the ASUM office in Willoughby where I was presented with an ASUM plaque and a gift and had my photograph taken with Dr Glenn McNally (Chairman ASUM Asia Link) and Dr Caroline Hong (ASUM CEO), which was a lovely surprise. I also presented ASUM with an appreciation plaque from the Indonesian Society (ISUM).

My visit to Sydney in the ASUM-ISUM scholarship program 2005 ended with a great Asian meal at one of the many restaurants at the famous Sydney landmark, Darling Harbour.

My special thanks go to Dr Caroline Hong who organised a great program for me and also to the ASUM Council for giving me this opportunity. I would also like to thank Dr Daniel Makes, SpRad (President of ISUM) for choosing me as the recipient of this program. I hope this program will continue, giving doctors in Indonesia the opportunity to improve their ultrasound knowledge and skills.

While on my Garuda flight back to Jakarta, I was filled with enthusiasm for continuing to improve my ultrasound skills. I am looking forward to imparting my newly gained knowledge to my colleagues so they too, will benefit from my experience. I have also since joined ASUM as an overseas member. I am privileged to be the first scholarship recipient of the ASUM Asia Link Program.

Good-bye Sydney and see you again.

Dr Taufik Jamaan SpOG
Jakarta, Indonesia

ASUM ASM 2005 presentations

The President, Dr David Rogers presented the following Awards at the Gala Dinner

Name	Presented with	Sponsor
Mr Peter Coombs	Chris Kohlenberg Teaching Fellowship NT, Nth Qld	GE Medical Systems
Dr Neil Simmons	Chris Kohlenberg Teaching Fellowship Tas	GE Medical Systems
Mr Martin Necas	Giulia Franco Teaching Fellowship NSW	Toshiba
Dr Naguesh Naik Gaunekar	Beresford Buttery Overseas Traineeship	GE Medical Systems
Ms Ann Quinton	Best Sonographer Research Presentation Award	Philips
Dr David Watson	Best Research Presentation Award	Siemens Ultrasound
Prof Fung Yee Chan	Best Clinical Presentation Award	Siemens Ultrasound
Mrs Faye Temple	Best Poster Award	ASUM
Prof Robert Gibson	UI/UL Lecture Award	ASUM

Ms Ann Quinton Best Sonographer Research Presentation Award

Dr Naguesh Naik Gaunekar Beresford Buttery Oveseas Traineeship

Mrs Faye Temple Best Poster Award

Mr Martin Necas Giulia Franco Teaching Fellowship

Mr Peter Coombs Chris Kohlenberg Teaching Fellowship

Prof Robert Gibson UI/UL Lecture Award

ASUM honours

Peter Warren ASUM Life Member and David Rogers President ASUM

Robert Gill ASUM Life Member and David Rogers President ASUM

Robert W Gill

PhD, Engineer, Scientist
President 1990–91

Dr Robert Gill is a scientist with a plethora of awards and honours, originating from his student years and continuing throughout his career in medical ultrasound, when he joined the Ultrasonics Institute in 1975, as Head of Doppler Research through to his appointment as Deputy Chief and General Manager of the CSIRO Industrial Physics in 2004.

Robert Gill has over 70 scientific publications, 150 conference papers, including 27 speaker invitations to major international meetings and four patents.

His major ultrasound scientific achievements include: making the first measurements of the rate of blood flow in the umbilical cord of the undisturbed human fetus and establishing the range of values found in normal pregnancies (1978); making the first measurements of blood flow in the human portal, splenic and renal veins (1980) production of the first comprehensive analysis of accuracy achievable in measuring blood flow ultrasonically, and factors affecting accuracy (1985) and demonstrated substantially improved accuracy in identifying pregnancies at risk of compromise using decision tree analysis on Doppler and other ultrasound data (1991).

Robert's contributions to ASUM are enormous. He was a Councilor from 1979–95, and he served greatly during, and beyond these years. He was the Society's first Editor of the ASUM Newsletter (1980–98); Member of the Education Committee (1990–98); Member of the Standards of Practice Committee (1990–98); ASUM nominated and successfully elected Council Member the World Federation of Ultrasound in Medicine and also ASUM's President from 1990–91.

As the Society's 17th President, he inherited the Society's new constitution and its new name – the Australasian Society for Ultrasound in Medicine. His first task was to consolidate the entry of New Zealand members. He also supported acknowledgment of long service to the Society by the introducing two new membership categories – Life and Retirement Membership. He greatly expanded the Education Committee and promoted the employment of an Education Manager.

