Australasian Society for Ultrasound in Medicine

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ASUM has appointed an Editorial Board to expand the role that has been provided by the Education Committee. On behalf of the Co-editor, Keith Henderson, and the Assistant Editor, Margo Harkness, I would like to sincerely thank the ASUM members listed below who have willingly taken on this important role.

Nigel Anderson, Matthew Andrews, David Carpenter, Lachlan de Crespigny, Mike Dadd, John Donlan, Kaye Griffiths, Elvie Haluszkiewicz, Rob Jones, Jenifer Kidd, George Larcos, Ken Myers, Shaun O'Regan, Lucia Pemble, Patsy Robertson, Fergus Scott, Peter Warren, Mary Young, Marilyn Zelesco.

The Board members were selected on the basis of their expertise to represent the diverse nature of medical ultrasound practised by members of our Society.

As an Editorial Board we look forward to developing the *Bulletin* to further service the needs of members and other readers.

Robert N Gibson
Editor

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Supplement - ASUM Annual Report 2000-2001 and Members' Services

Cover Picture Daniel Bernoulli (1700-1782)

Errata:
1. In the November 2000 issue of the Bulletin, it was incorrectly stated that Hugh Robinson based his original CRL chart on 50 pregnancies. His study involved 304 pregnancies. We apologise for this error.
2. In the May 2001 issue of the Bulletin, there was an error in the BUW Consultation Flow Chart on page 19. A corrected copy is printed on page 6 of this issue.

President's message

It is often said that "a picture says a thousand words". Teleconferences seem to be the way of life nowadays. Having accepted the mantle of President of ASUM, I now have a clearer understanding of the meaning of "extra-curricular activities"! However, my understanding also extends to a greater appreciation of the efforts of many individuals who have supported the activities of ASUM since its inception more than three decades ago. Yes, some of us have been around for a long time! Some members of the ASUM Council have been involved in ASUM activities, of one type or another, for more years than the age of some younger members. I do not intend to nominate those individuals, but I am sure that we know who they are. We are indebted to their continuing generous support. Mentoring is an important function in all aspects of ASUM professional activities, whether it relates to teaching ultrasonographic standards of practice or to encouraging unselfish contributions to essential services. There are many examples of consistent voluntary participation behind the scenes as members of committees.

I recently had the opportunity to participate in a meeting of the DMU Exam Board. This was quite an enlightening experience for me (no doubt, some of those board members are wondering what on earth I am going to say this time!). I am sure that we all realise the major role that the DMU plays in ASUM affairs. Our society is recognised internationally for its efforts in education. However, I doubt that many members fully appreciate the extent of the commitment by members of the DMU committee on the continued voluntary efforts of its lecturers and examiners. The ASUM is probably unusual in relying so heavily on the continued goodwill and generous support provided on a voluntary basis by its members.

As we approach the time of the year when ASUM seeks expression of interest for positions on Council I wish to express my sincere thanks for the support provided by members of the current Executive Council. In particular, Mary Young has provided very capable and sensitive support as Honorary Secretary. After a period of approximately nine months since the sudden resignation from the ASUM office of Sue Butterworth, we set about recruiting a replacement. The interim period proved to be rather difficult and certainly created unexpected increased demands on both the Executive Committee and the office staff. On behalf of the Executive Committee, I wish to express thanks to the ASUM office staff for their efforts during this period.

We are facing an interesting and challenging time ahead, particularly with the changes in accreditation requirements to be introduced under the ASAR program. If ASUM is to grow, or continue to survive as a relevant professional organisation, then we have to identify the needs of all members and the Australasian community. This is not a particularly easy process. The Executive Committee has ideas, some of which have been presented to Council and endorsed as worthwhile. However, in today's modern world of workplace efficiencies and increased productivity demands, few of us have the luxury of being able to commit much time during the working day to meetings and activities on behalf of ASUM. This is a fact of life that impacts severely on volunteer help in not-for-profit organisations. Hence, the need for a Chief Executive Officer whose primary role is to bring to fruition the ideas generated by the Executive Committee and by Council. We will certainly do all within our capabilities to ensure that the new Chief Executive Officer properly fulfils the essential role of taking ASUM forward with new initiatives to create a growing and professionally relevant ultrasound society.

So, why I am stating what might be thought to be pretty-damn-obvious? We are all concerned about constraining costs of running ASUM to avoid increasing the burden of membership fees. It was considered by some that if ASUM could survive without appointing a Chief Executive Officer that we could save some, not insignificant, salary cost. The Executive Committee has "experimented" with this idea over the past nine months. Without going into detail, it has proved to be an impossible dream! The alternative measures have not really saved money and have certainly placed a strain on the Executive Committee. A decision was made to appoint a professional conference organiser, primarily because the Scientific Meetings Committee and convenors of the ASUM 2001 Conference in Sydney were rather nervous at the thought of the increased workload in the absence of a Chief Executive Officer. It is anticipated that increased attendance and improved efficiencies and professional linkages with the various state convention bureaux will offset the additional cost of hiring a PCO. The Sydney meeting will provide a good test case for this model.

The Annual Scientific Meeting is a major showcase for ASUM professional activities and we are looking to a successful conference in September. As usual, there is a list of distinguished overseas speakers. The information has been distributed with the *Bulletin*. However, I would also draw your attention to our faculty of Australasian speakers. Please do not overlook the local talent. There is plenty of it around! We are fortunate to have high standards of practice in ultrasonography within ASUM. Of particular interest are the submitted papers and posters from sonographer, medical and scientist members. These provide an insight into their clinical and research interests, frequently sparking lively debate on current issues. I am looking forward to a stimulating and enjoyable Annual Scientific meeting. I hope to see many of you there.

Dr Stan Barnett, PhD
President

Introducing ASUM's new Chief Executive Officer, Dr Caroline Hong BDS GDHA AFCHSE CHE MHA FADI

The Australasian Society for Ultrasound in Medicine welcomes Dr Caroline Hong as the new Chief Executive Officer. Prior to this appointment, Caroline was the Chief Executive Officer of the Australian Dental Association NSW Branch. Caroline's background is in dentistry, health services, administration and association management.

Caroline graduated Bachelor of Dental Surgery in 1983 from the University of Adelaide. Shortly after that she went on to study for the Graduate Diploma in Health Administration at the University of South Australia (then called South Australian Institute of Technology) which led her to a career managing dental services and a community health centre. Her experience involved private practice, clinical teaching, dental research and government health services in South Australia and NSW.

In NSW, she worked for the Northern Sydney Area Health Service for 8 years based at Royal North Shore Hospital. She was the Director of Dental Services for Northern Sydney Area Health Service, during the period of the Commonwealth Dental Program.

Caroline then moved on to become the CEO of the Australian Dental Association NSW Branch, responsible for 2800 members in NSW and ACT, and managing a Secretariat staff of 21 people. From 1997 to 1999, Caroline studied part time whilst holding her CEO position. She was awarded a Master in Health Administration in 2000 from the University of New South Wales. She is also an Associate Fellow of the Australian College of Health Service Executives, a Certified Health Executive and member of the Australian Institute of Company Directors.

In May this year, Caroline was recognised for achievement and service to dentistry and admitted as a Fellow of the Academy of Dentistry International.

Caroline looks forward to contributing her experience and skills to ASUM.

Tennis elbow. How to improve your first serve

Dr Cheryl Bass MBChB MRCP(UK) RANZCR
Victoria House Medical Imaging, Prahran, Melbourne

Tennis elbow, the colloquial name for lateral epicondylitis, although not confined to tennis players is thought to be the result of repetitive microtrauma which disrupts the tendon fibres. This fibrillar disruption and the angiofibrotic response evoked are mirrored by the ultrasound findings.

PATIENT POSITION

The patient should be sitting with the elbow flexed and the forearm semipronated. This is the working position of the elbow and straightens out the common extensor origin (CEO). The arm should be resting on a pillow or on a couch that is situated between the patient and the examiner.

The common extensor origin is predominantly examined in the longitudinal plane with the transverse scan used to confirm the findings and measure the size of any abnormality. Comparison with the opposite CEO is essential.

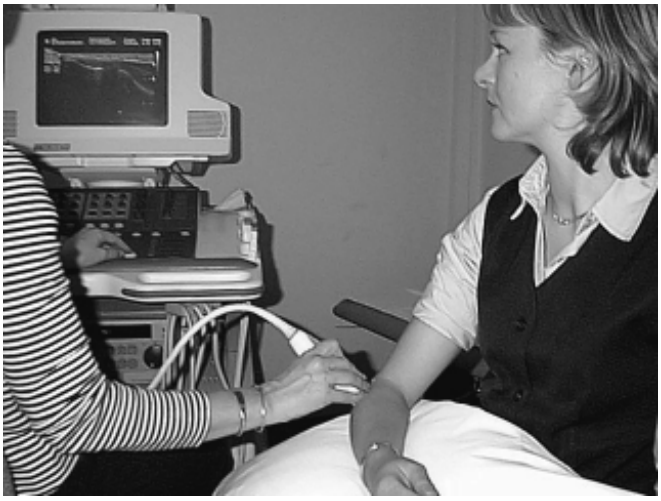
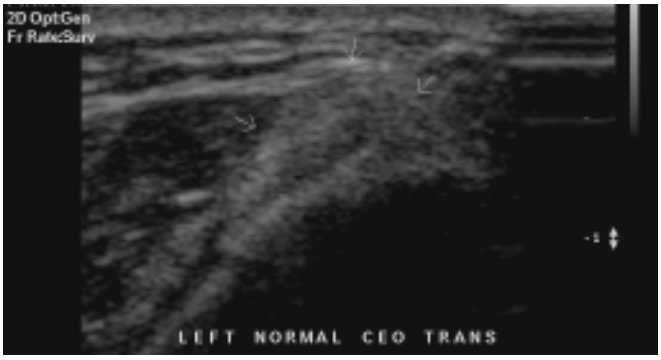
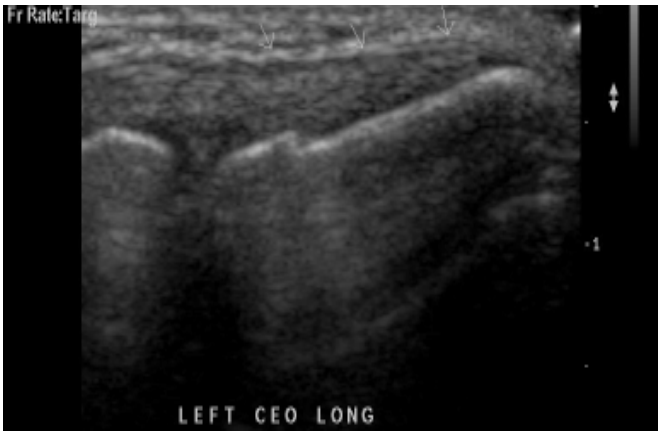


Figure 1 Scanning position for examining the CEO.

THE NORMAL CEO

In order to be able to consistently diagnose the abnormal CEO it is important to be familiar with the appearance of the normal structure. The normal CEO arises from the anterior surface of the lateral condyle of the elbow. The deep surface of the tendon is bounded by the curve of the humerus and more distally the radio-carpal joint (1). The superficial margin is straight and does not bulge beyond the line of the bony tip of the epicondyle. A small spur on the tip of the epicondyle is common, especially in the over forty age group. The fibrillar structure is clearly defined and the fibroadipose septi between the proximal muscles of the CEO are crisp. There is no vascularity within the normal tendon and there is no increased vascularity within the musculotendinous junction when interrogated with power or colour Doppler.





Figures 2a and 2b Transverse and longitudinal scans through a normal CEO demonstrating a uniform fibrillar texture which is moderately hyperechoic relative to the muscle. The superficial margin of the tendon is straight (arrows).

THE ABNORMAL CEO

The earliest change is often subtle enlargement of the tendon giving it a convex instead of a straight superficial margin.

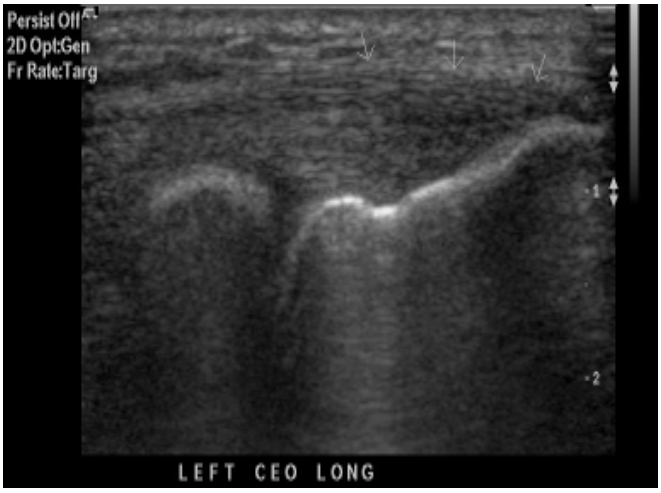


Figure 3 Longitudinal scan of the left CEO showing bulging of the superficial margin (arrows).

The most common finding is for the tendon to become diffusely or focally hypoechoic with alteration of the fibrillar pattern (2). The fibroadipose septi of the proximal muscle arising from the CEO may lose their crispness. The deep surface, comprising the anterior fibres of the extensor carpi radialis brevis (ECRB) tendon, are the ones most commonly involved by the tendinopathy (3).

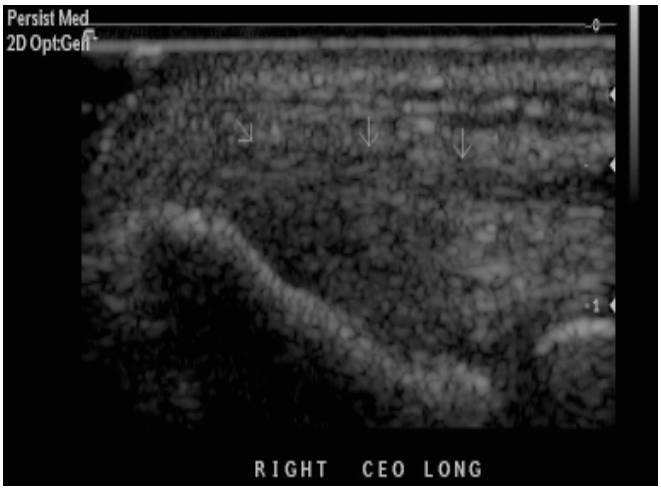


Figure 4 Longitudinal scan of the CEO demonstrating diffuse hypoechogenicity of the tendon as well as a convex superficial margin (arrows).

The abnormal CEO may be enlarged. The tendon is enlarged if it measures 10% more than the contralateral side (3). This is more common in the acute stages and with the onset of chronic tendinopathy there may be loss of volume of the tendon.

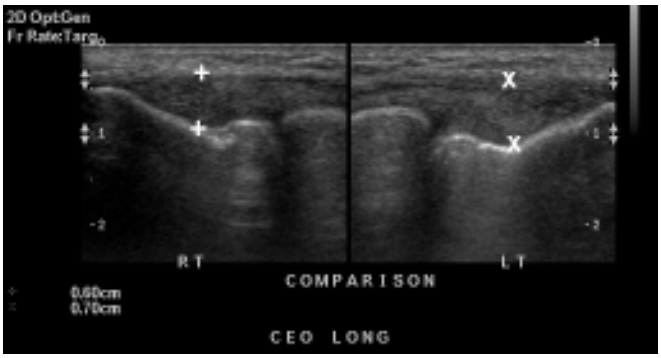


Figure 5 Split screen comparative image of the normal and abnormal CEO. Measurement calipers showing that the left CEO is more than 10% larger than the right.

Increased vascularity within the tendon may precede or co-exist with hypoechoic tendon. In the normal tendon there should be no vascularity. In patients with lateral epicondylitis increased vascularity is often demonstrated, particularly within the anterior fibres and there may also be increased vascularity in the musculotendinous junction and proximal muscle. This vascularity is low flow and the vessels can easily be occluded. In order to maximize visualisation of any increased vascularity, very light pressure should be applied using a layer of gel as a stand off. It is also important to have the tendon relaxed so that any blood vessels are not compressed. This is achieved by flexing the elbow.

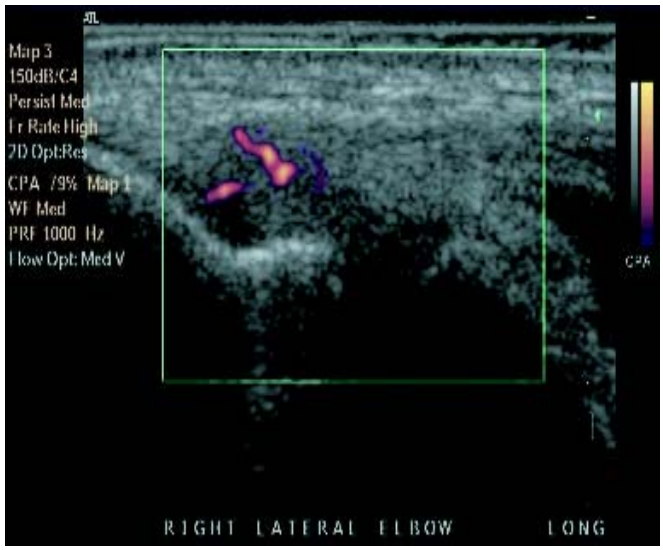
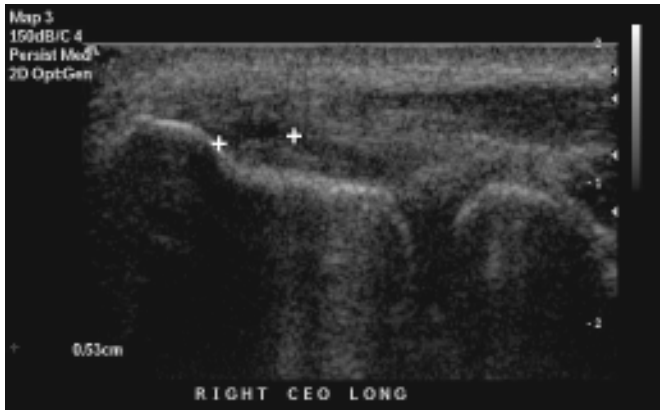
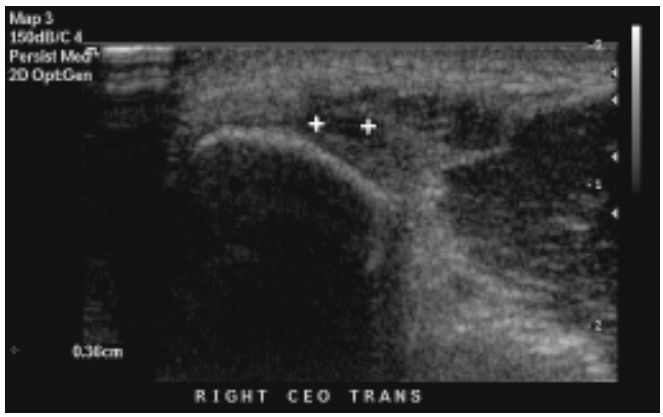


Figure 6 Power Doppler longitudinal scan demonstrating moderately increased vascularity within an enlarged and hypoechoic CEO.