Extra to Robert's Presidency, and to his other scientific and ASUM commitments over 30 years, his truly great contribution to the Society and its history must be his dedication, as the first Editor of the ASUM Newsletter (1980–98) until the first publication of the ASUM Ultrasound Bulletin. In only the Society's 10th year, Robert expanded the typewritten ASUM President's Newsletter, which was then rightly, dedicated to establishment of ASUM to encompass the promotion of Australia's and New Zealand's commitments to the science within the world arena; by setting standards of practice, via its accreditation, the DDU and DMU; safety and education programs into a Newsletter which also provided the inclusion, of the wider membership, of articles, issues and reports of expanded depth. Computers aided his policy of providing a forum to assist ASUM's greater diversity of its membership, enabling the publication of feature articles. The Newsletter as an expanded ASUM history archive remains a legacy to Robert Gill's contributions our Society. Election to Life Membership by our members is a deserved salute to him.

Ian G McDonald

MBBS, MD, Hon FRANZCR, FAIUM
Cardiologist, Professor of Cardiology, St Vincents Hospital Melbourne,
President 1979–80

Prof Ian McDonald's contribution to cardiology, medicine and to our Society is outstanding. He is ASUM's sixth president and a director of the Centre for the Study of Clinical Practice, St Vincent's Hospital Melbourne.

He embraced cardiac ultrasound early in the late 1960s, via research with Harvey Feigenbaum at the Indianapolis University, Illinois, USA

Margo Gill ASUM Life Member and David Rogers President ASUM

ASUM Life Member Ian McDonald

and also in dialogue with George Kossoff, at the Commonwealth Acoustic Laboratory, Sydney (later known as the Ultrasonics Institute).

His cardiology research was then, in M-Mode ultrasound investigations of valve movements, particularly in the mitral and tricuspid valves (2D cardiology did not emerge until the late 1970s), and in this 21st Century, McDonald continues to marvel at the fact that "ultrasound provided medicine with its first ever opportunity to see the heart from the outside". He is one of the first Australian cardiologists to introduce cardiac ultrasound to the antipodes.

Ian McDonald published one of the earliest medical ultrasound textbooks – *An Introduction to Echocardiogaphy*; IG McDonald, CC Thomas; Springfield lll, 1976. He has more than 130 scientific publications. These include recent articles on quality health care and telemedicine as Director of the Centre of Study of Clinical Practice, St Vincents Hospital, Melbourne.

Ian McDonald's ASUM Presidency (1979–80), during the Society's 10th anniversary, was energetic, at least. His and the Council's agenda encompassed stability of the new Constitution, which incorporated and formalised the Society, via consolidation of NSQAC's recognition of the Diploma of Diagnostic Ultrasound (DDU) and promotion of the future sonography profession with ASUM's introduction of the Diploma of Medical Ultrasonography (DMU–1979). He developed the Cardiology Syllabi for both examinations. He also assisted dialogue in promotion of ASUM within the international arena, particularly during the WFUMB's infancy.

In 1988, at the History of Ultrasound in Medicine Convention in Washington DC USA, to commemorate the 40th Anniversary of Ultrasound in Medicine, Ian McDonald was recognised as a pioneer in Medical Ultrasound, by the World Federation of Ultrasound in Medicine and the American Institute of Ultrasound of Medicine, in conjunction with the Smithsonian Institute of History, Washington DC.

Ian McDonald is a founding member of ASUM. He was instrumental in its early mission, education, promotion and its history, and is so worthy of being elected, by its members, to Life Membership.

Margo AS Gill

MApSc, MBA, DMU, AMS, FIR

Honorary Fellow

Margo Gill's contributions to medical ultrasound as a sonographer, researcher, educator and advocate for the sonography professional are absolutely exemplary. Margo Gill's sonography career has spanned public and private hospitals and also private practice in Australia and the United Kingdom and, particularly, also as a senior lecturer and/or program coordinator of Graduate Diplomas as the Queensland University of Technology (QUT) and Sydney University.

She joined the Society in 1989 and was awarded the Diploma of Medical Ultrasonography in that year. Throughout her career she has dedicated her time, knowledge, and empathy to her profession; making more than 45 scientific presentations, either proffered or by invitation; publishing more than six scientific papers; successfully received several research grants and supervised or examined several Masters theses.

She has been a convenor or scientific committee member of many conferences for ASUM, the Australian Institute of Radiography (AIR) and the Australian Sonographer's Association (ASA), receiving several awards for presentations. She was made an AIR Fellow in 1992 and is the inaugural recipient of the Outstanding Contribution to the Profession Award of the ASA (1994).

As the QUT representative on ASUM's Ultrasonographers Qualification Accreditation Committee, she became an inaugural member of the Australasian Sonographers Accreditation Registry (ASAR) she developed and wrote the *Guidelines for Accreditation of postgraduate Programs and Qualifications.*

Margo Gill's commitments to ASUM encompass her membership of the Queensland Branch Committee and on Council. She was the Queensland Branch Treasurer (1989–90) and its Chairman (1992–94); and Council Member, on which she was a member of the Sonographers Affairs Committee, from 1995–98, during which her contributions have been outstanding. She revised the *Policy on the Scanning of Live Models for Demonstration Purposes*; developed

the *Guidelines for the Adjudication of Prizes at the Annual Scientific Meeting.* Margo was a member of the Education Committee (1992–2002) for which she produced a significant teaching videotape, commissioned by that Committee and ATL Pty Ltd, and designed, coordinated and reported on the 1995 Education Committee's Survey of Members (> 200members); and reviewed many books. She was also a member of the Editorial Board of the ASUM Newsletter, serving as Assistant Editor from 1998–2002.

By invitation in 2001, she was a member of the ad-hoc DMU Advisory Committee, which reviewed the process for the conduct of the DMU; her major contribution being the preparation and production of the re-accreditation documentation, which was successfully accepted by the ASAR. Margo has also been an examiner/coordinator of the DMU examinations over many years.

Council appointed an Honorary Fellowship to Margo Gill at its 35th Annual Council Meeting. Indeed, a truly fitting award for such a pre-eminent member. Our Society is enriched by her generous strengths and contributions, so softly made to our science and profession.

Peter S Warren

Radiologist, FRANZCR, DDU
President 1994–96

Peter Warren is Director of the Department of Medical Imaging, Royal Hospital for Women, Randwick (prior location Paddington NSW). His introduction to ultrasound was in 1976, when he attended the early three-month Ultrasonics Institute/Royal Hospital for Women medical ultrasound course, in Sydney. He then spent some months with Drs Patricia Morley and Ellis Barnett at the Western Infirmary, Glasgow, Scotland, and with Dr Hugh Robinson at the Queen Mothers Hospital, Glasgow, returning to Sydney to work with William Garrett (then Director of Medical Imaging, until his retirement).

Peter Warren, awarded the DDU in 1997, has made grand contributions as a researcher, teacher and consultant to the science. His CV attests to more than 100 publications and/or scientific invitations, including proffered abstracts.

As a consultant to the Ultrasonics Institute, from the late 1970s, he contributed widely to medical ultrasound research, through to its acceptance in clinical practice. In the 1980s, when the UI Octoson showed greatly enhanced examinations of the neonatal and paediatric brain, he upended the babies onto the machine's plastic membrane to produce superlative and new ultrasound images of the brain, via the posterior cranial fontanel. In the early 1980s he contributed, with Gill, Kossoff, Garret *et al,* to further studies of blood flow measurements in the human fetus and the identification of pregnancies at risk of compromise. Also, with this group, he made major investigations of the upper and lower abdomen, using methyl cellulose as one of the first ultrasonic contrast agents to study the gut and bowel, to identify surrounding anatomy and organs to improve diagnosis. This contrast was administered orally and rectally (flavoured for oral administration). It allowed exquisite demonstration of the walls of the stomach, duodenum and small bowel, to identify upper abdominal pathology and to show panoramic images of the pancreas. This rectal contrast agent accentuated the uterus and tubes from bowel to discriminate between gynaecologic and pelvic anatomy and pathology.

Peter Warren's contributions to ASUM are striking. He was granted membership in 1987 and enthusiastically embraced the NSW Branch. Elected to Council (1987–97), he was Treasurer (1991–94) and President (1994–96). His presidency was dynamic; his greatest achievement being recognition of qualified sonographers, leading to their elevation to Ordinary Membership, thus making the Society's third significant Constitutional change, since incorporation in 1979.

Peter Warren supported and funded continued international dialogue; confirmed ASUM's endorsement of the ASAR with and donated 'start-up' funding. He vigorously updated ASUM's mission and its policies and employed an Education Coordinator (Keith Henderson) to establish a cohesive education program for all members and to explore the MOSSIP program.

He has rightly been elected by the membership as a Life Member.