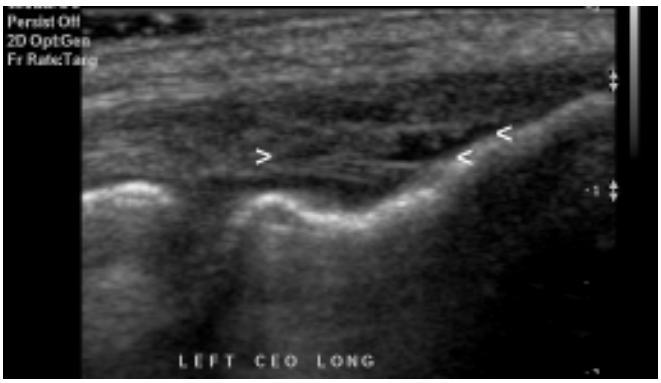
With increasing severity anechoic linear cleavage tears occur in the tendon. These are usually in the deep fibres of the ECRB. They start at the bony origin, extending distally along the long axis of the tendon. Tears should be imaged in longitudinal and transverse scans. They can vary in size from a narrow intrasubstance split to a large tear which extends through to the joint surface.

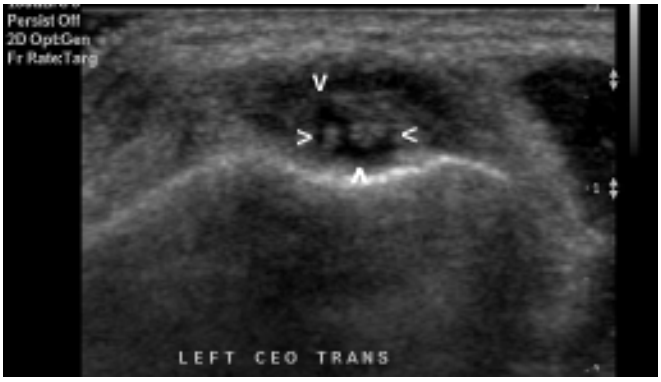




Figures 7a and 7b Longitudinal and transverse scans showing a small anechoic cleavage tear (between calipers) in the deep anterior fibres of the CEO.

In the normal elbow, it is questionable whether the lateral collateral ligament can be visualized and it definitely cannot be consistently demonstrated. Indirect evidence of a tear of the lateral ligament can be obtained by clenching the fist and demonstrating fluid passing from the joint and distending a tear of the CEO.





Figures 8a and 8b Longitudinal and transverse scans of an extensive tear of the CEO. The tear (arrowheads) appears as a multilayered anechoic structure in the longitudinal scan and has an irregular contour in the transverse scan. On real time scanning fluid could be "pumped" between the tear and the joint. Note the tendon surrounding the tear is enlarged and hypoechoic.

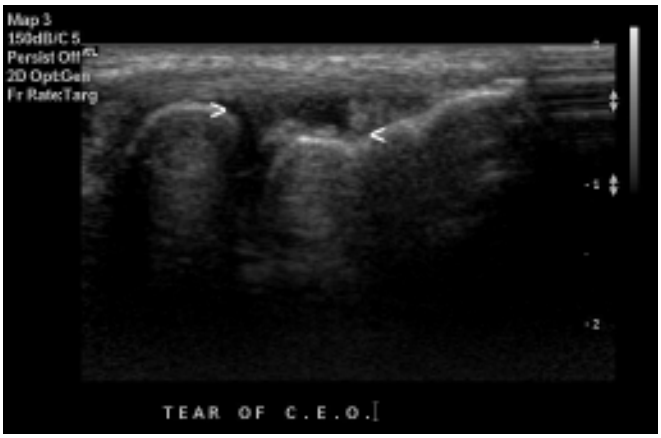


Figure 9 Tear of the deep surface of the CEO with disruption of the lateral collateral ligament. Arrows indicate expected position of ligament.

ACKNOWLEDGMENTS

I wish to thank Frank Burke, Mary Langdale and Judy Wills for their critical review of the manuscript. Thanks, also, to Mary Langdale and Mat Jones of Phillips Medical Systems for their considerable help with preparation of the images for publication.

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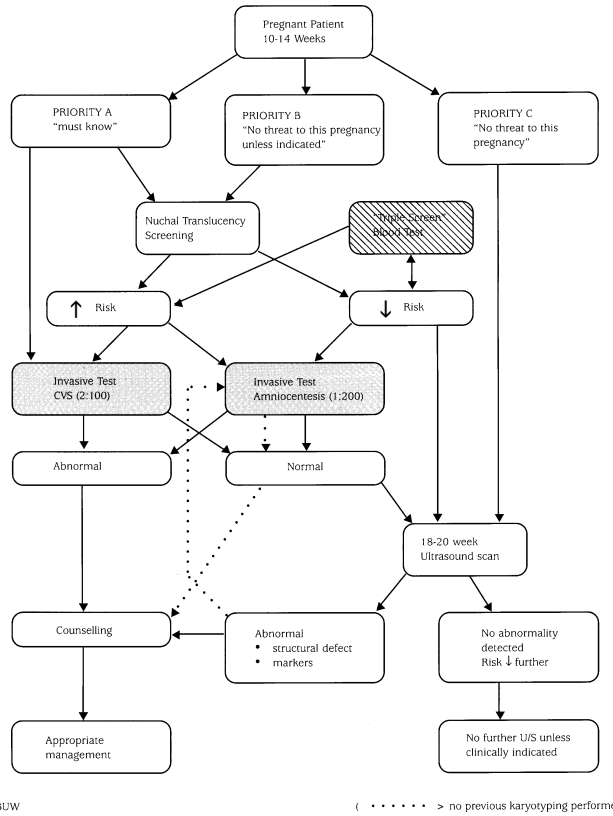
Erratum

In the May 2001 issue of the Bulletin, there was an error in the BUW Consultation flow chart on page 19. A corrected copy is printed below

Figure 1 Consultation Flow Chart developed by Brisbane Ultrasound for Women



The application of the Bernoulli equation in echocardiography - principles and pitfalls

Bonita A Anderson DMU (Cardiac) M App Sc (Medical Ultrasound), Senior Cardiac Scientist, The Prince Charles Hospital, Brisbane, Australia

The velocity of blood flow in the cardiovascular system is directly derived from the detection of Doppler shifts and application of the Doppler equation.

The Doppler shift is produced by the change in detected sound frequency compared with the transmitted (transducer) frequency, resulting from the motion of red blood cells (RBCs).

The Doppler shift is thus derived by simply subtracting the known value for the transducer frequency from the detected frequency reflected from the RBCs.

The Doppler shift is directly proportional to the velocity of RBCs. The relationship between velocity and the Doppler shift is expressed by the Doppler equation:

$$\pm \Delta f = \frac{2 f_o V \cos \theta}{c} \quad [1]$$

where
$\pm \Delta f$ = Doppler frequency shift (Hz)
f_o = known or transmitted frequency (Hz)
V = velocity of blood flow (m/s)
c = speed of sound in tissue (m/s)
cos θ = angle between ultrasound beam and blood flow
2 = "double" Doppler shift

The first Doppler shift occurs with the transmission of the pulse from the transducer (the stationary source) to the RBCs (the moving receiver). The second Doppler shift occurs upon reception of the returning signal to the transducer (the stationary receiver) from the RBCs (the moving source).

In clinical practice, the Doppler equation is rearranged to calculate velocity:

$$V = \frac{c (\pm \Delta f)}{2 f_o \cos \theta} \quad [2]$$

However, it is not the velocity itself that is important in echocardiography but rather the conversion of blood flow velocity to pressure gradients. This is achieved by application of the Bernoulli equation:

$$P_1 - P_2 = \tfrac{1}{2}\rho(V_2^2 - V_1^2) + \int_1^2 \frac{d\vec{V} \times d\vec{s}}{dt} + R\vec{V} \quad [3]$$

Pressure Decrease = convective acceleration + flow acceleration + viscous friction

where
$P_1 - P_2$ = pressure difference between 2 points (mm Hg);
V_1 = velocity at proximal location (m/s);
V_2 = velocity at distal location (m/s);
ρ = density of fluid (g/cm^3);
dV = change in velocity over the time period dt;
ds = distance over which pressure decreases;
R = viscous resistance in the vessel;
V = velocity of blood flow (m/s).

When applying the Bernoulli equation to clinical situations, the following is assumed:
1. flow acceleration is zero
2. viscous friction is negligible

Therefore, equation 3 is further simplified to:

$$P_1 - P_2 = \tfrac{1}{2} \rho (V_2^2 - V_1^2) \quad [4]$$

If P_1 and P_2 are expressed in millimetres of mercury (mm Hg), V_1 and V_2 are expressed in metres per second (m/s) and a blood density of 1.07 g/cm^3 is assumed, equation 4 becomes:

$$P_1 - P_2 = 4 (V_2^2 - V_1^2) \quad [5]$$

Furthermore, if the distal velocity is much larger than the proximal velocity; that is, $V_2 >> V_1$, then:

$$P_1 - P_2 = \Delta P = 4 V^2 \quad [6]$$

Hence, simplification of the Bernoulli equation to equation 6 allows the conversion of blood flow velocity to pressure gradients. However, there are numerous limitations to this simplification of the Bernoulli equation of which the echocardiographer must be aware.

Essentially limitations of the Bernoulli equation can be categorised as underestimation or overestimation of pressure gradients.

UNDERESTIMATION OF THE PRESSURE GRADIENT

Underestimation of the pressure gradient using the simplified Bernoulli equation (equation 6) can occur when there are significant viscous friction forces or when there is contribution from flow acceleration.

"Underestimation" of pressure gradients can also occur when there is a non-parallel angle between Doppler beam and blood flow direction or when there is a low cardiac output (poor ventricular systolic function).

Significant viscous forces

Viscous friction loss arises from friction between neighbouring fluid elements and between moving fluid and solid boundaries such as vessel walls. Provided that fluid remains laminar, losses from viscous friction are minimal over a short length of most stenoses. When the size and length of a stenosis reaches a critical point, normal laminar flow breaks down. At this point, underestimation of the pressure gradient will occur if the simplified Bernoulli equation (equation 6) is used.

Viscous friction losses are most significant in small cross-sectional area, tunnel-like stenoses such as coronary artery lesions. For example, in experimental studies (1), Doppler underestimated the pressure gradient by 15% in tunnel

stenosis with an area of 0.25 cm^2 at a length of 4 cm and by 42% with an area of 0.06 cm^2 at a length of 4 cm. Hence, the smaller the tunnel area and the longer the tunnel, the greater the discrepancies.

Fortunately, this problem is not very relevant in the assessment of typical stenosis of cardiac valves and great vessels. It has been found that for orifices 1 to 2 mm in length and ranging in area from 1.5 cm^2 to 0.1 cm^2, the correlation between the measured pressure gradient and the predicted pressure gradient derived from the simplified Bernoulli equation is excellent (1-3).

Flow acceleration

Flow acceleration refers to the energy required to overcome inertial forces caused by changes in flow rate over time. In most clinical situations, flow acceleration is zero (4). However, in some conditions, flow acceleration may contribute to the overall result of the Bernoulli equation.

Flow acceleration may become important in the assessment of certain types of prosthetic valves where a greater increase in the momentum of flow is required to open the valve.

Since flow acceleration is ignored, the true pressure gradient will be underestimated in this situation.

Non-parallel angle between Doppler beam and blood flow direction

Pressure gradients are derived from the velocity of blood flow. It therefore follows that the maximum pressure gradient is derived when the maximum velocity is detected. As mentioned, velocities are derived from Doppler shifts and the application of the Doppler equation (equation 2).

The most important limitation of the Doppler equation in the accurate estimation of velocity is the incident angle between the ultrasound beam and the direction of blood flow. The maximum velocity is derived when blood flow direction is parallel to the ultrasound beam; that is, when the incident angle is zero degrees such that the value of cos θ equals 1. As the incident angle increases, the value of cos θ decreases and, thus, the absolute velocity will be underestimated.

Non-parallel alignment most commonly occurs when assessing aortic valve stenosis. This is because aortic stenotic jets are often eccentric and their direction is difficult to determine from the two-dimensional and colour flow Doppler image. For this reason, careful interrogation of the Doppler signal from multiple transducer positions including the apical, right sternal edge, right supraclavicular and suprasternal notch positions, is essential.

Low cardiac output

A low cardiac output does not literally result in an "underestimation" of the pressure gradient. What it can do, however, is lead to underestimation of the severity of a stenotic valve lesion.

For example, in a patient with severe aortic valve stenosis with poor left ventricular systolic function, the maximum instantaneous pressure gradient (MIPG) may only be 30 mm Hg. If the MIPG alone is considered, the criteria for severe aortic valve stenosis is not met and, therefore, the severity of stenosis may be underestimated.

In this scenario, the mechanism for the low pressure gradient is poor systolic function of the left ventricle. If the left ventricular function was normal, the predicted MIPG across the aortic valve would be much higher.

Therefore, particularly in the assessment of aortic valve stenosis, the MIPG should always be considered along with the systolic function of the left ventricle, especially when the gradients are low.

OVERESTIMATION OF PRESSURE GRADIENTS

Overestimation of the pressure gradient using the simplified Bernoulli equation (equation 6) can occur when there are increased proximal velocities.

"Overestimation" of pressure gradients can also occur when the catheter-derived pressure gradients are compared with the Doppler-derived pressure gradients or when the mitral regurgitant Doppler signal is mistaken for the aortic stenosis Doppler signal.

Increased proximal velocity (V_1)

In most circumstances, estimation of the pressure gradient is derived from the most simplified form of the Bernoulli equation using the velocity distal to the stenosis and ignoring the velocity proximal to the stenosis:

$$\Delta P = 4 V^2 \qquad [6]$$

However, when the proximal velocity (V_1) becomes significantly elevated (>1.2 m/s), calculation of the pressure gradient will be overestimated. In these instances, V_1 can no longer be ignored. Hence, the "corrected" pressure gradient should be derived from equation 5:

$$\Delta P = 4 (V_2^2 - V_1^2) \qquad [5]$$

Situations in which V_1 is increased includes:

1. aortic stenosis with coexistent:
   - high cardiac output states such as anaemia, sepsis and coexistent AV fistula,
   - significant aortic regurgitation,
   - subvalvular obstruction such as hypertrophic obstructive cardiomyopathy,
2. coarctation of the aorta.

Catheter-derived pressure gradients versus Doppler-derived pressure gradients

Essentially, there are two important instances whereby the catheter-derived pressure gradient differs from the Doppler-derived pressure gradient: (1) in aortic valve stenosis and (2) when there is "rapid" pressure recovery.

In aortic stenosis, the catheter-derived pressure gradient recorded is the *"peak-to-peak"* pressure gradient which is the arithmetic difference between the peak left ventricular and peak aortic pressures. This is a non-simultaneous and non-physiological measurement as the peak aortic pressure occurs *after* the peak left ventricular pressure. The Doppler-derived pressure gradient is a measure of the maximum

instantaneous pressure gradient. Doppler-derived pressure gradients are always higher than the catheter-derived "peak-to-peak" gradient because the instantaneous gradient occurs before the peak aortic pressure.

However, as the pressure gradient increases as with severe aortic stenosis, the *difference* between the Doppler-derived and catheter-derived gradients decreases (5). This happens as the peak left ventricular pressure occurs later in systole and the rise in aortic pressure is "slower".

Rapid pressure recovery is a phenomenon which accounts for the apparent "overestimation" of pressure gradients derived by Doppler in patients with aortic valve stenosis (6-9). When rapid pressure recovery occurs, there may be no gradient detected at catheterisation whilst a definite pressure gradient is obtained by Doppler echocardiography.

To explain this phenomenon, the basis of hydraulic principles must be revisited. Recall that Doppler-derived pressure gradients are determined from application of the Bernoulli equation. This equation is based on the law of conservation of energy which states that the total energy at all points along a tube through which fluid moves must be the same. The total hydraulic energy of blood at any point in the circulation is the sum of three components: (1) pressure energy, (2) kinetic energy, and (3) gravitational energy.

"Pressure energy" (W_p) is associated with pressure (P) in a volume of blood (v) and can be expressed as:

$$W_p = Pv \quad [7]$$

Kinetic energy (W_k) refers to blood in motion and is dependent on the mass and the square of the velocity (V) of blood. Mass is the product of density (ρ) and volume (v). Therefore:

$$W_k = \tfrac{1}{2} \rho v V^2 \quad [8]$$

Gravitational energy (W_g) is the potential energy inherent in a volume of blood by virtue of its position relative to an arbitrary horizontal reference. It is equal to the product of density of blood (ρ), gravitational acceleration constant (g), the height of the blood above the reference level (h) and the volume of blood involved (v):

$$W_g = \rho g h v \quad [9]$$

Therefore, the **total hydraulic energy** (W_t) of blood at any point in the circulation is the sum of these three components:

$$W_t = W_p + W_k + W_g \quad [10]$$

or

$$W_t = \rho v + \tfrac{1}{2} \rho v V^2 + \rho g h v \quad [11]$$

Total hydraulic energy can also be expressed as energy per unit volume or equivalent pressure (P′) by dividing all components by volume (v):

$$P' = P + \tfrac{1}{2} \rho V^2 + \rho g h \quad [12]$$

Hence, the energy or equivalent pressure gradient between two points in the vascular system can be expressed as:

$$P'_1 - P'_2 = (P_1 - P_2) + \tfrac{1}{2} \rho (V_1^2 - V_2^2) + \rho g (h_1 - h_2) \quad [13]$$

What is important to note from this equation is the relationship between pressure and kinetic energy.

Based on the continuity principle, given a steady flow condition, the volume entering the tube must be the same as the volume leaving the tube: "What goes in, must come out". Therefore, the volume flow rate (Q) at two points (1 and 2) must be equal:

$$Q_1 = Q_2 \quad [14]$$

Flow rate (Q) can be derived from the area (A) and velocity (V) and can be expressed:

$$Q = A V \quad [15]$$

Therefore, if $Q_1 = Q_2$, then:

$$A_1 V_1 = A_2 V_2 \quad [16]$$

From this equation, it can be seen that in order to maintain flow rate (Q), V_2 **MUST** increase when A_2 decreases. Therefore, when there is a narrowing or a stenosis, the velocity through this region must increase.

Recall that kinetic energy is proportional to density and velocity squared. Therefore, any increase in velocity will also increase kinetic energy. Since total energy must remain constant, an increase in kinetic energy (velocity) means that pressure must decrease (pressure is converted to kinetic energy).

As flow then expands into a wider lumen beyond a stenosis, velocity (and therefore, kinetic energy) will decrease and pressure will increase (be recovered).

In most clinical situations, that rate of pressure recovery is limited by turbulence distal to a stenosis such that the recovery of pressure occurs well downstream from the stenosis.

In cardiac catheterisation, the pressure gradient across the aortic valve is recorded from the pull-back gradient between the left ventricle and the upper ascending aorta. This is because the catheter cannot be held too close to the aortic valve due to catheter whip artefact. Hence, the pull-back gradient is really the pressure gradient between the left ventricle and the ascending aorta.

In most instances, the pressure within the ascending aorta has not yet fully recovered and the pull-back gradient between the left ventricle and ascending aorta will accurately reflect the pressure gradient across the aortic valve (Figure 1, top).

However, in the event that there is "rapid" pressure recovery, the pressure within the ascending aorta may be the same as the left ventricular pressure. Hence, no pressure gradient is recorded and the true maximal pressure gradient is underestimated (Figure 1, bottom).

By contrast, the Doppler-derived pressure gradient measures the maximal instantaneous pressure gradient between the left ventricle and the aortic valve. Therefore, the Doppler-derived pressure gradient represents the "true" pressure gradient across the aortic valve.

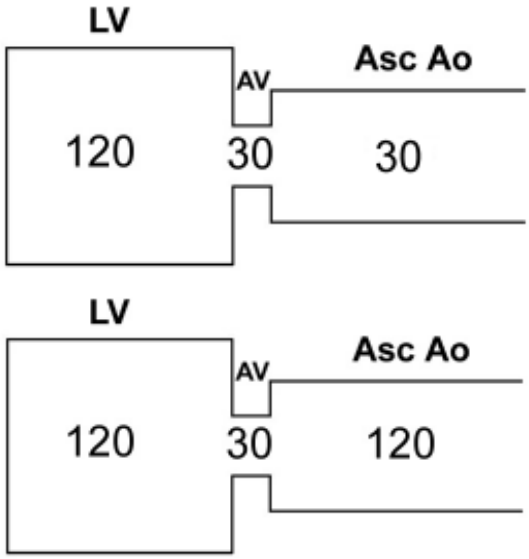


Figure 1 Effect of pressure recovery on the accuracy of pressure gradients measured across the aortic valve by catheterisation.

***Top panel,* The pressure in the left ventricle (LV) is 120 mm Hg, the pressure at the aortic valve is 30 mm Hg and the pressure in the ascending aorta is 30 mm Hg. The pressure recovers to 120 mm Hg further downstream from the ascending aorta. Observe that the pull-back gradient from the left ventricle to the ascending aorta will accurately reflect the pressure gradient across the aortic valve (90 mm Hg).**

***Bottom panel,* The pressure in the left ventricle (LV) is 120 mm Hg, the pressure at the aortic valve is 30 mm Hg and the pressure in the ascending aorta has already recovered to 120 mm Hg. Observe that in this case, pull-back gradient from the left ventricle to the ascending aorta does not reflect the pressure gradient across the aortic valve. In fact, there will be no gradient detected despite the fact that there is a pressure drop of 90 mm Hg across the aortic valve.**

Therefore, failure to recognise rapid pressure recovery can produce the mistaken impression of "overestimation" of the gradient by Doppler.

Baumgartner et al. (9) suggest that clinically relevant discrepancies between the Doppler-derived and catheter-derived pressure gradients in aortic valve stenosis can be predicted when the aorta is small (diameter < 3 cm). Conversely, clinically relevant pressure recovery is highly unlikely when the aortic diameter is > 3 cm (Figure 2).

In fact, pressure recovery and the resulting differences between Doppler and catheter measurements can be predicted from the Doppler velocity, aortic valve area and the size of the ascending aorta. The magnitude of pressure recovery – the difference ($P_3 - P_2$) between the lowest pressure in the stenosis (P_2) and the distal recovery pressure (P_3) – can be calculated in aortic stenosis using the equation:

$$P_3 - P_2 = 4V^2 \times 2 \frac{AVA_C}{AoA} \times \left(1 - \frac{AVA_C}{AoA}\right)$$

where
V = peak Doppler velocity
AVA_C = effective aortic valve area by continuity equation
AoA = CSA of ascending aorta

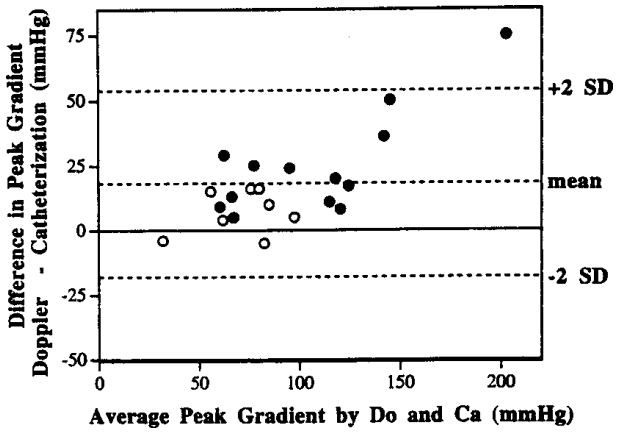


Figure 2 Differences between Doppler and peak catheter gradients versus average peak gradient by Doppler and catheter technique (9).

Mean difference ± 2 SD are represented by the dashed lines. Data of patients with a diameter of the ascending aorta < 3 cm are indicated by filled circles, whereas open circles represent data from patients with a diameter of the aorta > 3 cm.

Abbreviations: Ca = catheterization; Do = Doppler; SD = standard deviation.

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Therefore, by subtracting the predicted recovered pressure (value for $P_3 - P_2$) from the Doppler gradient, the "Doppler-predicted catheter gradient" can be derived:

Doppler-predicted catheter gradient = $(4\ V^2) - (P_3 - P_2)$

Other clinical situations, besides aortic stenosis, which may have discrepant results due to rapid pressure recovery include lesions which have "tapering" geometry such as subpulmonary tunnels, subaortic membranes, coarctation of the aorta, hypertrophic obstructive cardiomyopathy (10,11). Furthermore, prosthetic bileaflet valves such as the St Jude valve are also susceptible to pressure recovery due to their hydrodynamic flow properties (12).

Mitral regurgitation versus aortic stenosis

In the assessment of a patient with aortic stenosis (AS), it is crucial that the peak aortic velocity is differentiated from other systolic jets. The most common source of confusion is the mitral regurgitant (MR) jet. This is because both the AS and MR jets are of high velocities and, from the apical window, both these jets appear below the zero baseline; that is, they are directed away from the transducer.

Misinterpretation can be avoided by:

1. ensuring that the Doppler signal has typical features of AS: in most instances, the AS jet peaks in early systole whereas the MR jet peaks in mid-to-late systole, also the MR jet is often accompanied by its typical forward flow pattern across the mitral valve,
2. obtaining consistent Doppler velocities from multiple transducer positions: when searching for the peak AS velocity, interrogation from the apex, right sternal edge, suprasternal notch and right supraclavicular regions should always be performed,

3. using ancillary 2-D information: for example, if the aortic valve appears thickened but has good separation of its leaflets during systole and a Doppler velocity of 6 m/s is obtained (corresponding to a MIGP of 144 mm Hg), MR should be suspected as the source of this Doppler signal,
4. examining the timing of the Doppler jet: the duration of the MR jet is always longer than that of the AS jet. Between aortic valve closure and mitral valve opening, there is a period when both the aortic and mitral valves are closed – the isovolumic relaxation time (IVRT). During the IVRT, there is no flow into or out of the left ventricle. The IVRT is approximately 70 - 80 msec and in the presence of AS would be even longer due to associated abnormal relaxation of the left ventricle. Furthermore, following mitral valve closure, there is a period called the isovolumic contraction time (IVCT) which precedes aortic valve opening. Hence, when mitral forward flow and AS are evident on the same Doppler trace, there will always be a "gap" between the end of mitral flow and the beginning of the AS signal (IVCT) as well as a "gap" between the end of the AS signal and the beginning of mitral flow (IVRT) (see figure 3). Since the IVRT is greater than the IVCT, the "gap" between the end of the AS signal and the beginning of mitral flow is most obvious.

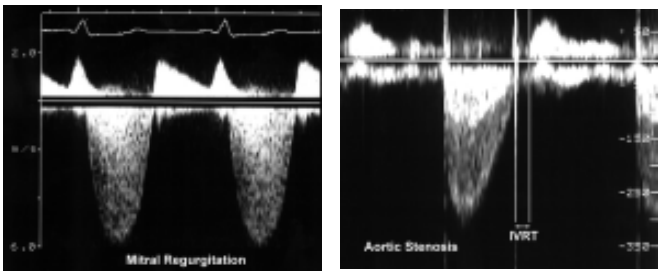

Figure 3 IVRT in identifying AS from MR.

Left, **This is a Doppler signal of MR. Observe that the MR signal (below the zero baseline) is "continuous" with mitral forward flow (above the zero baseline). There are no "gaps".**

Right, **This is a Doppler signal of AS and mitral forward flow. Observe the "gap" between the end of mitral flow and the beginning of the AS signal (IVCT) as well as a "gap" between the end of the AS signal and the beginning of mitral flow (IVRT). Since the IVRT is greater than the IVCT, the "gap" between the end of the AS signal and the beginning of mitral flow is most obvious.**

CONCLUSION

Application of the modified Bernoulli equation in echocardiography is frequently used in the evaluation of pressure gradients across cardiac valves and great vessels. echocardiography is now considered the method of choice in the haemodynamic assessment of the severity of valvular stenosis. Hence, it is crucial that pressure gradients derived by this investigation are accurately determined.

For this reason, the echocardiographer must have an appreciation of the basic principles of the simplified Bernoulli equation as well as have a comprehensive understanding of the pitfalls and limitations of this principle.

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Assessing the value of online medical resources

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ABSTRACT

Given the nature of the World Wide Web as a largely unregulated and constantly evolving information source, it is often difficult to find sites that offer useful, comprehensive and reliable resources. There are basic principles for assessing the authenticity of websites, although their intrinsic value can only be assessed by each user in the context of their specific needs and expectations. Since everyone uses the Web for different reasons, and it is not a resource whose existence is based on an identified public need for specific kinds of information, what one finds will depend largely on the assumptions others are making when they decide to create a page. The most successful web resources are those which have managed to answer the questions already being asked by people, whether on the Internet or elsewhere. The beauty of the WWW, however, is that it is constantly evolving and expanding to fulfil and create new needs, thereby fuelling and feeding itself and its users.

Given the nature of the World Wide Web as a largely unregulated and constantly evolving information source, it is often difficult to find sites that offer useful, comprehensive and reliable resources. A simple search on Google (www.google.com) for the word "radiology" retrieves over 700,000 results. The first ten of these include three professional organisations, three radiology journal sites, two University and teaching sites, one publisher site and one directory of radiology resources. Interestingly enough, this retrieval is fairly indicative of the general scope of useful resources the web is likely to provide. The following is a discussion of the basic principles for assessing websites and what kinds of information are most commonly available, with a focus on some radiology specific sites that you may find while trawling the web in search of relevant information.

FULL TEXT JOURNALS AND JOURNAL DIRECTORIES

One of the most valuable and information rich sources of online medical information is full text journals. In the last three to five years, there has been an explosion of medical journal content which is accessible on the Internet, in many cases before the print copy is even available to subscribers. While this has broader and more complex implications for publishers, the rapid development of online content has been consistently pushed by the ever-increasing demand for better depth and more immediacy of information. Full text access to a journal title will vary according to a number of factors, including the existence of a concurrent paid print subscription, affiliation with an institution which is paying for access, and free trial periods often provided by publishers in an attempt to "sell" their online format to potential users.

Any journal providing full text access is available to any person willing to pay for access. At the cheapest and most user friendly end of the scale, there are publishers who will give online access to anybody holding a current print subscription, usually by providing passwords to log in to secure areas of the site. Some publishers will only allow access to online versions of their publications by charging an additional fee above the cost of a print subscription. Alternatively, online subscriptions may be purchased without a print subscription, while libraries at major educational institutions and hospitals can usually provide access to some full text journals according to rules laid down by publishers regarding institutional use of their titles. These are usually more restrictive than individual access rights, as it is not in the publisher's interest to provide access freely to hundreds of people through one paid subscription source.

While publishers compete to provide better and more immediate access to online content, one of the consequences of this information revolution is the evolution of online journal directories. These are usually created by enthusiasts and academic researchers who are aiming to harness and bring under some semblance of order the mass of content which is "out there" and not always easily found on the web. Journal Directories generally consist of hyperlinked lists of journal titles grouped alphabetically or by subject, and there are many which are impressively comprehensive. They are also an excellent way to find the journal site you are looking for without the frustration of trying to navigate a search through cyberspace.

ASSESSING THE VALIDITY OF AN ONLINE MEDICAL RESOURCE

- √ The author of the site is a reputable organisation such as a university, hospital department, journal publisher or a professional society.
- √ The page is regularly updated with current information. This will usually be indicated by a statement at the bottom of the "Home" page stating "Last modified … 2001"
- √ You have followed a link from a reputable source to get to the site: this judgement should be followed by assessment based on the first two criteria again.
- √ There are active and regular "hits" and feedback on the site: Examples of this are regularly updated reports of interactivity with other sites and organisations, comments and discussion boards available at the site. Beware of "hit counters" which indicate how many visitors have been to a site. These are easily falsified by the site's author.

Figure 1

The value of directories like these is given extra weight with the impact they can quite easily have on directing hits to journal websites, and the user's subsequent use of these sites to maintain current awareness of professional research and publication developments. The vast majority of journals with an online presence will provide the option to sign up for free e-Table of Contents Alerts, and such services are usually right out in front on the journal's home page. Unlike free trial periods and free sample issues of journals, TOC alerts are not designed specifically to lure you into purchasing a subscription, although this may be a side-effect of finding a journal whose TOC regularly alerts you to articles you wish to read.

ONLINE JOURNAL DIRECTORIES

Free Medical Journals
http://www.freemedicaljournals.com/

Highwire Press
http://intl.highwire.org/

Science.Komm Journal Directory
http://www.sciencekomm.at/journals/medicine/med-bio.html/

Monash University Directory of Electronic Health Sciences Journals
http://dehsj.med.monash.edu.au/cgi-bin/flist.asp

MEDICAL/RADIOLOGY DIRECTORIES

MEDLINEplus
http://www.nlm.nih.gov/medlineplus/

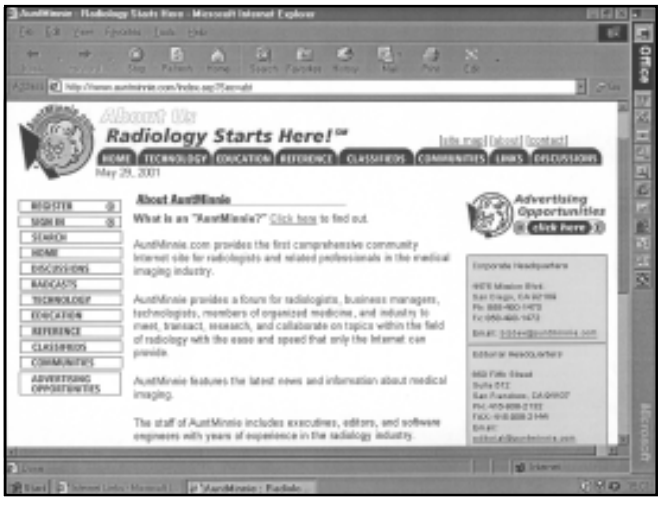
HealthWeb
http://www.healthweb.org/

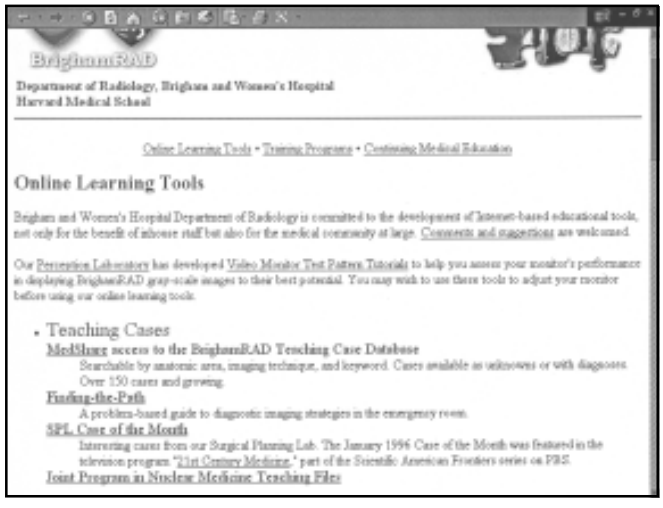
AuntMinnie
http://www.auntminnie.com/

RadCenter Search for Radiology
http://www.radcenter.com/XcDirectory.asp

Radiologist.com
http://radiologist.com/

Figure 2





Directories of other kinds are rife across the Internet, and with widely varied degrees of authority and value. Some of the most popular search "engines", such as Yahoo and Excite operate primarily as directories of information, catering to the user who wants to find information quickly following a minimal search. These search facilities will not filter their search retrieval based on a site's value as a reference tool, and are therefore not a recommended way of finding specialty information.

Again, the issue of authorship can play a part in assessing the value of a directory site. It should be immediately apparent if a site's focus is on the patient or the medical professional, and from there, whether the information itself has depth of content. In most cases, the directory itself will not provide anything of value, but if it is comprehensive enough, it will have links to sites that do.

ONLINE TEACHING RESOURCES AND RESOURCE SHARING

The issue of intended audience for a site is a further complication when assessing the value of web based medical resources. Many teaching hospitals and University Departments of Medicine will "publish" lectures and reading materials for educational purposes. These vary in their complexity from text-only files to those that include text, graphics and sound for a complete online presentation of a lecture. These can be extremely valuable as learning tools, although in many cases they are not accessible to the web surfer because of password restrictions and firewalls. This last point reinforces one of the most common problems in trying to use the Internet: even if you can find valuable information, it is often protected from public use.

An example of a site that is making teaching cases and research sharing freely available on the Internet can be found at Brigham and Women's Hospital Department of Radiology (http://brighamrad.harvard.edu/index.html). In conjunction with Harvard Medical School and a number of other teaching hospitals, they have created a site that includes regularly updated online learning tools using the WWW as a medium to "dynamically share teaching cases with other institutions". This includes a searchable case list and interactive problem-based learning modules, designed to encourage physicians

to choose an appropriate course of treatment for each case. Similarly, the Scottish Radiological Society has an educational resource page at http://www.radiology.co.uk/srs-x/, which includes cases, online tutorials and MCQs available to any web surfer.

SEARCHABLE DATABASES AND LIBRARY SERVICES

Increasingly, library services and government departments are being forced to move access to searchable databases onto the WWW to meet the demands of professionals wanting wider access to more information. Australian State Government Health Departments are now moving to provide around the clock access to Medline and full text of journals and medical textbooks via an Internet login. Pioneering this movement are Victoria's Clinician's Health Channel (http://www.clinicians.vic.gov.au/) and NSW's Clinical Information Access Program (http://www.clininfo.health.nsw.gov.au/). Academic Libraries and many of Australia's larger hospital libraries are also beginning to go online in order to better cater to the needs of medical professionals who are unable to physically visit their services: virtual services and virtual users are a reality we are all beginning to confront, from both sides of the fence. Information provision is being pushed in a new direction by this electronic age of communication.

Since everyone uses the Web for different reasons, and it is not a resource whose existence is based on an identified public need for specific kinds of information, what you find will depend largely on the assumptions others are making when they decide to create a page. The most successful web resources are those which have managed to answer the questions already being asked by people, whether on the Internet or elsewhere. Simply put: perhaps if what you are looking for is not there, it is because the people who can provide it have not created a page for it yet. The beauty of the WWW, however, is that it is constantly evolving and expanding to fulfil and create new needs, thereby fuelling and feeding itself and its users. Ultimately the value of resources on the Internet can only be assessed by the end user: you.