Kaye Griffiths

To the CEO ASUM

Awardee for the RANZCOG/ASUM Beresford Buttery Travel Grant

I am very pleased to advise that following the consideration of the Scholarship Selection Committee and ratification by the Board of Directors of the RANZCOG Research Foundation, the award of the 2006 Beresford Buttery Travel Grant is to be made to Dr Rebecca Chalmers of the Fetal Diagnostic Unit at Monash Medical Centre.

Dr Chalmers' study visit is to attend a course in fetal echocardiography and advanced obstetric and gynaecological ultrasound at the Jefferson Ultrasound Research and Education Institute in order to improve theoretical knowledge and practical skills in these areas. The echocardiography will be incorporated into the design of a clinical study assessing the effects of antenatal corticosteroids on cardiac function in the compromised fetus.

The Scholarship Selection Committee was pleased to have Assoc Professor Lachlan De Crespigny's input into the assessment process on behalf of ASUM.

We would be happy for you to announce this award through your ASUM publications.

I will look forward to Dr Chalmers' report on her study visit following its completion next year.

George Douvos
Senior Coordinator RANZCOG Research Foundation

Your ASUM DMU Examination Applications close 31st January

Enquiries to ASUM on

tel +61 2 9958 0317

email dmu@asum.com.au

New members July–September 2005

July 2005

Full members
Robyn Alcorn SA
Wendy Brown NSW
Kelly Cameron SA
Desley Capper Qld
Ann Carr SA
Petra Chapman Qld
Sai Kwee Choo SA
Diane Christian NZ
Amanda Diprose SA
Cathryn Dixon NSW
Karen Forth SA
Laverne Harris NZ
Andrew Hilton Vic
Jacqui Keene Vic
Chiara Lepore SA
Amanda Libri SA
Sheree Lloyd NZ
Liza Mannix NSW
Linda McKendrick SA
Casey Monks SA
Sean Muir Tas
Stella Oborn SA
Steven Oreo Qld
Monique Pace SA
Shelley Rees SA
Tracey Scott SA
Katrina Stevens NSW
Megan Stewart Vic
Kirrily Swaffer SA
Chris Thomas SA
Fiona Thomson NZ
Xue Bai Wan Vic
Helen Webber SA
Lucinda Whittaker SA
Julie-Anne Winchester SA
Tracey Wright SA

Associate members
Ashita Fiji
Celeste Baker SA
Sally Bateman SA
Shelley Brodie SA
Anthea Croft SA
Zoe Li ACT
Warwick Park Vic
David Pham Vic
Pratika Sharma Fiji
Simone Silver NSW
David White SA

Corresponding associate DMU Asia 2005
Colin Wing Yew Chan Malaysia
Li Anne Leong Malaysia
Hui Xien Yvonne Fraser Malaysia
Hwei Fun Peng Malaysia
Phui Mei Lydia Chin Malaysia
Diana I-Lee Kho Malaysia
Yean Wah Mok Malaysia
Jeng Wui Tan Malaysia
Pui Zhi Lo Malaysia
Pay Chiam Chew Malaysia

August 2005

Full members
Judith Hu NSW
Robert Norsworthy SA
Harley Roberts NSW
Cathy Sorensen NZ
Tihema Stewart NZ
Anna Tadevosian NSW
David Van Gelderen Vic

Associate members
Gerald Pretorius WA

September 2005

Full members
Taufik Jamaan Indonesia
Dennis Nelson NZ
David Range NSW
Denise Thomas UK

Associate members
Daniel Burton NSW
Ha Nguyen VIETNAM
Tai Nigro SA
Sally O'Hearn NSW
Elizabeth Shannen Qld
Victoria Thompson NSW
Samreen Zeeshan NSW

Trainee members
Eden Bartak Qld
Scott Petersen Qld
Michael Wu Vic

MSK Ultrasound 2006

'The Master Class'

Saturday 8th and Sunday 9th April 2006

Surfers Paradise Marriott Resort, Gold Coast

Following the outstanding success of 'MSK Ultrasound 2005'
we would like to invite you to participate in 'MSK Ultrasound 2006'.
This contemporary seminar will be useful to all who practice in the MSK U/S field.

- Renowned facilitators
- Succinct, accurate, current lectures
- Informal workshop focus to promote learning and exchange of ideas
- Latest technology on display
- Workshops and open teaching forums are included in the registration fee

Invited International Guest Speaker
Jon Jacobson

Clinical Associate Professor, Michigan University

Provisional Program
Saturday 8th April
Shoulder & Elbow U/S – Jon Jacobson
Injections under ultrasound control – Greg Cowderoy
Workshops
Morning Tea
Wrist & Hand U/S – Jon Jacobson
Ultrasound of peripheral nerves – Jon Jacobson
Workshops
Lunch
Open Teaching Forum: the Groin – John Read
Afternoon Tea
Knee – Jon Jacobson
Ultrasound of soft tissues – Jon Jacobson
Vascular birthmarks & other kids' stuff – David Lisle
Sunday 9th April
Ankle & Foot U/S – Jon Jacobson
Dynamic imaging – Jon Jacobson
Workshops
Morning Tea
Hip & Thigh U/S – Jon Jacobson
Ultrasound of the infant hip – David Lisle
Workshops

Interactive Live Scanning Forum: Groin Ultrasound

John Read
Castlereagh Sports Imaging

Workshop Facilitators

Frank Burke
Greg Cowderoy
James Linklater
David Lisle
Jenny Noakes
Neil Simmons
Amanda Woodward
Mark Bryant
Barry Lennon
Peter Murphy

For further information,
or to receive a registration brochure, contact

Event Solutions

Ph +61 7 3855 3711
Fax +61 77 3855 2811
Email: shan@eventsolutions.com.au

Visit the Phoenix Conferencing website for program updates and registration information

www.phoenixconf.com

Corporate Members 2005

Australian Imaging & Ultrasound Distributors
Medical Imaging Solutions
Sharmaine Crooks 02 9888 1000
aiud@audist.com.au

Australian Medical Couches
Couch Manufacturer
Marcus Egli 03 9376 0060
claudia@australianmedicalcouches.com

Bambach Saddle Seat Pty Ltd
Sue Johnston 02 9939 8325
sjohnston@bambach.com.au

Bristol-Myers Squibb Medical Imaging
Ultrasound Contrast & Nuclear Imaging Agents
Wayne Melville 02 9701 9108
mob 0409 985 011
wayne.melville@bms.com

Central Data Networks P/L
CDN. Affordable PACS & Medical Imaging Networks
Robert Zanier 1300 722 632
mob 0407 069 307
info@cdn.com.au

Focus Medical Technologies
Laurence Heron 02 9209 4530
info@focusmedical.com.au

GE Healthcare
Tsui Lian 02 9846 4850
tsui_min.lian@med.ge.com
General Manager David Radford

Insight Oceania Pty Ltd
Medison Ultrasound
John Walstab 1800 228 118
jwalstab@insight.com.au

Meditron Pty Ltd
Acoustic Imaging, Dornier, Kontron
Michael Fehrmann 03 9879 6200
michaelf@dornier.meditron.com.au

Peninsular Vascular Diagnostics
Vascular Ultrasound Education
Claire Johnston 03 9781 5001
pvdvic@austarmetro.com.au

Philips Medical Systems Australasia P/L
incorporating formerly ATL, HP, Agilent
Liz Jani 03 9945 2026
liz.jani@philips.com
General Manager Wayne Spittle

Queensland X-Ray
Radiology
James Abbott 07 3343 9466
James.abbott@qldxray.com.au

Rentworks Ltd
Medical Leasing Equipment
Don Hardman 02 9937 1074
don.hardman@rentworks.com

Schering Pty Ltd
Ethical Pharmaceuticals
John Peace 02 9317 8666
jpeace@schering.com.au

Siemens Ultrasound
Acuson
Nick Kapsimallis 02 9491 5863
nick.kapsimallis@siemens.com
General Manager Kevin Fisher

Sonosite Australasia Pty Ltd
Portable Ultrasound
Greg Brand 1300 663 516
greg.brand@sonosite.com

Sound Medical Equipment
Distribution of ultrasound scanners
Ron Mellenbergh 02 8437 3555
contact@soundmedical.com.au

Toshiba (Aust) P/L Medical Division
Toshiba
David Rigby 02 9887 8063
drigby@toshiba-tap.com
General Manager Rosina Davies

ASUM CHRISTMAS VACATION PERIOD
The ASUM office will be closed from Friday 23rd December 2005. The last day for business will be Thursday 22nd December. The office will reopen on Monday 9th January 2006

Applications for DMU close 31 January 2006
Applications for DDU close 20 March 2006

2005

Thurs 24 Nov 2005 ASUM Chris Kohlenberg Teaching Fellowship
Burnie Tas
Venue Medical Imaging Dept 1st Floor Medical Centre
North West Regional Hospital
5.30 pm Refreshments 6.00 pm – 8.00 pm workshop/meeting
Speaker Neil Simmons
Contact Judy Jarman
Tel +61 3 6437 1626
Charmayne Allan
Tel 03 6430 6711