The orthogonal view in gynaecological imaging: work in progress

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Transvaginal B-mode imaging is the current standard in assessment of female pelvic anatomy. Because the intervening tissue consists only of vaginal wall, higher frequency probes can be used to produce images of outstanding quality. This instrument has allowed greater precision in the diagnosis of gynaecological disease. The transvaginal approach has problems however, in that there is a more limited ability to angle the probe to obtain optimum planes than with a transabdominal approach. The sonographer is then required to produce a mental image of the third plane, in order to arrive at a decision about the pelvic findings. Considerable experience and training is needed to allow accurate interpretation of the findings, and while we recognise that this is essential, it is true that those factors can vary widely within the sonographic community.

Further advances in image capture and manipulation have allowed this process to be generated on screen. A volume data set of B-mode images with precise spatial co-ordinates can be captured with either a dedicated mechanical probe, a position sensor attached to the probe, or by software manipulation. This data set can then be examined using image manipulation software. One possibility then is the ability to reconstruct the image in different planes, including those that are not possible to generate simply by probe orientation. The image can also be displayed on a 2D screen in three orthogonal planes. A corresponding point of reference can be shown on each of the three planes (Figure 1). The data set of the image can be examined relative to any point on it by rotation of the image around the X, Y, or Z-axis.

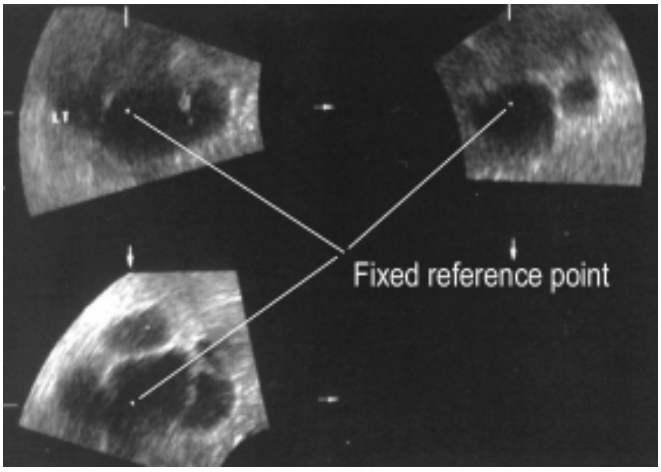

Figure 1 Orthogonal view display

Two illustrative cases are presented. These cases were examined on a single day using the transvaginal 5 to 7 MHz volume probe of a Voluson 730 (Excelray Aust). This probe has a scan head that can mechanically oscillate within oil contained in the semirigid membrane over the probe tip. The image acquisition takes seconds. The display can be set up to produce on screen the three orthogonal views as illustrated in Figure 1, or a single image of any of the three planes. There is also the capacity to display a reconstructed 3D image. Such is the utility of this machine that it is used almost exclusively in our practice, when a gynaecological scan is performed.

CASE 1 - LEFT ADNEXAL CYSTIC MASS

The patient was a 65 year old woman who had an abdominal hysterectomy performed many years before for menstrual problems. The ovaries were conserved. The presenting symptom was vague abdominal pain. A CT of her abdomen was requested and reported a complex left adnexal mass, possibly an ovarian neoplasm. An ultrasound was recommended.

The report stated that there was a complex multicystic adnexal mass, with thick septae between the cysts. There was nodularity and solid tissue in the inner wall of the upper cyst. The diagnosis was interpreted as being consistent with an ovarian neoplasm with suspicious features. Histology was recommended. From the image supplied that would be a correct part of the differential diagnosis (Figure 2).

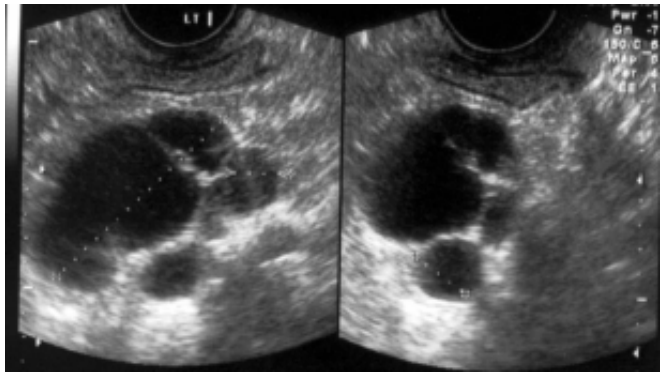

Figure 2 Case 1 Left Adnexal Mass

The reconstructed orthogonal view clearly shows the incomplete folding of the superior wall that is characteristic of a hydrosalpinx (Figure 3). This is a benign condition that only requires surgery if symptomatic.

CASE 2 - RIGHT ADNEXAL CYSTIC MASS.

The patient was a 45 year old woman presenting with painful heavy periods and intermenstrual bleeding. She had previously had a tubal ligation. The uterus was "bulky" on clinical examination.

The sagittal and transverse images (Figures 4 and 5) images display a thin walled cystic mass adjacent and possibly adherent to the normal right ovary. There is anechoic fluid within the cyst, and no wall features. The differential diagnosis is a functional ovarian cyst, a benign cystadenoma, a paraovarian cyst or a hydrosalpinx.

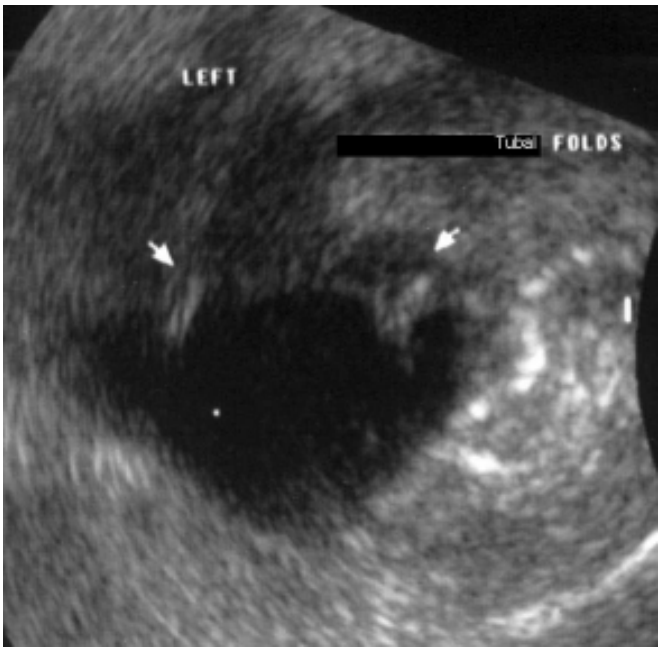

Figure 3 Case 1 Orthogonal view

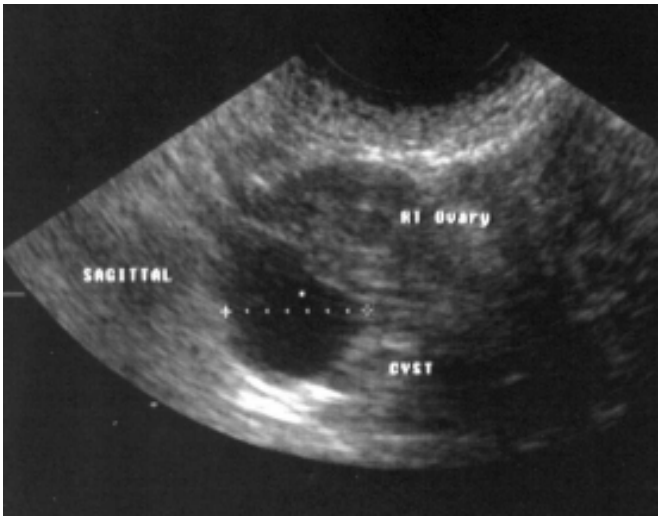

Figure 4 Case 2 Sagittal

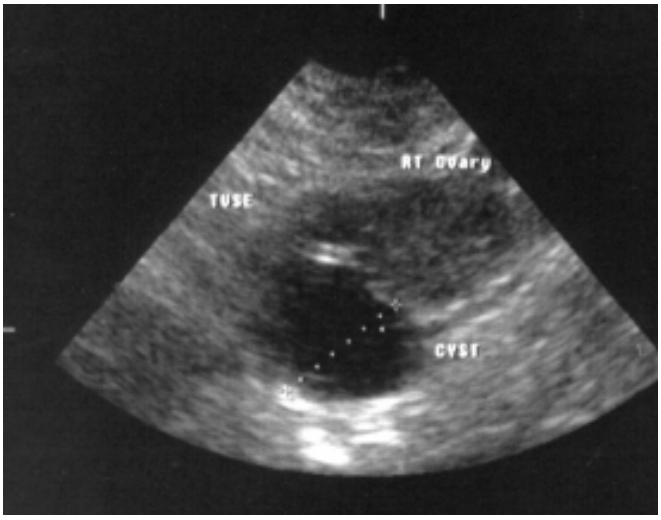

Figure 5 Case 2 Transverse

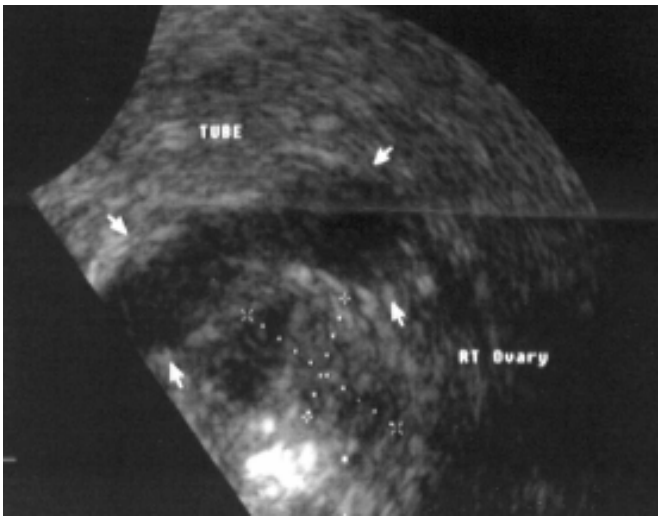

Figure 6 Case 2 Orthogonal view.

On the reconstructed orthogonal image, again the "cyst" is clearly tubular in its long axis, confirming the diagnosis of a hydrosalpinx (Figure 6).

The uterus contained a centrally placed fibroid mass, 30mm in diameter. The relationship to the endometrial cavity was not clearly defined with B-mode, so saline infusion (SIS) was performed.

Again the sagittal and transverse images (Figures 7 and 8) provide some information, but it is not entirely clear if the fibroid is submucosal, indenting the cavity and having a broad attachment to the fundal myometrium, or is a myomatous polyp. A polypoid myoma can usually be resected via transcervical hysteroscopy, whereas an attempt to resect a fundal fibroid with broad attachment via hysteroscopy has a significant risk of inadvertent uterine perforation and intra-abdominal injury. Total hysterectomy might be the treatment of choice for this type of lesion. The orthogonal view (Figure 9) shows the lesion to extend along the lateral wall of the cavity and to display a pedicle thereby confirming the polypoid nature of this fibroid (Figure 9).

Another example shows the way that an orthogonal image can be used to assess congenital anomalies of uterine duplication. In this case (Figure 10) the woman was known to have two cervices from speculum examination. A saline infusion was performed to outline both the uterine cavities.

CONCLUSIONS

These cases illustrate the utility of the reconstructed orthogonal view in gynaecological imaging to demonstrate

- relationships of various structures
- diagnostic features which may not be easily appreciated in the available planes
- pathology in different projections.

The AP coronal view of the uterus and endometrium provides a display of the image in the plane that the clinician thinks of when **imagining** our reports. In my opinion, it is a major advance to be able to provide the actual picture.

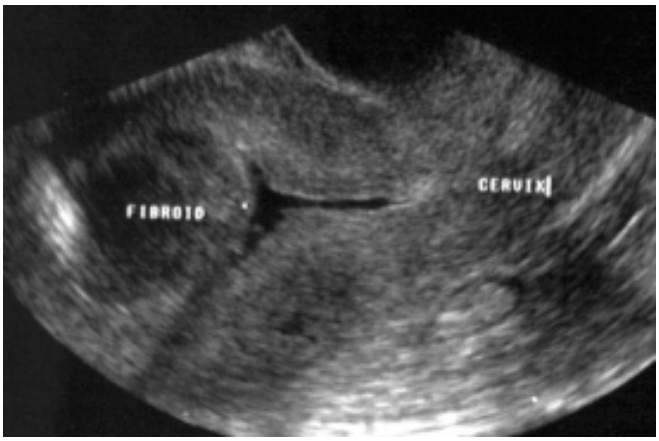

Figure 7 Case 2 Myoma Sagittal

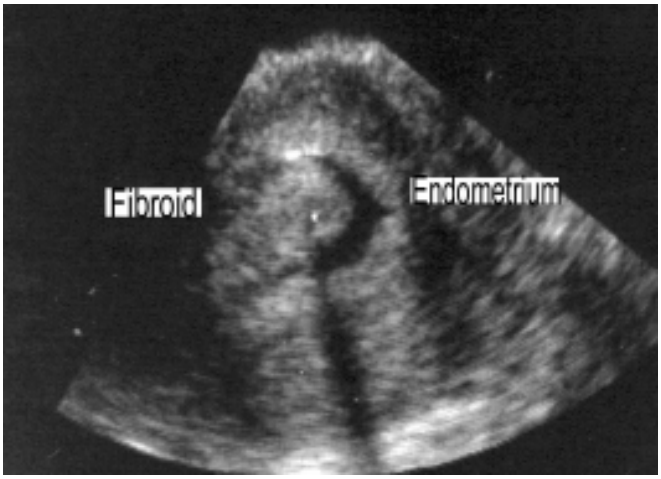

Figure 8 Case 2 Myoma Transverse

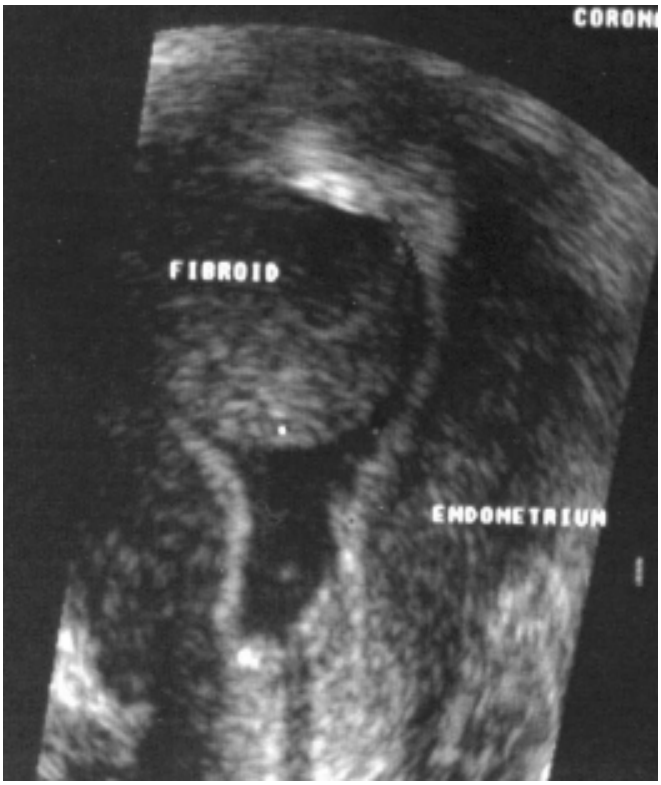

Figure 9 Case 2 SIS orthogonal view

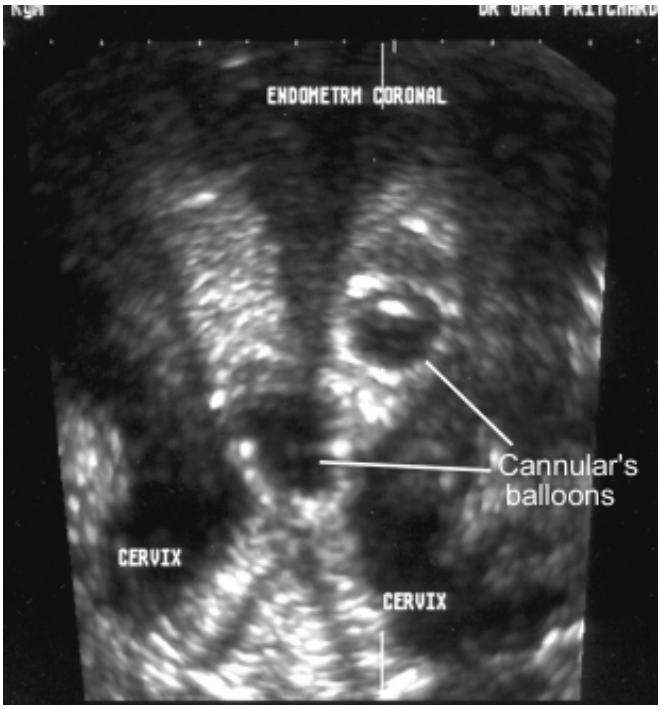

Figure 10 Saline infusion. Uterus didelphys, coronal view of uterus

Anatomy and anatomical variations of the major arteries in the neck

Phillip James MBBS MMed FRANZCR

Anatomical variations occur throughout the course of the carotid and vertebral arteries. Failure to recognize these variations may lead to a false diagnosis of pathology.

COMMON CAROTID ARTERY

Classic description

The right common carotid artery arises from the brachiocephalic trunk, posterior to the right sternoclavicular joint. The left common carotid artery arises directly from the aortic arch.

The common carotid arteries ascend into the neck, embedded in the carotid sheath, along with the internal jugular vein and the vagus nerve.

The common carotid artery gives off no branches.

At the superior border of the thyroid cartilage, which is typically at the level of the fourth cervical vertebra (C4), the common carotid artery bifurcates into the internal and external carotid arteries.

Variations

Origin: - Numerous variations in the origin of the vessels from the aortic arch are described. Most of these are of practical significance to the angiographer rather than the sonographer. Two of the rare variations may create confusion for the sonographer as no carotid bifurcation is present. In the first, the common carotid artery does not divide and either the internal or external carotid artery is absent. In the second both the internal and external carotid arteries arise directly from the aortic arch (Figure 1). Both these variations may be unilateral or bilateral.

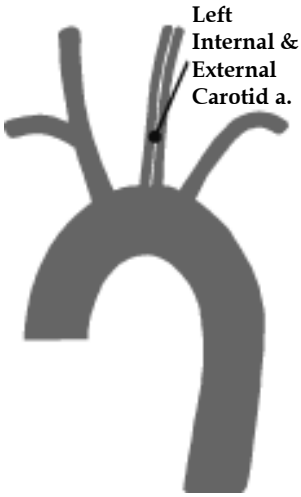

Figure 1 Left internal and external carotid arteries arise directly from the aortic arch.

Branches: - Typically the common carotid artery does not give off any branches. Rarely the vertebral artery can arise from the inferior portion of the common carotid artery (Figure 2). The superior thyroid and less commonly the ascending laryngeal, inferior thyroid and the occipital arteries can arise from the superior portion of the common carotid artery.

Figure 2 Right vertebral artery arising from the right common carotid artery.

Bifurcation: - The common carotid artery typically bifurcates at the superior border of the thyroid cartilage, which corresponds to the C4 level, however the position of the carotid bifurcation can vary considerably (Figure 3). The carotid artery usually bifurcates at the same level on each side of the neck even when there is significant variation from the norm. As the height of the larynx varies with age it is more accurate to relate the level of the bifurcation to the vertebral column rather than the laryngeal cartilages.

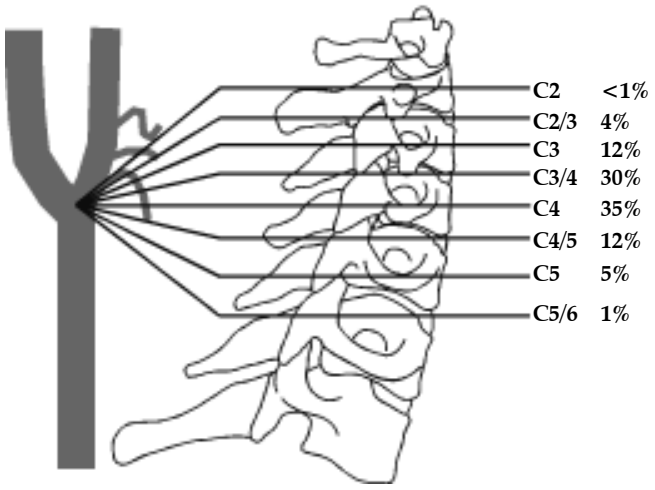

Figure 3 Level of the common carotid artery bifurcation.

INTERNAL CAROTID ARTERY

Classic description

The internal carotid artery is one of the terminal branches of the common carotid artery. The artery supplies the majority of the cerebral hemisphere, the eye, the forehead and part of the nose.

The internal carotid artery ascends within the carotid sheath to the base of the skull. It enters the base of the skull through the carotid foramen.

The internal carotid artery gives off no branches in the neck.

Variations

Course: - The cervical portion of the internal carotid artery usually runs a relatively straight course. With increasing age it is common for the vessel to become tortuous. Occasionally a tight loop develops in the cervical portion of the internal carotid artery.

EXTERNAL CAROTID ARTERY

Classic description

The external carotid artery is one of the terminal branches of the common carotid artery. Typically the external carotid artery lies anterior and medial to the origin of the internal carotid artery.

The artery gives off branches as it ascends through the neck supplying structures in the neck, face and scalp. The external carotid artery terminates in the substance of the parotid gland dividing into the superficial temporal and maxillary arteries.

Variations

Origin: - The origin of the external carotid artery usually lies anterior and medial to the internal carotid artery. In approximately 15% of the population the origin of the external carotid artery is lateral to the internal carotid artery. This variation is three times more frequent on the right side than the left. The variation is also more common with increasing age, indicating that it is, at least in part, related to tortuosity of the vessels.

VERTEBRAL ARTERY

Classic description

The vertebral artery arises from the first part of the subclavian artery.

Each vertebral artery passes anterior to the transverse processes of C7 and then passes through the foraminae transversarium of C6 to C1. The artery emerges from the foramen transversarium of the atlas and curves posterior to the lateral mass of the atlas. It then pierces the dura mater to enter the vertebral canal where it passes through the foramen magnum to join the other vertebral artery forming the basilar artery.

In the neck the vertebral artery gives off small spinal and muscular branches.

Variations

Origin: - Typically the vertebral artery arises from the first part of the subclavian artery. The vertebral artery can also arise from the second part of the subclavian artery, bifurcation of the brachiocephalic trunk, aortic arch and the common carotid artery.

Size: - The two vertebral arteries are usually similar in diameter however a significant disparity in size between the two vessels is not uncommon.

Course: - Typically the vertebral artery enters the foramen transversarium of C6. While this is by far the most frequent foramen for the artery to first enter, it has been described first entering the C7, C5, C4 and C3 foraminae (Figure 4).

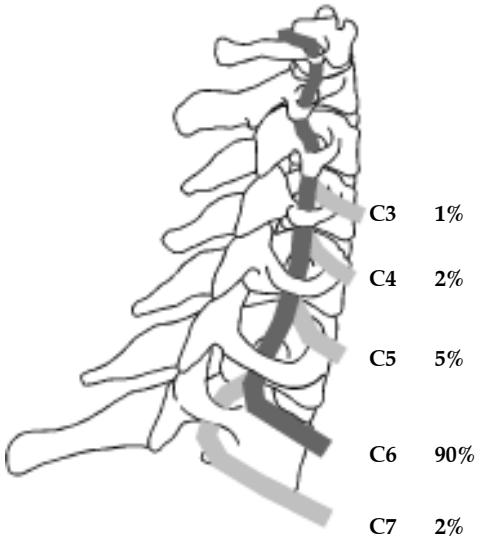

Figure 4 Level of first foramen transversarium entered by the vertebral artery.

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The value of Australian involvement in the development of safety guidelines for ultrasound in medicine

Dr Stan Barnett PhD FAIUM, ASUM President and Chair of ASUM Safety Committee

In planning future developments of ultrasound in medicine it may be instructive to reflect on the history of Australia's involvement in research and development in this area of diagnostic medicine. Ultrasonography has developed as a relatively safe and effective modality. Newcomers to the field may not be aware of the significant and world-class contribution that has been made by Australian scientists, medical practitioners and sonographers. The Australasian Society of Ultrasound in Medicine was established through the dedication of many of those pioneers of medical ultrasound. Many of those individuals have been recognised internationally for their efforts. Nevertheless, it is appropriate that ASUM continues to publicise the activities and pursuits of its members wherever possible. Due recognition of the intrinsic value of many of the committees of ASUM should not be overlooked. The fundamental purpose of a society such as ASUM is to ensure continued professional standards of practice. This is underpinned by essential activities in developing relevant and practical standards, largely through the efforts of volunteers.

One of those activities involves the establishment of appropriate guidelines to ensure the continued safe application of ultrasound. With the modern trend towards increasing litigation, it is important that recognised sets of practical safety guidelines and international standards are developed that can limit potential medico-legal issues for unfounded arguments. The activities of various safety committees around the world are concerned with the establishment of safe practices and credible assessment of risk in all applications of diagnostic ultrasound. To achieve this end, the activities of the World Federation for Ultrasound in Medicine and Biology (WFUMB) Safety Symposia have been extremely valuable. However, these symposia, or expert workshops, can only make recommendations and conclusions based on empirical research data. The conclusions and recommendations resulting from these symposia have been published under the endorsement of the WFUMB.

Australia and ASUM have been well represented in both the activities of the WFUMB and in the research that has contributed to the scientific database for expert evaluation. This is largely because technological development of ultrasonography in Australia has been underpinned by dedicated research into biological effects and safety of ultrasound. The efforts of the Ultrasonics Laboratory created a position of world prominence for its activities in technological research and in the study of biological effects. Research into biological effects of diagnostic ultrasound continues within the acoustic group in CSIRO in collaboration with university partners. ASUM maintains a Safety Committee whose purpose is stated: "*to provide authoritative information to the membership of the ASUM and the Australian Government and public on the safety of ultrasound applications in medicine.*" ASUM policy and guidelines on safe use of diagnostic ultrasound are published in a separate folder.

Australian research has consistently contributed to the development of international standards. Both the Ultrasonics Laboratory (1975-1988) and ASUM (1970-) have been represented effectively despite very modest resources. It is pleasing to see that some of this effort has been recognised in a recent publication by the WFUMB (1). This historical review highlights research activities of selected individuals who were identified for their significant contribution to the science of acoustics and bioeffects of diagnostic ultrasound. This documentation of a series of personal histories gives an interesting insight into the development of research and the particular areas of specialty in a range of countries. The review paper is edited on behalf of WFUMB by Prof. Wesley Nyborg, University of Vermont, himself one of the real pioneers, an active and productive researcher and highly respected mentor. It contains personal histories of research activities of 21 international scientists.

The present article includes extracts from the paper including the introduction by Dr. Nyborg, and a section each from Drs. Stan Barnett (ASUM President) and George Kossoff (ASUM Life Member). This is reprinted with permission of Elsevier Science from a historical review by WL Nyborg, Ultrasound in Medicine and Biology, Vol 26, no 6, pp911-964. Copyright 2000 by World Federation of Ultrasound in Medicine and Biology. It is appropriate that the significant contribution of decades of Australian research on ultrasound in medicine and biology is recorded in our society's Bulletin. I trust that members will find the content of these articles to be informative and interesting.

BIOLOGICAL EFFECTS OF ULTRASOUND: DEVELOPMENT OF SAFETY GUIDELINES - PERSONAL HISTORIES

Prof Wesley L Nyborg, Physics Department, University of Vermont, Burlington, VT 05405, USA

Abstract

After the end of World War II, advances in ultrasound (US) technology brought improved possibilities for medical applications. The first major efforts in this direction were in the use of US to treat diseases. Medical studies were accompanied by experiments with laboratory animals and other model systems to investigate basic biological questions and to obtain better understanding of mechanisms. Also, improvements were made in methods for measuring and

controlling acoustical quantities such as power, intensity and pressure. When diagnostic US became widely used, the scope of biological and physical studies was expanded to include conditions for addressing relevant safety matters. In this historical review, a major part of the story is told by 21 investigators who took part in it. Each was invited to prepare a brief personal account of his/her area(s) of research, emphasizing the "early days," but including later work, showing how late and early work are related, if possible, and including anecdotal material about mentors, colleagues, etc.

Introduction

After vacuum technology and piezoelectric materials became available early in the 1900s, it was possible to generate ultrasound (US) at intensities sufficient to make this an interesting new modality. In the 1920s and 1930s, investigators created excitement by reports of physical, chemical and biological effects that could be produced by US at intensities up to several hundred watts per cm^2 and frequencies in the vicinity of 300-400 kHz. This led to development of applications, along with extensions of the range of intensity and frequency available, as well as research aimed at learning the basic mechanisms involved. Applications directly related to medicine included bacteriocidal use, physical therapy and surgery. In the 1950s and 1960s, the promise of diagnostic US became increasingly apparent, and the need to define conditions for its safe practice was recognised. The 1970s and 1980s saw diagnostic US established as a major part of diagnostic medicine. Also, during this period, there was much research on biological effects of US, as well as development of improved methodology for characterising the acoustic output of diagnostic US equipment. This research and development enabled the formulation and use of scientifically based safety guidelines, and also helped to advance applications of US to therapy and surgery.

The authors of these accounts include investigators who made significant contributions to understanding how US produces biological effects, leaders in developing applications to therapy and/or surgery, and leaders in developing and using much-needed methodologies for characterising US fields.

By invitation, each of the histories is a brief account of the development of the author's area of interest from a personal perspective, emphasising the "early days," but including later work, showing how late and early work are related, when this can be done. ("Early," of course, means different things to different people.) The accounts include memorabilia about mentors, colleagues, etc., and sometimes recall issues that have been the focus of lively debate. It is clear that the present status of medical US owes much to the efforts and accomplishments described here.

Stanley B Barnett: Ultrasound Bioeffects Research

As an honours graduate of King's College University of London, my undergraduate thesis involved research on Molossid bats in flight, under the guidance of David Pye, an expert on echo-location techniques. Despite that early introduction, I was subsequently quite surprised to find myself directed towards a career in ultrasound. Early in 1970, I joined a small group of dedicated scientists working in a converted warehouse in what is now known as the "Historic Rocks" area of Sydney.

Dr Stan Barnett

I can clearly remember my first meeting with a somewhat flamboyant individual, wearing a brightly coloured bow tie, who spoke English with an American/ Russian accent and insisted on first-name addressing. This was quite a contrast from my days at King's College, when the head of the Department was addressed as nothing less than Professor, and then only when spoken to! George Kossoff had just returned from a 2-year visit to the University of Illinois where he worked with Floyd Dunn and a graduate student by the name of William O'Brien, Jr.

Having spent *25* years working in the same Laboratory as George Kossoff and David Robinson, it is inevitable that I have been influenced in some way by these individuals. They share a common desire to achieve, to be noticed, and to know more than anybody else around them at any time. This has inspired elements of competition and, no doubt, has contributed to the success of the Laboratory. I have considered myself fortunate to work in a high-profile Laboratory with a mix of graduates in engineering, physics and biological sciences in close association with Universities and teaching hospitals.

In the early 1970s, research at the Commonwealth Acoustic Laboratory (as it was known then) involved a range of diagnostic applications (obstetrics, ophthalmic, mammographic) and the ultrasonic treatment of Meniere's disease. The technical achievement of the therapeutic application was in the design of a miniaturised transducer and holder that could pass through the patient's external auditory meatus and be positioned adjacent to the round window of the cochlea to allow US to be transmitted into the inner ear. This procedure was considerably less traumatic than an alternative approach that coupled US to the semicircular canal after removing part of the skull bone with power saws, bone cutters and drills. The so-called "round window" procedure achieved success, with approximately 70% of patients showing removal or improvement of the debilitating symptoms of loss-of-balance and orientation (2). An advantage over alternative surgical procedures, such as labyrinthectomy, was that the patient's hearing was not destroyed. Although the technique successfully treated the symptoms in patients with unilateral affliction, the means by which this was achieved was not fully understood. This, of course, is not unusual for technological developments in medicine.

My introduction to US research, therefore, involved working in hospital operating theatres with ENT surgeons, and planning and undertaking a series of animal studies to mimic these surgical US exposures of the mammalian inner ear. Endpoints included histological examination of the vestibular

and cochlear neuroepithelia, microscopic examination of surface preparations of the cytoarchitecture of the organ Corti, and measurements of cochlear microphonic responses and temperatures. Many hours were spent preparing glass microelectrodes with hand-built laboratory equipment. The character-building exercise included enduring the frustration of measuring minute signals with high-impedance KCl microelectrodes after spending hours implanting them in the surgically-exposed cochleas of anaesthetised guinea pigs. This was done in a laboratory that was only about 2 miles by line-of-sight from a naval base. The value of an electrically-shielded operating area soon achieved a great significance!

The results of approximately 6 years of work in a variety of small and large animals showed that the sensory apparatus of the vestibular labyrinth (responsible for balance in healthy individuals, but hypersensitised in patients with Meniere's disease) was selectively destroyed (3) and damage to the cochlea was restricted to its base so that practical hearing (to about 8 kHz) ability was preserved. Using the cochlear microphonic response as a physiological indicator (4, 5), it was discovered that a combination of the effects of direct interaction and bulk temperature increase was responsible for the structural changes observed in the neuroepithelia. A relatively slow increase in temperature within the endolymph fluid (8°C after 3-min continuous insonation) was accompanied by a gradual depression in microphonic response. The histopathology aspects of the small animal work were carried out with guidance and support from Professors Wilhelm and Lykke in the School of Pathology of the University of New South Wales.

In 1974, our laboratory experienced its first working visit by an overseas scientist in the form of Marvin Ziskin of Temple University Medical School, Philadelphia, PA, USA. The initial meeting left an indelible mark on my memory as this enthusiastic American had a burning desire to undertake bioeffects research on a marsupial species. He presumably came to Australia in the belief that wallabies and koalas roamed freely through the city streets! Undaunted, this intrepid adventurer's quest brought us to a meeting with Marshall (Marsh) Edwards in the School of Veterinary Clinical Sciences of the University of Sydney. After Edwards painstakingly explained the difficulties of attempting to do research with marsupials within the 6-month sabbatical period (litter sizes were small, there were no breeding programs within the University and many species are protected), a collaborative effort was established using guinea pigs.

That introduction more than 20 years ago has developed into valued personal and scientific associations. The Ultrasonics Laboratory has enjoyed successful long-term research collaborations with Marsh Edwards and other members of the University of Sydney. This has led to successful grant applications and a number of degrees conferred on students as a result of work in my bioeffects laboratory. I have been honoured by being appointed an Honorary Associate of the University of Sydney, School of Veterinary Clinical Sciences.

In the early 1980s, there was considerable international interest in the possible mutagenic effects of diagnostic US. A paper from a prestigious New York medical college had reported alteration in the rate of sister chromatid exchanges (SCE) in mammalian cells exposed *in vitro* to US emitted from a diagnostic device (6). Although our studies were unable to confirm these results, we observed an increased rate of SCE in Chinese hamster ovary (CHO) cells when insonated with ms pulse lengths, at peak pressures that were considerably higher than those used in diagnostic imaging at that time.

This was apparently noticed by researchers at the University of Rochester, New York, NY, USA. I accepted an offer to work in the faculty of Radiation Biology with Morton (Mort) Miller during 1986/87, to further study the SCE phenomenon. While there, I also spent many hours in Edwin Carstensen's laboratory, insonating myriads of CHO cells. I quickly shared in the enthusiastic attitude of this small group of dedicated people. We all became familiar with the security officers who patrolled at night and on weekends. Although the SCE technique is highly labour-intensive, I could not match the output of Yukio Doida, a frequent summer visitor from Japan. I suspect that he slept in the cell-culture room. After 3 months, it was almost impossible to find Doida behind the bench-to-ceiling piles of thousands of petri dishes. Only the sound of quiet rhythmical counting of cell colonies gave a hint to his whereabouts.

Our studies showed a marginal, but statistically significant, increase in SCE rates (7). However, the reliability of the SCE effect remained elusive; it is almost certainly a product of inertial cavitation. The difficulty in the procedure lies in the need for enough cells to survive the exposure, divide with abnormal DNA replication and then be detected in a test sample of a few cells from a population of tens of millions (many of which may be unaffected). The special chromatid labelling procedure also affects the SCE rate and it is, therefore, essential that this be carefully controlled so that the SCE rate (and variability) in controls does not mask a small increase induced by the exposure insult. The protocol (used by the Ultrasonics Laboratory) of holding the cell suspension on ice prior to insonation would certainly have increased the probability of gas bubble formation when the suspension was warmed to 37°C during insonation, thereby assisting cavitation. In fact, subsequent work in Miller's laboratory has demonstrated this effect by enhancing US-induced mutations in Chinese hamster V79 cells when a similar protocol was used (8). This underlines the importance and great difficulty of standardising protocols for sensitive endpoints in studies involving short time schedules.

I am very pleased to have had the opportunity to work with Mort Miller and Ed Carstensen, and I greatly value their friendship. It was an exciting time in Rochester for a number of reasons. I have never experienced sub-zero temperatures for so long (about 3 months). Spring was heralded by the sudden appearance of masses of brightly coloured tulips. The nature of the environment is such that things happen quickly and create an impact. For the many individuals who have been associated with the "U of R," it would seem normal for new developments to take place. I was fortunate to arrive at the time when the Rochester Center for Biomedical Ultrasound was formed, and I was involved in its inaugural Symposium, together with such luminaries as Wesley

Nyborg. I distinctly remember Wes quoting from the Bible in terms of Maxwell's equations and demonstrating the creation of light. He pointed out that there was no such record for the creation of sound, but speculated that it must have occurred very early to make possible the "Big Bang."

On my return to the Ultrasonics Laboratory in its new purpose-built modern facility, I set about the serious task of writing grant applications to encourage scientists to visit my laboratory and continue to develop academic liaisons. The Australian Bicentennial year of 1988 is significant for many people but, for me, it was overshadowed by the arrival of an effervescent Welshman bent on a mission to unlock the mysteries of ultrasonic bioeffects research. Alun (Roy) Williams took time out from his busy schedule to spend approximately 2 months developing a project to identify the mechanisms responsible for fetal weight loss when pregnant mice were insonated with therapeutic doses. It had troubled Roy that some reports of US-induced fetal weight reduction had referred to symptoms that indicated maternal compromise. Our study demonstrated that exposure with similar intensities that avoided the pregnant uterus, but interacted with the dam's nervous system affected the maternal physiology and also impaired fetal development (9). These results highlight the potential difficulties in assessing US safety from experiments where the ratio of beam size to target is not relevant to human clinical examinations. The possibility of direct effects, independent of maternal interference, was subsequently tested in another collaborative study, with the University of Sydney School of Veterinary Clinical Sciences, using an embryo culture system. It was found that development of rat embryos, specifically the forebrain, was impaired when pulsed US was applied together with a mild temperature (+ 1.5°C) elevation (10).