Fri 25 Nov 2005 ASUM Chris Kohlenberg Teaching Fellowship
Launceston Tas
Venue Boardroom St Lukes Hospital
4.30 pm Refreshments 5.00 – 7.00 pm workshop/meeting
Speaker Neil Simmons
Contact Jean Cassidy
Tel +61 3 6336 6321

Sat 26 Nov 2005 ASUM Chris Kohlenberg Teaching Fellowship
Hobart Tas
Venue Doctors Tea Rooms Hobart Private Hospital
10.00 am Morning tea 10.30 am – 2.00 pm workshop/meeting
Speaker Neil Simmons
Contact Kathy Fenton
Tel +61 3 6233 1752
Fiona Thompson
Tel 03 6223 2941

2006

Sat 14 Jan 2006 ASUM DMU Part I & Part II
Applications for exemption/waiver closing date, Sydney NSW
Contact DMU Coordinator
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum.com.au

Sat 21 Jan 2006 ASAR Student Status
Applications closing date

Tue 31 Jan 2006 ASUM DMU Part I & Part II Examination applications closing date
Sydney NSW
Contact DMU Coordinator
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum.com.au

Fri 3 Mar 2006 5 days ECR 2006 (European Congress of Radiology)
Venue Vienna Austria
Information www.ecr.org
Email info@ecr.org

Wed 22 Mar 2006 2 days ASUM DDU Technical Seminars
A theoretical course in applied Telysics bioeffects and safety
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Wed 22 Mar 2006 5 days ASUM DMU Preparation Course
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Thur 23 Mar 2006 ASUM Nuchal Translucency Course
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Sun 26 Mar 2006 ASUM DMU Practical Examiner Accreditation & Training Day
Venue AIU Mermaid Beach Gold Coast Queensland
Contact DMU Coordinator
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum,.com.au

Fri 24 Mar 2006 2 days ASUM Multidisciplinary Workshop
General Ultrasound Workshop 24–25 March 2006
O & G Ultrasound Symposium 24–25 March 2006
Vascular Ultrasound Workshop 24–25 March 2006
Musculoskeletal Ultrasound Workshop 24-25 March 2006
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Thurs 23–Fri 24 Mar 2006 2 days ASUM O & G Workshop
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Fri 24 Mar 2006 2 days ASUM Vascular Ultrasound Workshop
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Fri 24 Mar 2006 2 days ASUM Musculoskeletal Ultrasound Workshop
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Sun 26 Mar 2006 ASUM Pelvic Floor Scanning Workshop
Venue Conrad Jupiters Gold Coast Queensland
Contact ASUM
2/181 High Street

Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

May – October 2006 ASUM DMU Practical Examination period
Contact DMU Coordinator
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum.com.au

Thur 18 May 2006 3 days World Congress of Echocardiography and Vascular Ultrasound
Venue Marrakesh Morocco
Contact Navin C Nanda MD
President ISCU PO Box 323 Gardendale
AL 35071 USA
Tel +1 205 934 8256
Fax +1 205 934 6747
Email isuc@iscu.org

Sun 28 May 2006 5 days 11th Triennial Congress World Federation for Ultrasound in Medicine and Biology (WFUMB)
Venue Seoul Korea
Contact Byung Ihn Choi MD
Congress Secretariat
Tel +82 2 760 2515
Fax + 82 2 743 6385
Email choibi@radcom.snu.ac.kr
Websitewww.wfumb2006.com

Mon 12 2006 June 3 days Danish Society 9th International Congress on Interventional Ultrasound
Venue Copenhagen Denmark
Information www.interventional-ultra-sound.org
Email secretary@interventional-ultra-sound.org

Thur 14 July 2006 3 days ASUM (NZ Branch) 2006 Ultrasound Conference
Venue Napier War Memorial Conference Centre Napier Hawkes Bay New Zealand
Contact rownena.tyman@hawkesbay-dhb.govt.nz or jayne.lloyd@hawkesbay-dhb.govt.nz

Sat 29 July 2006 ASUM DMU Part 1 & Part II Written Examinations
Venue as allocated. Candidates receive individual notification.
Contact DMU Coordinator
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum.com.au

Thur 14 Sep 2006 ASUM 2006 Skills Day
Venue Melbourne Convention Centre Melbourne
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
asum@asum.com.au