Research on the bioeffects of US continues to play a prominent role in Australia and the ASUM has an active Safety Committee, of which I am Chair. A merger of divisions within the CSIRO resulted in closure of the Ultrasonics Laboratory and displacement of staff in 1997. My laboratory is currently secreted securely within the confines of an impersonal monolith built in 1979 on the requirements of the National Measurement Laboratory. Despite these socioenvironmental changes and several funding challenges, research has continued through collaborative associations with academic institutions in Australia and overseas (11-13). I look forward to further stimulating research opportunities.

Research on the bioeffects of US has evolved from therapeutic applications, where gross anatomical effects were recorded after exposures to intensities not relevant to diagnostic exposures. The search for effects induced by relatively low levels of US used in diagnostic applications has introduced some sophisticated test systems. The movement away from phenomenological reporting to the mechanistic approach is to be applauded. However, a number of reports of fascinating effects on mammalian cell development are not readily explained by known interactive mechanisms. Detection of subtle biochemical changes involving cell membrane-mediated signal transduction and responses at the subcellular level may help to understand some, yet to be determined, nonthermal processes in cell development. The search for effects at the level of the chromosome has involved rather crude endpoints, mostly relating to gross morphology. The possibility of altered genetic expression has not been seriously questioned by sensitive tests. It may be that the answers lie within the realm of molecular biology.

The World Federation for Ultrasound in Medicine and Biology has recognised the importance of research on bioeffects and safety by its continued support and sponsorship of symposia on the Safety of Ultrasound in Medicine (14). The workshop-style meetings provide an excellent opportunity for focused debate on issues that are of global concern to the safety of diagnostic US. I am pleased to have been given the opportunity to participate in these activities. It is hoped that this positive encouragement will continue amidst the otherwise general financial restrictions on international research.

George Kossoff: Personal History

Dr George Kossoff

In March 1959, on graduation as B.A. first class honours in Electrical Engineering, University of Sydney, I was approached by Norman Murray, the Director of the Commonwealth Acoustic Laboratories, who invited me to set up and head its program on Medical Ultrasound. I had at that time considered taking up an offer of appointment as a nuclear scientist at the Atomic Energy Commission. Norm Murray persuaded me to accept his invitation on the basis on his description of medical ultrasound as a field in the early stages of development when it would be easier to make a meaningful contribution. Not by accident, he also proposed that the appointment would be at a grade higher than that normally offered to raw graduates. In other words, he made an offer that I just could not refuse.

The initial tasks I was given were; (1) to develop a calibration facility to measure the acoustic output of physiotherapy equipment and (2) to provide recommendations as to the direction for research into medical US in Australia. The first was in response to concern regarding possible induction of abortion by unlawful US physiotherapy procedures, the second as result of interest in publications by John Wild, Doug Howry, Bill Fry, Toshio Wagai and Ian Donald into potential applications of medical US.

My first international publication (15) described the method we developed for calibration of ultrasonic therapeutic equipment. The acoustic power output was measured using the Cartesian float method described in draft form by the IEC Technical Committee 29, Working Group 7. The intensity distribution was measured by a densitonometric evaluation of the degree of starch-iodine reaction on a starch-coated plastic film developed for the application. The Cartesian float

method has proved to be remarkably age-resistant, and we still occasionally use the method for quick, first cut assessment of power output of acoustic output in the 1-10 W range.

The publications by Alice Stewart on increased incidence of leukemia in children exposed to X rays *in utero* indicated that there was immediate need for research into obstetrical applications of diagnostic US. In collaboration with Dave Robinson from our laboratory and Bill Garrett at the Royal Hospital for Women, Paddington, we constructed our first obstetric echoscope in 1962 and began to examine patients that year. We found the Cartesian float to be too unstable to allow measurement of the low acoustic output generated by diagnostic equipment. We, therefore, developed a balance technique to measure the acoustic output (16) and the peak acoustic intensity (17) generated by diagnostic equipment, and described the methodology for specification of acoustic parameters generated by such equipment (18).

A major brief of the Commonwealth Acoustic Laboratories was to undertake research and provide services into hearing conservation. It was, therefore, a natural extension for the medical US program to investigate the therapeutic application of US for the treatment of Meniere's disease, which causes vestibular disturbance and progressive hearing loss. The work by Michele Arslan demonstrated that ultrasonic irradiation of the semicircular canal abolished vertigo attacks while conserving hearing in patients with this disease. Our research with several ENT specialists in Sydney confirmed these results but, unfortunately, also demonstrated that the procedure induced partial facial paralysis in a significant number of patients. Experiments demonstrated that this was due to conductive heating of the facial nerve from the surrounding temporal bone irradiated by the large applicator used by the original equipment. We, therefore, developed equipment employing a smaller and more efficient applicator that dramatically reduced the risk of this complication. The equipment was successfully used in Australia and overseas in many otologic centres for several years (19).

Part of my responsibility in assisting with the ultrasonic treatment was the monitoring of nystagmus during the irradiation. Initially, the eyes of the patient would swing slightly in the direction of the irradiated ear in response to treatment. The direction of the swing would, after 10 to 20 min of treatment, change in the other direction as the other ear took control. On one occasion early in the series, I was tested by our ENT colleagues by being asked to comment on my observation of the direction of nystagmus on a patient who, unknown to me, had a glass eye. Fortunately, I was sufficiently honest to tell them that I could not make sense of the erratic movements of the artificial eye and, so, passed their reality check. In the process of performing temperature elevation measurements on temporal bones, I became proficient with the anatomy of the inner ear. This knowledge allowed me to realise that the round window of the inner ear could be used as a natural opening through which to apply the ultrasonic irradiation. The approach simplified the prerequisite surgical approach from a major mastoidectomy to a simple reflection of the tympanic membrane. The round window was also a larger and, therefore, more efficient approach and less energy was needed for the treatment. This eliminated any possibility of causing facial paralysis (20). The technique attracted international interest and was used for several years until it was superseded by newer US therapeutic methods.

In 1967-1969, at invitation from Bill Fry, I spent a 2-year sabbatical at the Bioacoustic Research Laboratory, University of Illinois and the InterScience Research Institute in Champaign/Urbana, Illinois. I appreciated the opportunity to enlarge my experience, working, not only with Bill Fry, but also people like Frank Fry, Reg Eggleton, Elizabeth Kelly and Floyd Dunn and with young graduate students like Bill O'Brien. The two groups were eminent in research into focused US for surgery and were at that time pioneering the application of computers to diagnostic US. They had excellent facilities and I was impressed by their dedication to their research. It was there that I was also introduced to the intricacies of cavitation-induced phenomena (21).

Stan Barnett joined our Laboratory in 1970, and we have had a close working relation on bioeffects and exposimetry over the ensuing 25 years. Originally, Stan undertook research to determine the histological effects of the round window irradiation on the inner ear (3). The last author (G. M. Clark) in this publication went on to develop a distinguished career as Professor of Otolaryngology at Melbourne University, with his pioneering research into the bionic ear.

At the completion of the inner ear program, Stan and I focused our attention on exposimetry and mechanisms of interaction of diagnostic US with soft tissue. At times, our publications would be influenced by my technically-oriented outlook (22) and, in others, his biology expertise would form the dominant theme (23).

In 1983, in my capacity as President of WFUMB, I chaired the WFUMB Council Meeting held in New York. It was agreed, at that meeting, that the World Federation should take a proactive role in sponsoring activities of interest to its membership. I was requested by Council to organise the WFUMB First Symposium on Safety and Standardization of Ultrasound in Obstetrics. This was a major undertaking in that the Symposium was to be held immediately after the WFUMB 85 Congress, the staging of which taxed most of our available resources. Stan was of great assistance in helping to organise the Symposium and, together, we co-edited its proceedings (24). The Symposium proved to be highly successful in bringing together leading experts in the field, giving them opportunity to present international perspective and to get to know each other. It also acted as a catalyst encouraging several organisations to sponsor national conferences on the subject.

Encouraged by its success, WFUMB decided to continue to sponsor these symposia. As result, while I was on sabbatical leave at Emory University, Atlanta, Georgia, Wes Nyborg and I co-chaired the WFUMB Second Symposium on Safety and Standardization in Medical Ultrasound, which was held in Airlie, Virginia (25).

It became apparent at the second symposium that a carefully prepared draft document that could be widely circulated for comment was needed before international consensus on WFUMB recommendation could be developed. WFUMB and several national US organizations generously supported a limited-attendance workshop I helped to organize, which was held in Geneva in May 1990. After a 1-week intensive effort by all participants, Stan Barnett was able to produce the Geneva draft document on WFUMB Recommendations Regarding Thermal Mechanism for Biological Effects of Ultrasound. The document was produced having access to only one word processor, and a major task was the allocation of time on a 24-h basis over the 1-week duration of the workshop for participants to get into a queue to type in their section for the recommendations. The ultimate outcome of this Herculean effort was the publication of the Special Issue of the WFUMB Symposium on Safety and Standardization in Medical Ultrasound (22) that, for the first time, published WFUMB recommendations on thermal mechanisms for biological effects of US.

Although I am no longer as involved, I'm pleased that WFUMB continues to support such symposia. There are many topics where official recommendations by WFUMB can affect Government policy in the provision of ultrasonic diagnostic services and I am pleased that I had the opportunity to contribute to the development by WFUMB of this activity.

Over the years, I also participated in a number of activities by organisations such as the IEC and societies such as the AIUM relating to standards in safety and standardisation. In particular, I was Chairman of the WFUMB Committee on Standardisation from 1985 until 1994, and Chairman of the Australasian Society for Ultrasound in Medicine Committee on Safety and Standardisation from 1979 until 1994.

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Statement on normal ultrasonic fetal measurements (Revised May 2001)

EDITORIAL

The new ASUM statement on normal ultrasound fetal measurements supersedes all previously recommended obstetric charts.

It is appropriate that the ASUM adopts a new standard as, with the exception of the biparietal diameter chart, previous charts were obtained on machines that definitely can no longer be considered "state of the art". Furthermore they were not based on an Australian population. The ASUM has adopted the new charts after considerable thought and debate, having been under consideration for over two years. The new charts are based on measurements obtained by a diverse group of sonographers on a large, diverse group of Australian pregnancies. This mirrors the situation in clinical practice.

Adoption of a uniform standard across Australia will benefit the patient and the clinician and will increase the credibility of the sonographic report. Clinicians have always been confused by the alteration in dating created by chart variation.

There is still concern in some quarters that the new femur length charts are under reading in the second half of pregnancy. The Standards of Practice Committee is aware of this potential problem and it will be kept under review. It is ironic that although there has been fierce debate over the issues surrounding the adoption of new charts, in reality the majority of users are unaware of which charts are in their ultrasound machines. For example, when reviewing the charts in our three machines I was amazed to find them discrepant. This was attributable to reversion to factory settings during an upgrade. Eternal vigilance is required!

The charts have mathematical formulae to enable them to be entered into most machines. So, please, everyone enter or ask your application specialist to enter the new charts into your machines. Let us unite in using these new charts to provide a uniform obstetric ultrasound report.

Cheryl Bass

ASUM POLICY STATEMENT

This policy implements a standard obstetric chart to ensure uniform reporting of obstetric measurements across Australia and New Zealand. The data used are based on the most recent research involving Australasian populations.

These charts are based on an Australian population. The figures were the result of a three year study of 3,800 pregnancies and 11,600 measurements of fetal parameters. 26 practices were involved with the project.

After the first trimester of pregnancy a multiparameter assessment of gestational age is advocated. This should include at least two fetal measurements (usually biparietal diameter (BPD) and femur length (FL)) plus a consideration of additional parameters such as head circumference (HC), occipitofrontal diameter (OFD), abdominal circumference (AC) and humerus length (HL).

Crown-Rump Length Measurements for an Australian Population
Compiled by S Campbell Westerway

Gestation (weeks/days)	CRL (mm)	Gestation (weeks/days)	CRL (mm)	Gestation (weeks/days)	CRL (mm)
5.2	1	8.3	20	11.4	52
5.3	2	8.4	21	11.5	55
5.4	3	8.5	22	11.6	56
5.5	3	8.6	22	12.0	57
5.6	4	9.0	23	12.1	58
6.0	4	9.1	24	12.2	60
6.1	5	9.2	26	12.3	61
6.2	6	9.3	27	12.4	63
6.3	7	9.4	28	12.5	64
6.4	8	9.5	29	12.6	65
6.5	9	9.6	31	13.0	68
6.6	10	10.0	34	13.1	70
7.0	11	10.1	36	13.2	72
7.1	11	10.2	37	13.3	74
7.2	12	10.3	38	13.4	76
7.3	12	10.4	39	13.5	77
7.4	13	10.5	39	13.6	80
7.5	14	10.6	40	14.0	81
7.6	15	11.0	44	14.1	84
8.0	17	11.1	45	14.2	85
8.1	18	11.2	47	14.3	86
8.2	19	11.3	48	14.4	87

Measurements in the beam axis are more accurate than those made across the axis. Despite this, some measurements (eg Crown-Rump Length (CRL) and femur length) should be measured across the axis.

The earliest measurement of gestational age taken in pregnancy should usually be accepted as the definitive assessment, subsequent examinations reflecting only fetal growth in the intervening period. If measurements taken after the first trimester are within one week of the gestational assessment taken from menstrual dating then the ultrasound assessment of gestational age confirms the menstrual dates. If the ultrasound measurements are in agreement and differ from menstrual dates by more than one week prior to 20 weeks a new estimated due date should be calculated and recorded. The reduced accuracy of prediction of gestational age after 20 weeks must be appreciated.

At any gestation, if the ultrasound fetal measurements of each parameter are not in agreement, the reason for this difference should be evaluated. This is preferable to just averaging all values to arrive at an estimated gestational age.

The wide normal range of BPD in late pregnancy must be appreciated. It is not expected that BPD be used to assess gestation late in pregnancy. The values from 33 weeks are intended to predict the growth in fetal head size from a known gestation.

Crow-rump length

The CRL is measured between the fetal poles, excluding the limbs. The Campbell Westerway charts differ from the previously recommended Robinson charts in pregnancies of less than 7 weeks.

The exception to the above recommendation is when using CRL in association with risk assessment for nuchal translucency. This applies only to those practices having access to the Fetal Medicine Foundation (FMF) Nuchal Translucency Risk Assessment Software. The FMF Software is based on the Robinson CRL charts and therefore the Robinson Charts should be used in this context. But in addition, gestation should still be reported based on the Campbell Westerway charts.

The quadratic regression formulae used to describe the relationship between CRL and gestational age are:

$CRL = 0.5967\ (GA)^2 - 2.1413 - 3.4966$ ($r^2 = 0.985$) and
$GA = -0.0007\ (CRL)^2 + 0.1584\ (CRL) + 5.2876$ ($r^2 = 0.99$)

Ultrasonic Fetal Measurement Standards for an Australian Population
Compiled by S Campbell Westerway

Gestation (weeks)	BPD (mm)	OFD (mm)	Head circ.(mm)	Abdominal circ.(mm)	Femur (mm)	Humerus (mm)	Gestation (weeks)
+/-2 standard deviations shown in brackets. Measurements are completed weeks.							
11	16 (2.0)	21 (2.0)	59 (15)	52 (10)	8 (2.0)	8 (3.0)	11
12	20 (4.0)	24 (2.0)	70 (15)	63 (10)	10 (2.5)	9 (2.0)	12
13	24 (4.0)	29 (3.0)	84 (15)	74 (10)	11 (2.5)	11 (3.0)	13
14	28 (4.0)	34 (3.0)	96 (15)	84 (10)	15 (3.0)	14 (4.0)	14
15	31 (4.0)	38 (3.0)	108 (15)	96 (10)	17 (3.5)	17 (5.5)	15
16	36 (5.0)	46 (3.0)	128 (15)	106 (10)	22 (4.0)	21 (4.0)	16
17	39 (5.0)	50 (3.0)	141 (15)	120 (15)	25 (4.0)	25 (5.0)	17
18	42 (4.0)	54 (3.5)	151 (20)	131 (15)	28 (5.0)	27 (5.5)	18
19	45 (5.0)	57 (3.5)	160 (20)	140 (15)	30 (5.0)	29 (5.0)	19
20	47 (4.0)	61 (3.5)	170 (20)	151 (15)	32 (6.0)	31 (5.0)	20
21	49 (4.0)	63 (4.0)	176 (20)	164 (20)	34 (6.0)	32 (6.0)	21
22	52 (5.0)	68 (3.5)	188 (20)	176 (20)	37 (5.0)	35 (6.0)	22
23	57 (5.0)	76 (4.0)	210 (20)	186 (20)	43 (5.0)	38 (4.0)	23
24	60 (6.0)	79 (4.0)	220 (20)	201 (20)	45 (4.0)	40 (6.0)	24
25	64 (6.0)	82 (4.5)	231 (20)	212 (20)	48 (5.0)	43 (5.0)	25
26	67 (4.0)	84 (4.5)	238 (20)	223 (25)	49 (5.0)	44 (4.0)	26
27	68 (5.0)	86 (4.5)	250 (20)	230 (25)	50 (5.0)	47 (4.0)	27
28	72 (4.0)	95 (5.0)	263 (20)	242 (25)	54 (4.0)	50 (5.0)	28
29	75 (4.0)	97 (5.5)	269 (25)	259 (25)	55 (5.5)	51 (5.0)	29
30	76 (4.0)	98 (5.5)	274 (25)	262 (25)	58 (6.0)	52 (5.0)	30
31	80 (6.0)	101 (5.0)	284 (25)	272 (30)	59 (5.5)	54 (5.0)	31
32	81 (4.0)	102 (5.0)	288 (25)	283 (30)	62 (6.0)	56 (5.0)	32
33	84 (6.0)	107 (5.5)	300 (25)	294 (30)	65 (4.0)	57 (6.0)	33
34	86 (6.0)	108 (5.5)	305 (25)	305 (30)	66 (4.0)	59 (5.5)	34
35	88 (6.5)	109 (5.5)	310 (25)	315 (30)	67 (6.0)	60 (6.0)	35
36	90 (6.0)	112 (5.5)	317 (25)	325 (35)	69 (6.0)	62 (5.0)	36
37	92 (6.5)	113 (6.0)	321 (25)	333 (35)	72 (5.0)	63 (6.0)	37
38	93 (6.0)	116 (5.5)	328 (25)	342 (35)	73 (5.5)	64 (6.0)	38
39	95 (8.0)	119 (6.0)	336 (25)	356 (35)	75 (6.0)	65 (5.5)	39
40	96 (8.0)	120 (6.0)	340 (25)	362 (35)	76 (4.0)	66 (6.0)	40
41	98 (8.0)	122 (6.0)	344 (25)	367 (35)	77 (5.0)	68 (6.0)	41

Biparietal diameter and head circumference

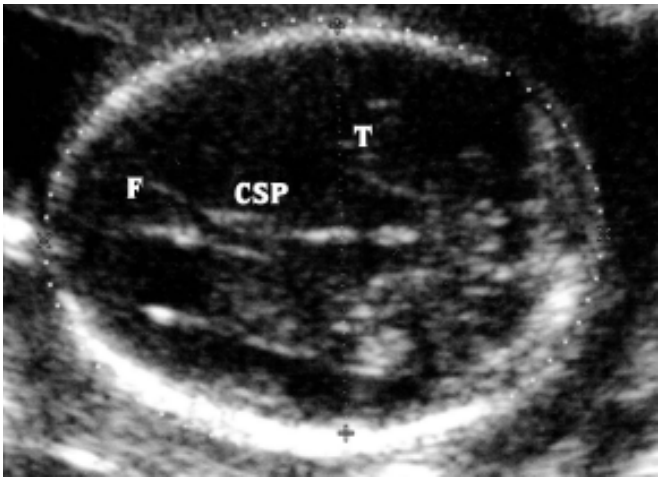
The BPD and OFD are measured on a transverse axial section of the fetal head which includes the falx cerebri anteriorly and posteriorly, the cavum septum pellucidum anteriorly in the midline and the thalami. The BPD is measured from the outer edge of the nearer parietal bone to the inner edge of the more distant parietal bone. The OFD is measured perpendicular to the BPD. The Campbell Westerway charts utilise the formula HC=(BPD+OFD)x1.57. In clinical practice if the ultrasound unit has the facility to provide an ellipse measurement this is also acceptable.

The Campbell Westerway BPD chart is not significantly different from the ASUM biparietal diameter chart adopted by ASUM in 1990.

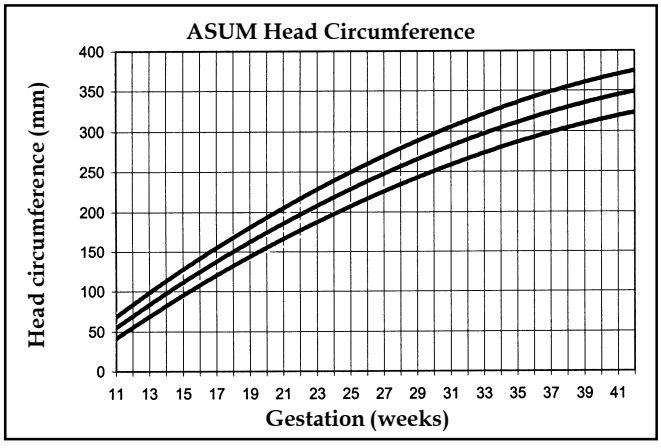
The Campbell Westerway HC chart is statistically different at a number of weeks of gestation to the Hadlock charts.

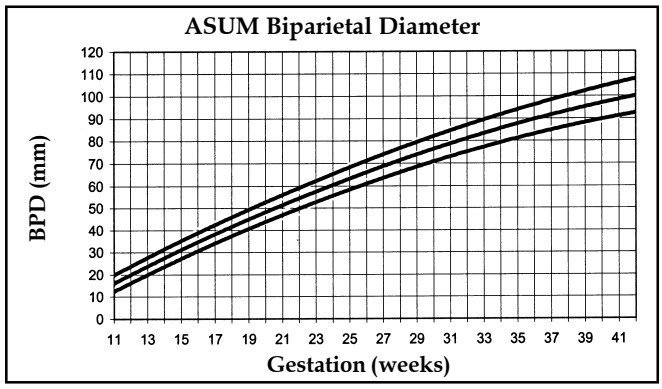
The quadratic regression formulae used to describe the relationship between BPD,OFD,HC and gestational age are:

BPD = -0.0371 $(GA)^2$ + 4.69 (GA) – 31.546 (r^2 = 0.969) and
GA = 0.397 (BPD) - 0.00306 $(BPD)^2$ + 0.00002788 $(BPD)^3$ + 4.933
OFD = -0.0665 $(GA)^2$ + 6.8881 (GA) – 49.08 (r^2 = 0.963) and
GA = 0.381 (OFD)- 0.00344 $(OFD)^2$ + 0.00002298 $(OFD)^3$ + 4.189
HC = -0.1699 $(GA)^2$ + 18.494 (GA) – 127.91 (r^2 = 0.991)
GA = 0.0001797 $(HC)^2$ + 0.02631 (HC) + 9.667 (r^2 = 0.996)



Biparietal diameter and head circumference measurements
F = falx
CSP = cavum septi pellucidum
T = thalami





Femur and humerus length

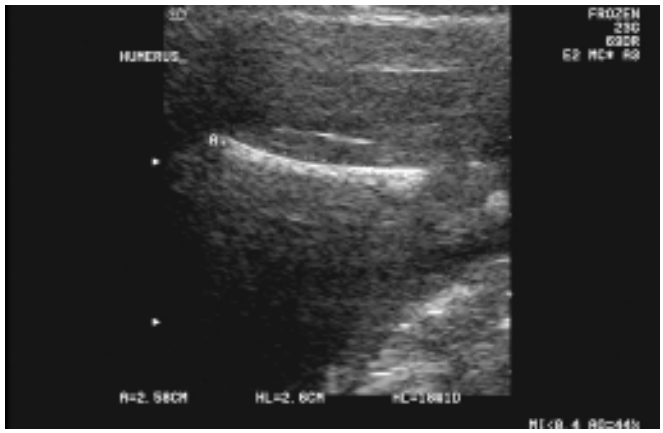
This the first time the ASUM has specifically recommended a humerus length chart.

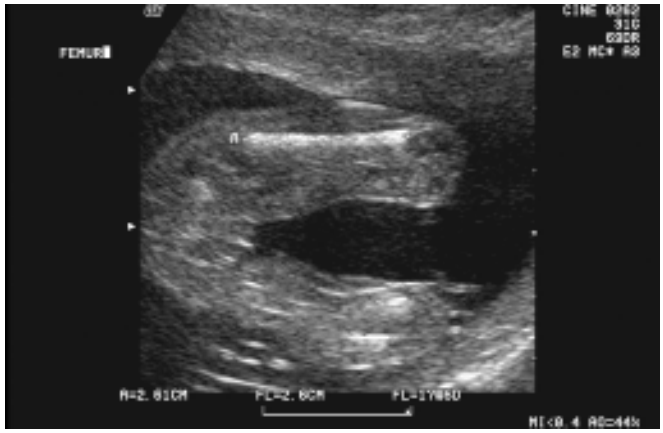
The long bones are measured with the bone across the beam axis. The strong acoustic shadow behind the femoral or humeral shaft and the visualisation of both cartilaginous ends indicates that the image plane is on the longest axis and is the optimal measurement plane. The calipers are placed along the diaphyseal shaft excluding the epiphysis.

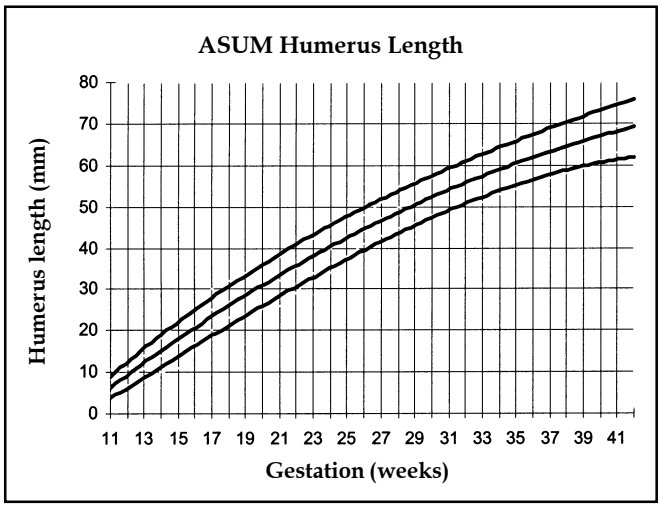
The Campbell Westerway chart is not statistically different from the Hadlock chart.

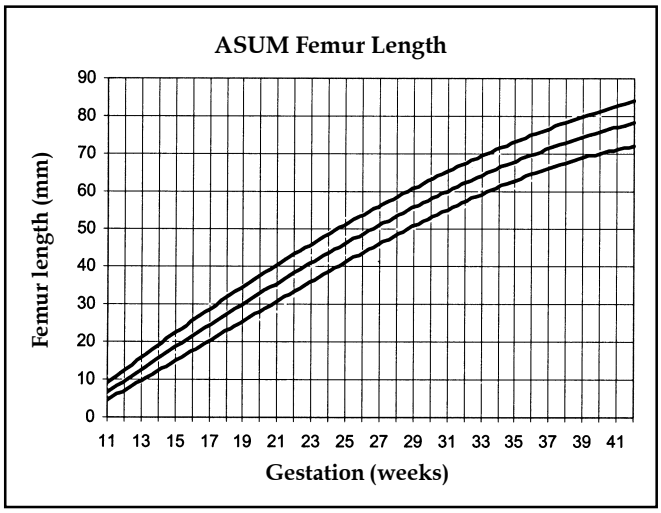
The quadratic regression formulae used to describe the relationship between FL, HL and gestational age are:

FL = -0.0004 $(GA)^3$ + 0.0032 $(GA)^2$ + 3.1263 (GA) – 28.489 (r^2 = 0.974)
GA = 0.41 (FL) - 0.002884 $(FL)^2$ + 0.00003924 $(FL)^3$ + 8.284
HL = -0.0001 $(GA)^3$ – 0.0235 $(GA)^2$ + 3.5386 (GA) – 29.452 (r^2 = 0.956)
GA = 0.406 (HL) - 0.002804 $(HL)^2$ + 0.0000563 $(HL)^3$ + 8.411 (r^2 = 0.999)









Abdominal circumference

These measurements are more appropriately used in the assessment of fetal growth, particularly in the second half of the pregnancy, than in the assessment of gestational age. It is, however, an appropriate measurement in the mid trimester to demonstrate normal fetal proportions.

The abdominal circumference is measured at the level of the liver and stomach, including the left portal vein at the umbilical region.

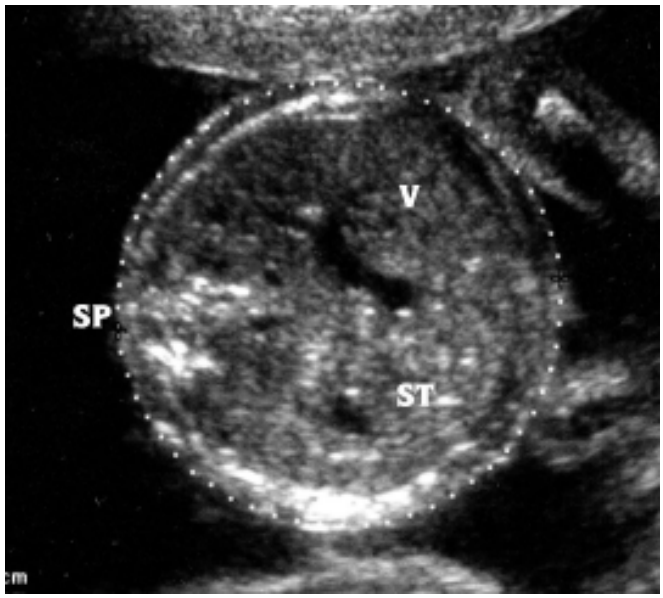
The Campbell Westerway charts differ statistically from the previously recommended Deter charts.

The quadratic regression formula used to describe the relationship between AC and gestational age is:

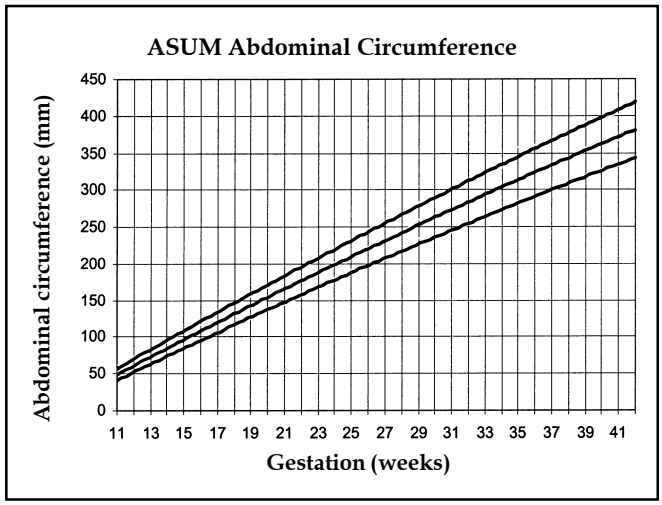
$AC = -0.0469 (GA)^2 + 13.204 (GA) - 90.946$ ($r^2 = 0.984$)
$GA = 0.0000367 (AC)^2 + 0.07715 (AC) + 7.192$ ($r^2 = 0.999$)

Fetal weight

No formula for estimating fetal weight has achieved an accuracy which enables us to recommend its use. It should be noted that errors are reported for one standard deviation only and that even at this level the accuracy is disappointing. The British Medical Ultrasound Society suggest that there may be an improvement in accuracy of about 5% using two rather than one parameter.



Abdominal circumference measurement
SP = spine
ST = stomach
V = umbilical vein/portal sinus



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Book Reviews

Title: Ultrasonography in Obstetrics and Gynecology: A Practical Approach
Editors: CB Benson, PH Arger, EI Bluth
Publisher: Thieme
Published: 2000 ISBN 3-13-125361-4
Approximate cost: $A142.00

This 235-page text is edited by a group of well-known authors and has contributions by another 25 authors, most of whom are familiar experts in the ultrasound field. The text was developed from material presented at a special course on ultrasound at the Radiological Society of North America (RSNA) Annual Meeting in 1996. This book is a sub-set text of a book previously reviewed (ASUM Bulletin 4:2;27 May 2001), *Ultrasound: A Practical Approach to Clinical Problems, Edited by Bluth, Arger, Benson, Ralls and Siegel.*The text is a 2000 publication and it would seem that much of the material has been updated since the 1996 RSNA course.

The focus of the text is on individual chapters providing an approach to common clinical problems and presentations in the areas of the female pelvis and obstetrics. There is one chapter on "The breast nodule: Sonographic characterization". The aim of the book is to review the current state of sonography in regard to what the editors see as important clinical issues. It is therefore predominantly written with the clinical issue as the chapter title. For example, excellent chapters are included with titles such as "Family history of ovarian carcinoma", "Vaginal bleeding - postmenopausal", "Abnormal premenopausal bleeding: from menarche to menopause", "Cervical sonography in premature labor", "Triple marker screening positive for Down Syndrome" and "Tamoxifen".

Radiologists are the primary target market for the text and it focuses more on clinical issues and possible diagnostic findings rather than on how-to-do an examination in a particular area. However there is wealth of information that is of equal importance to sonographers and the text is highly recommended for them. There is very good background clinical material on presenting signs, symptoms, other possible investigations and their role in relation to ultrasound. The chapters relating to abnormal Triple Screen results and the one on the sonographic evaluation of the fetus following teratogen exposure are particularly good examples of this, and would be of particular interest to those in general departments.

One disappointing feature, I thought, was that the chapter on "Uterine size less than dates" seemed a bit outdated and would appear not to have been updated since the 1996 RSNA course. The chapter started well with good definitions and explanations of the correct terminology in relation to intrauterine growth restriction (IUGR), but barely mentions the use and role of Doppler. Also, as the text is predominantly written by American authors, Australasian sonologists and sonographers need to be aware of some of the differences in clinical practice and expected standards between the USA and here. For example, the discussion on the role of sonography in the evaluation of raised maternal serum alpha fetoprotein is based on the American system and is not necessarily the same as the Australasian scenario. The chapter overall provides some very useful information however. Similarly (as is the case in many texts), the evaluation of the fetal cardiac outflow tracts is described as an optional extra, rather than as a standard part of the examination, as is the case in published Australasian standards.

An extensive series of high quality and interesting images are provided to complement the text. The text is well presented with extensive reference lists provided at the end of each chapter.

Overall, I found this an excellent text and would think it very suitable in any general ultrasound department. The text would be very appropriate for radiologists and radiology registrars. It would also be very applicable to all general sonographers and student sonographers, particularly those in the more advanced stages of their training. The detail is probably not comprehensive enough for those working in dedicated obstetric and gynecology departments, however as an easy to read overview text it would be of considerable value, particularly for those in training. This would be a valuable text for departments involved in ultrasound teaching and is strongly recommended.

Margo Harkness
Senior Lecturer in Medical Ultrasound
Queensland University of Technology

Title: The Practice of Breast Ultrasound
Author: Helmut Madjar
Collaborator: Jack Jellins
Publisher: Thieme
Published: 2000 ISBN 3–13-124341-4
Pages: 254
Illustrations: 366
Approximate cost: $A205

It is a long time since I sat down and read a book cover to cover and in fact I probably never have, but if one was going to, this is an excellent book to start with. It has something for everyone and everyone can gain something by reading all sections. Dr Helmut Madjar has worked in the field of breast imaging and diagnosis since the early 1980s. He is a leading authority in breast ultrasound and an excellent teacher. The book aims to improve the reader's ability to interpret breast ultrasound images and promotes a standardised examination technique. It is easy to read and well set out, being ordered into beginner, intermediate and advanced sections according to the German requirements and best of all not dedicating too much of the book to physics. The beginner's section emphasises a standard approach to the normal breast. The intermediate section covers all the usual pathology with good insights into traps for the unwary. The advanced section covers specialised areas including intervention, staging and some of the newer techniques such as 3D and Doppler.

Relevant clinical information is given as well as a clear indication of what needs follow up. It adopts a sensible approach to mammographic correlation but, not surprisingly, is biased towards ultrasound. Its use of key points and summaries, and many illustrations means the reader can

choose the depth at which they wish to explore the book. The highlighted key points are also excellent for a quick pre-exam refresher. In the intermediate section, the numerous pictures are accompanied by sample reports in point form to help the beginners realise what to put in and encourage uniformity of reporting in the more experienced.

The only omission was the absence of a chapter on the male breast. In this age of men being more health aware, a chapter on the male breast would have been welcome.

Overall, I thoroughly enjoyed browsing through the book. It is of use in both the diagnostic and the breastscreen setting. The large number of high quality pictures make this not only a valuable text for the novice but also a useful departmental reference book for the quick comparative pathology search prior to giving out one's trademark authoritative report.

Cheryl Bass

Title: **Breast Ultrasound 2nd Ed**
Author: **ME Lanfranchi**
Publisher: **Thieme**
Published: **2000 ISBN 3-13-125731-8**
Approximate cost: **$A209.00**

Breast ultrasound has become more sophisticated so that we now carefully analyse breast lesions to narrow the differential diagnosis so that fewer benign lesions need biopsy.

Mirta Lanfranchi is the major author of this book with a chapter each provided by Norman Koremblit and Roman Rostagno. They provide an excellent, well-illustrated description of breast anatomy, breast ultrasound and breast pathologies. The book commences with chapters on anatomy, equipment and technique. Then follows chapters devoted to cysts, solid benign nodules, solid malignant nodules, diffuse pathology, lactiferous ducts, trauma and infection, breast prostheses, post-operative changes and recurrent breast cancer. The last few chapters examine ultrasound-guided intervention, artifacts, post-menopausal breast ultrasound, colour Doppler and 3-D ultrasound.