Fri 15 Sep 2006 3 days ASUM 2006 36th Annual Scientific Meeting of the Australasian Society for Ultrasound in Medicine
Venue Melbourne Convention Centre Melbourne
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
asum@asum.com.au

September – October 2006 ASUM DMU Part II Oral Examinations
Venue as allocated. Candidates receive individual notification.
Contact ASUM
Tel +61 2 9958 0317
Fax +61 2 9958 8002
dmu@asum.com.au

Sat 4 Nov 2006 ASUM DMU Part 1 Supplementary Written Examination
Venue as allocated. Candidates receive individual notification.
Contact DMU Coordinator
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum.com.au

Sun 5 Nov 5 2006 days XVIII FIGO World Congress of Gynecology and Obstetrics
Venue Kuala Lumpur Malaysia
Information www.figo2006kl.com

2007

March 2007 5 days ASUM Multidisciplinary Workshop
Venue Sydney
Contact ASUM
2/181 High Street
Willoughby NSW 2068
Tel +61 2 9958 7655
Fax +61 2 9958 8002
www.asum.com.au

Thur 19 July 2007 4 days ASUM NZ Branch Meeting in conjunction with RANZCR
Venue Wellington Convention Centre
Contact Rex de Ryke
email rdrt@xtra.co.nz

Sat 28 July 2007 ASUM DMU Part I & Part II Written Examinations
Venue as allocated. Candidates receive individual notification.
Contact DMU Coordinator
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum.com.au

2008

Sat 26 July ASUM DMU Part I & Part II Written Examination
Venue as allocated. Candidates receive individual notification.
Contact ASUM
Tel +61 2 9958 0317
Fax +61 2 9958 8002
Email dmu@asum.com.au
2009

2009

Thur 5 Sep 4 days ASUM hosts WFUMB 2009 World Congress in Sydney Australia
Venue Sydney Convention and Exhibition Centre
Contact Dr Caroline Hong ASUM CEO
Email carolinehong@asum.com.au or
Email asum@asum.com.au
ASUM Head Office
2/181 High Street
Willoughby
NSW 2068
Australia

'MUST ATTEND' MEETINGS

2006

22–26 Mar 2006 Multidisciplinary Workshop Gold Coast Australia

28 May–1 Jun 2006 WFUMB 2006 Seoul Korea

14–16 Jul 2006 ASUM NZ Branch 2006 Ultrasound Conference

15–17 Sept 2006 36th Annual Scientific Meeting Melbourne

2009

5–8 Sept 2009 WFUMB World Congress Sydney

Hosted by ASUM
Contact ASUM tel +61 2 9958 7655 fax +61 2 9958 8002 email asum@asum.com.au website www.asum.com.au

Guidelines for authors

Authors are invited to submit papers for publication in the categories described below. Final responsibility for accepting material lies with the Editor, and the right is reserved to introduce changes necessary to ensure conformity with the editorial standards of the *Ultrasound Bulletin.*

Original research

Manuscripts will be subject to expert referee prior to acceptance for publication. Manuscripts will be accepted on the understanding that they are contributed solely to the *Ultrasound Bulletin.*

Quiz cases

A case study presented as a quiz, involving no more than three or four images and a paragraph briefly summarising the clinical history as it was known at the time. It will pose two or three questions, and a short explanation.

Case reports

Case reports are more substantial presentations resembling short scientific papers which illustrate new information, or a new or important aspect of established knowledge.

Review articles

Review articles are original papers, or articles reviewing significant areas in ultrasound and will normally be illustrated with relevant images and line drawings. Unless specifically commissioned by the Editor, articles will be subject to expert referee prior to acceptance for publication.

Forum articles

Members are invited to contribute short articles expressing their observations, opinions and ideas. Forum articles should not normally exceed 1000 words. They will not be refereed but will be subject to editorial approval.

Calendar items

Organisers of meetings and educational events relevant to medical ultrasound are invited to submit details for publication. Each listing must contain: activity title, dates, venue, organising body and contact details including name, address, telephone and facsimile numbers (where available) and email address (where available). Notices will not usually be accepted for courses run by commercial organisations.

Corporate news

Corporate members are invited to publish news about the company, including structural changes, staff movements and product developments. Each corporate member may submit one article of about 200 words annually. Logos, illustrations and tables cannot be published in this section.

Format

Manuscripts should be submitted in triplicate in print and on PC formatted diskette as MS Word documents.
Images must be supplied separately and not embedded. PowerPoint presentations are not accepted.

- Font size: maximum 12 pt, minimum 10 pt
- Double spacing for all pages
- Each manuscript should have the following:

Title page, abstract, text, references, tables, legends for illustrations.

- Title page should include the:

Title of manuscript, the full names of the authors listed in order of their contribution to the work, the department or practice from which the work originated, and their position.

Corresponding author's name, contact address, contact telephone number and facsimile number (where available) for correspondence.

- Abbreviations may be used after being first written in full with abbreviation in parentheses.
- References should be cited using the Vancouver style, numbered according to the sequence of citation in the text, and listed in numerical order in the bibliography. Examples of Vancouver style:

1 In-text citation Superscript. If at the end of a sentence the number(s) should be placed before the full stop or comma.

2 Journal article Britten J, Golding RH, Cooperberg PL. Sludge balls to gall stones. *J Ultrasound Med* 1984; 3: 81–84.

3 Book: Strunk W Jr, White EB. The elements of style (3rd ed.). New York: Macmillan, 1979.

4. Book section Kriegshauser JS, Carroll BA. The urinary tract. In: Rumack CM, Wilson SR, Charboneau JW, eds. *Diagnostic Ultrasound*. St Louis, 1991: 209–260.

Abstract

Manuscripts for feature articles and original research must include an abstract not exceeding 200 words, which describes the scope, major findings and principal conclusions. The abstract should be meaningful without reference to the main text.

Images

Images may be submitted as hard copy (in triplicate) or in digital format. Images sent must have all personal and hospital or practice identifiers removed. Do not embed images in text. Separate images are required for publication purposes.

A figure legend must be provided for each image. Hard copy images should be presented as glossy print or original film. Any labelling should be entered on the front of the glossy print using removable labels. Send one copy of illustrations without labelling as this can be added electronically prior to publication. On the back of the print include the author's name, figure number and a directional arrow indicating the top of the print.

Digitised graphics should be supplied as JPG or TIFF files on PC formatted 3.5" diskette or CD, which must be clearly labelled with the author's name and the names of the image files.

Copyright

Authors are required to provide assurance that they own all property rights to submitted manuscripts, and to transfer to ASUM the right to freely reproduce and distribute the manuscript.

ULTRASOUND BULLETIN PUBLICATION DATES

	February	May	August	November
Submission Deadline	10 January	19 April	22 July	3 October
Post Date	24 February	26 May	22 August	30 November

ASUM MEMBERSHIP BENEFITS

BIG DISCOUNTS
for Registrations to All ASUM Meetings

ONLINE CLINICAL HANDBOOK
A reference collection of images, cases and differential diagnoses

NETWORKING
Connect with other Ultrasound Professionals and Manufacturers

PROFESSIONAL EXAMINATIONS & QUALIFICATIONS
DDU, DMU & CCPU

PROFESSIONAL ADVANCEMENT
Publish in ASUM Bulletin distributed in Australia, NZ & Asia

SPECIAL RATES
Educational Resources (Video/CD/DVD) For Hire

PARTICIPATE
Eligibility to participate in ASUM Council and Committees

INSURANCE
Optional Sonographers Professional Indemnity Insurance

ON-LINE EDUCATION
Free Physics to DDU/DMU

MOSIPP
Recording CPD/CME Points

POLICIES & STATEMENTS
Guidelines, Updates & Worksheet

BULLETIN
Quarterly Delivered to your Door

FREE
Employment Advertising on the ASUM Website

PROFESSIONAL ADVANCEMENT
Speaking Opportunities at Meetings in Australia, NZ & Asia

SPECIAL
Home Loan Packages
AMP

Join Now!

SPECIAL
Car Rental Rates
Hertz
RENT A CAR

FOR FURTHER INFORMATION:

www.asum.com.au

Proven Outcomes in Ultrasound.

The new **SONOLINE G40™ ultrasound system** goes beyond best-in-class to an entirely new level of performance unique in the world of ultra-portable ultrasound. The G40 system provides improved image uniformity even at greater scanning depths, thanks to Hanafy Lens transducer technology. It also offers expanded clinical capabilities enabled by the extended field of view of Virtual Format Imaging. So now you can save time. Reduce costs. And experience outstanding performance through Siemens technology migration.

Contact your Siemens representative today for more information. Because with the new G40 system, the answers are always within reach.

Siemens Ltd - Medical Solutions

Australia: **1800 227 587**

New Zealand: **0800 251 111**

Siemens **Medical Solutions** that help

SIEMENS
medical