In each chapter, the concise text is well laid out amongst the numerous images with their accompanying illustrations. High quality images are provided for most of the pathologies discussed. Topics can be found easily amongst the concise paragraphs with clear headings. Some lists of signs and differentials are in bold. Source references are supplied at the end of each chapter. There is no index but topics are listed under chapter headings at the beginning of the book.

Although the author refers briefly to mammography as an important part of breast assessment there is very little attempt to correlate ultrasound with mammography.

I would have found a separate chapter specifically focusing on differentiating benign from malignant lesions helpful because this is the most useful thing we can do every day. However most of this information is in the text if one looks for it.

Breast Ultrasound should be a useful resource during breast ultrasound training. It is probably better read and studied rather than being used as a resource book because features of many lesions overlap.

Patsy Robertson

Report to ASUM on AIUM Bioeffects Committee Meeting, Florida, March 2001

OVERVIEW

The topics that created major discussion were:

- Live scanning at scientific meetings.
- Contrast agent use and American Institute of Ultrasound in Medicine (AIUM) support for American College of Radiology (ACR) lobby of Food and Drug Administration (FDA), re: medical reimbursement.
- Bioeffects and contrast agents.
- Relevance of Mechanical Index (MI) as an indicator of bioeffects associated with contrast agents.
- Output review subcommittee.
- Overheating transducers
- Literature reviews.
- Structure of Bioeffects Committee.

Chair, Dr Brian Fowlkes completed his term on conclusion of this meeting, handing over to Dianne Dalecki (Vice - Chair, Zacharay, Illinois)

This was a rather arduous meeting, lasting seven hours.

The major benefit of attending meetings of the AIUM Bioeffects Committee is the opportunity to participate in discussion on matters that are of common concern amongst ultrasound societies; issues related to basic science, standards, regulation and clinical use. The current most important issue facing regulatory standards in the USA is the objective of National Electrical Manufacturers Association (NEMA) to pressure the FDA, through the AIUM Bioeffects Committee, to remove all acoustic output limits for equipment using the Output Display Standard (ODS). Currently, the FDA is the only body that effectively regulates ultrasound intensity.

SAFETY ISSUES

Live Scanning

The Committee is divided in its position on the use of live models within educational sessions. It was noted that its advice against the use of live models at the AIUM Annual Conference was generally ignored. It was agreed to create a sub-committee to evaluate the educational advantages for hands-on scanning in Obstetrics & Gynecology to give assistance to the Annual Convention Committee (ACC).

The AIUM Bioeffects Committee (BC) is facing a difficult time. On the one hand the Chair is emphatic that live scanning at AIUM Conferences is unacceptable, while on the other hand various statements from the BC state that there is no evidence of harm from ultrasound examinations.

The AIUM consistently states that adherence to the principles of the ODS will ensure safe use of diagnostic ultrasound, however, it now admits that the Output Display is mostly ignored by users in the USA.

European Federation of Societies for Ultrasound in Medicine and Biology liaison member (F Duck) reported that the latest policy is published which allows live scanning in various scientific and educational forums provided that a set of guidelines are followed. The guidelines include the specific prohibition of live scanning of pregnant women or of children under the age of 16 years.

ASUM liaison member (S Barnett) reported that the ASUM Safety Committee is currently examining the issue with the intent to review and modify the existing policy. The issue of a prohibition on obstetric scanning is problematic if the policy is to include all educational and training situations.

All parties agreed to maintain communications on this important issue. The Chair of the BC admitted that the AIUM is stumbling over this issue. There is a definite sense that the BC is used as a means of endorsing lobbying efforts by particular groups. An example of such an activity was presented on the issue of contrast agents and medicare reimbursement.

Contrast agents and requested support for ACR

Dr Chris Merritt (Philadelphia) addressed the meeting for an hour on this issue.

Dr Merritt now works in association with Barry Goldberg (Thomas Jefferson hospital) who has been actively pursuing the application of echo-contrast sonography for some time.

Merritt requested that the AIUM Bioeffects Committee help the ACR form a committee that will work directly, and confidentially, with the contrast agent industry to lobby the FDA to approve the use of a range of contrast agents and thereby allow Medicare reimbursement.

The Medical Imaging Contrast Agent Association (MICAA) would also be involved.

The purpose of Merritts request was to involve a few selected AIUM bioeffects experts to help the ACR and MICAA counter any concerns about potential bioeffects that might by raised by the FDA. The discussions would have to be completely confidential with no correspondence with the general bioeffects community.

Following Merritt's departure from the meeting most members objected strongly. There was great concern about AIUM being used to support a commercial venture. Also, anyone who had read the book of abstracts for the present AIUM meeting would realise that a new and important area of research is in the evaluation of bioeffects of contrast agents in diagnostic ultrasound fields.

Bioeffects and contrast agents

There are some important new studies showing intravascular damage after very brief (*e.g.* 10 sec) exposure to diagnostic ultrasound in the presence of contrast agents. Following discussion of two of these papers it was agreed to convene a sub-committee charged with drafting a statement on bioeffects in contrast-aided ultrasound (proposed, D Miller). The sub-committee comprises scientists (A Brayman and D Miller), clinician (J Abramawicz), and industry (C Church and J Abbott).

Mechanical Index

There was some discussion, lead by W O'Brien, on the problem of reporting MI in bioeffects studies. (In a presentation a few days later during the AIUM Conference, Frizzell gave evidence that the threshold for lung lesion production in rodents was not frequency-dependent; there was no difference when frequency doubled from 2.8 to 5.6 - MHz). It was agreed that the MI is a poor indicator of bubble destruction and potential bioeffects when gas body encapsulated contrast agents are used.

There is also little chance that MI estimates will bear close resemblance to the actual exposure in different experimental conditions.

John Abbott advised that the displayed MI was inconsistent between different manufacturers. There are large systems variabilities that will give significant error between MI display and actual value.

It was agreed that it is more relevant to report pressure values in bioeffects studies. This was suggested as criticism of the papers currently under review.

FDA output limits

John Abbott (ATL/Philips) summarised the responses to his questionnaire on output review. The objective being the complete removal of the FDA exposure limits. The proposal has support from NEMA and AIUM Technical Standards Committee. In the 12 months since his proposal he has received 12 responses to the questionnaire. The respondents were not identified although there were no more than two scientists in the group. The consensus seemed to be that the existing FDA limits were inappropriate although there was no clear message as to what to do next. The discussion will continue.

Over-heating transducers

Terry Sweeney (ATL) reported on the proliferation of nonstandard add-on transducers from third party suppliers in the USA. Some of these were reported to reach surface temperatures in excess of 80^0C when operating in air. John Abbott (ATL) agreed that it was common practice to find such transducers masquerading as genuine, being at least a weekly occurrence. These cheap look-alike transducers are available on the web.

Literature reviews

AIUM literature reviews have been inactive for some time. The AIUM Bioeffects Committee acknowledged that the AIUM web page is quite inadequate, in terms of educational material. It was agreed that all publications from the Bioeffects Committee would be put onto the web-site. No deadline was suggested.

Structure of Bioeffects Committee

The Chair outlined concern about the size of membership of the committee. The By-laws were discussed with a view to minimising the size.

Stan Barnett
Chair, ASUM Safety Committee

ASUM NZ Branch

This year has been a busy year for the Branch with members being involved in the Acuson Obstetrics & Gynaecology workshop in Christchurch, the nuchal translucency course in Auckland, the annual conference in Queenstown and the Chris Kohlenberg Teaching Fellowship later in September/ October this year.

The **Acuson Obstetric & Gynaecology Seminar** (Sat 28 April) was attended by 135 registrants. Beth Williams (convenor) and the Christchurch team did a superb job in organising an interesting program to benefit midwives, obstetrician/ gynaecologists, radiologists and sonographers. Targeting such a diverse group in the O & G field was a new initiative and I congratulate the Drs Andrew McLennan, Obstetrician Gynaecologist, Royal North Shore Hospital, Sydney and Rob Sim, Radiologist, National Women's Hospital, Auckland, for their ability to cover vast topics with relevance to all concerned. The NZ Branch is most grateful to Acuson for it's generous sponsorship of the meeting.

Dr Andrew McLennan was very generous in coming to Auckland a number of weeks later to assist with the Nuchal Translucency Accreditation Course (Sat 19 May). The venue was National Women's Hospital. The course was limited to 120 people and those who left registration too close to the date had to be turned away. There is considerable interest in this growing area of screening for trisomy.

By the time this goes to print the NZ Branch should have had its July conference in Queenstown. The NZ annual meeting is always a highlight for the NZ ultrasound community and I trust the efforts of those organising the event from all over the country culminate in a superb academic and social event. A special thanks goes to **Acuson, Aloka, ATL, GE Medical Systems Ultrasound, Kodak, Schering** and **Toshiba** whose generous support has made Queenstown 2001 possible**.**

This year NZ is privileged to have the **Chris Kohlenberg Travelling Fellowship**, sponsored by **GE Medical Systems Ultrasound**. Dr Quentin Reeves, consultant radiologist, Broadway Radiology, Palmerston North will give lectures on musculoskeletal ultrasound in Dunedin, Christchurch, Wellington and Hastings. He will also conduct a Musculoskeletal Workshop in Auckland, early October, the date to be confirmed. (Watch the ASUM web site http:// www.asum.com.au).

Finally, the success of the NZ Branch is contingent on a diverse group from across NZ working together to provide academic meetings to enhance ultrasound education within NZ. This group includes the trade, sonologists and sonographers. The Branch committee is keen to take on new people as it aims to provide relevant, interesting and enjoyable meetings that will propagate the highest standards of ultrasound in NZ.

Mike Heath
Honorary Chairman, NZ Branch ASUM

12th ASUM Vascular Ultrasound Workshop Convenors Report

A successful return of the ASUM Vascular Workshops was held in Melbourne at the Aikenhead Conference Centre, St Vincent's Hospital on 23-24 June 2001.

The popularity of these workshop sessions was evidenced by the strong turnout and positive feedback. I believe most people had an enjoyable as well as educationally fulfilling time. Despite a very full curriculum, our vendor/sponsors helped to make the cocktail party a resounding success. I would like to thank all our sponsors for their continuing support of ASUM's educational initiatives. Strong support from both registrants and sponsors has ensured the continuation of these workshops.

Finally I would like to thank the invited guest speakers, Drs Ken Rholl and Joseph Polak from the USA. They were put through their paces and were supported by a strong local and interstate faculty. Thank you also to the organising committee, but I especially extend thanks to John Donlan and Peter Russell who spent countless hours tirelessly and generously giving of their time and expertise. Without you, committee meetings would have been very lonely indeed!

John Vrazas
Interventional Radiologist
St Vincents Hospital Melbourne

Council meeting for May 2000

Councillors gathered once again at the Novotel Hotel at Brighton le Sands to review ASUM activities, and determine new directions. There has been much discussion at Executive and Council meetings on restructuring Council to reduce costs and increase efficiency. Stan has investigated the structure of other societies, and they seem to be able to keep Council to 12 Councillors, so the Executive is now working on a model to be presented to the next Council Meeting.

Stan Barnett is also actively lobbying for ASUM to bid for the 2009 WFUMB Meeting to be held in Sydney. He tabled the tourism brochure prepared by the Sydney Convention and Visitors Bureau, (SCVB) and listed the assistance offered by that organisation to prepare such bids for large meetings. Invitations have been issued to representatives of Ultrasound Societies in South East Asia to attend the 2001 Annual Scientific Meeting as it is in Sydney. Documentation for the bid must be ready for November 2001, and the bid presentation would be made in March 2002.

Glenn McNally, the Treasurer, reported a review of Budgets for the various Committees. The Finance Committee has recommended a modest increase in membership fees in order to balance the budget, and noted that membership fees have not been increased for three years. There will also be a review of the formula for funds allocation to the New Zealand and State Branches.

There was some discussion of the recognition (or lack thereof) of our own Members and their contribution to the Society. Life Membership seems to be awarded towards the end of a person's career, and there is no recognition of the dedicated lecturers and presenters who tirelessly prepare papers and lectures, and without whom there would be no Annual Scientific Meetings, Workshops or Branch Meetings. Executive will investigate the possibility of Honorary Membership, and the recognition of such an award.

Recruitment of a Chief Executive Officer

The position was advertised and a short list was presented to the Executive. Dr Caroline Hong was appointed on 9 July 2001 as ASUM's new Chief Executive Officer.

Reports were tabled from various Committees which will be detailed elsewhere in this Bulletin.

Dave Carpenter tabled a letter from CSIRO, that funds of approximately $10,000 which were accumulated from lectures given by the now defunct Ultrasonics Institute, would be made available to ASUM for the purpose of sponsoring a plenary lecture, preferably for research/education, the speaker to be from Australia or New Zealand. The amount awarded would be $1,000 annually. It was proposed that if ASUM matched the amount, it would become a perpetual award.

The next Council Meeting will be at the Sydney Convention Centre during the Annual Scientific Meeting.

Mary Young
Honorary Secretary

New members April – June 2001

FULL MEMBERS

Socrates Angelides	NSW
Catherine Buli	VIC
Teresa Clapham	QLD
Loretta DeMunck	NSW
Van Diep	VIC
Natalie Dowling	NSW
Wendy Hallewell	WA
Michael Hesselberg	WA
Derek Johns	WA
Himanshu Kaushik	NSW
Majella McSweeney	QLD
Sally Quinn	NSW
Vivienne Rush	VIC
Adriana Samayoa	VIC
Damayantha Seneviratne	QLD
David Su	NSW
Alexandria Taylor	VIC
Murray Thorn	QLD
Dinesh Varma	VIC
Susan Williams	QLD
Angela Wong	NSW

ASSOCIATE MEMBERS

Shaton Abel	WA
Marsha Abbott	QLD
Delyn Aguilar	VIC
Kam Aldridge	QLD
Mark Alexander	QLD
Christine Anderson	QLD
Kylie Anderson	QLD
Teena Anderson	WA
Jacqueline Archer	NSW
Felicity Arrigo	WA
Lee-Anne Bailey	NSW
Glen Barker	VIC
Fiona Batty	NSW
Sarah Beadle	NSW
Raymond Beh	NSW
Anthony Benjamin	QLD
Sally Bland	NSW
Anne-Maree Brandner	VIC
Jason Brightwell	QLD
Catherine Bui	NSW
Thanh Hung Bui	NSW
Helen Burnett	QLD
Michelle Cahill	VIC
Matthew Cashman	SA
Kerrie Child	NZ
In-suk Cho	WA
Marinos Christofz	NSW
Alesha Clark	NSW
Danielle Claudio	WA
Jackie Cluff	NZ
Lisa Courtney	NSW
Jocasta Daley	NSW
Michael Devadas	NSW
Lien Diep	WA
Carl Donald	QLD
Kellie D'Orsa	VIC
Danoush Fardsavar	VIC
Craig Freeman	NT
Deborah Freeth	ACT
Emma Godrik	SA
Kelli Gordijn	VIC
Reshma Haider	NSW
Mark Hanna	NSW
Jacqueline Harding	QLD
Nathan Hawke	QLD
Andrew Harris	VIC
Alison Hartigan	NSW
Brooke Hazlett	VIC
Pauline Henderson	NSW
Jane Henzell	QLD
Geraldine Hill	NZ
James Hilton	QLD
Erin Honeysett	NSW
James House	VIC
Michelle Hoy	NSW
Pei Huang	NSW
Shaista Hussaini	NSW
Christine Irving	QLD
Sharon Kaddatz	QLD
Luke Kearns	NSW
Abdul Khan	VIC
Thomas Kolotas	NSW
Catherine Kovatch	NSW
Katherine Levett	NSW
Chiharu Lupuleasa	TAS
Liza Mannix	NSW
Cologne Massurit	QLD
Craig McQuillan	NZ
Adrian Merchent	NSW
Lisa Mitchell	VIC
George Msapenda	SA
Sean Muir	TAS
Karl Mulcahy	QLD
Janice Murrell	VIC
Diana Nguyen	VIC
Renae Nguyen	NSW
Tracey Nugent	QLD
Joseph O'Sullivan	QLD
Catrina Panuccio	SA
Lori Perram	NSW
Sarah Petterson	NSW
Luke Pittman	NSW
Peter Price	WA
Ying Qin	QLD
Katrine Quinn	QLD
Azin Radfard	NSW
G Radhakrishnan	NSW
Charmaine Reader	NSW
Catherine Riches	WA
Karen Roskilly	NZ
Sally Ruthenberg	QLD
Shelley Spence	QLD
Kristin Sternbeck	NSW
Kirsten Strapps	ACT
Kathy Tawton	QLD
Amy Taylor	NSW
Danielle Taylor	WA
Peter Tierney	QLD
Kathyanne Thompson	NSW
Amanda Wright	NZ
Haidongi Zhangi	NSW
Jiazeng Zhao	NZ
Omaya Zirein	NSW

DDU examination results

The following were successful in the examinations held in May - June 2001

PART I

Socrates Angelides	NSW
Lisa Begg	QLD
Lucy Bowyer	NSW
Susanne Close	ACT
Glenn Gardener	NSW
Allan Kruger	SA
Denise Ladwig	NSW
Fatima Patel	NSW
Craig Pennell	WA
Carol Portmann	QLD
Sheryle Rogerson	VIC
Lip Gen Teh	WA
Kevin Warr	WA

PART II

Michael Bethune	VIC
Deborah Cohn	NSW
Stephen Cole	NSW
Richard Evans	QLD
David Ferrar	NZ
Gabriel Freilich	NSW
Michael Hession	NSW
David Kaye	VIC
Allen Lee	NSW
Joanne Ludlow	WA
Nilaofer Meher-Homji	NZ
Stanley Ng	NSW
Denise Roach	SA
Shiva Roy	NSW
Andrew Taylor	VIC
John Van Den Broek	VIC
Susan Walker	VIC
Christopher Wilkinson	SA

2002 DDU Examination Dates and Fees

Part I Examination Fee

A$385.00 (includes GST) for ASUM Members
A$660.00 (includes GST) for Non members

Part II Examination Fee

A$660.00 (includes GST) for ASUM Members
A$935.00 (includes GST) for Non members

Part II Casebook Fee

A$275.00 (includes GST)

Fees quoted above are from 1 July 2000 and may be subject to change.

PLEASE NOTE THE FOLLOWING INFORMATION PERTAINING TO THE NEXT DDU EXAMINATIONS

2002 Part I

Part I written examination will be held on Monday 20 May 2002
* Closing date for applications Monday 25 March 2002

2002 Part II

Casebooks for 2001 Part II DDU Examination must be submitted by Monday 21 January 2002 and accompanied by the prescribed fee of A$275.00 for all participants.

Part II written examination will be held on Monday 20 May 2002
* Closing date for applications Monday 25 March 2002

Part II oral examination will be held on Saturday 15 June 2002 in Sydney, (except Cardiac candidates, who will be examined in Melbourne on a date yet to be determined).

NB Applications received after the closing dates will not be accepted. All applications must be submitted on the original form as photocopies are not acceptable. All applicants are advised to read through the DDU handbook. For the latest copy, please contact ASUM on 61 2 9958 7655.

2002 DMU Examination Dates and Fees

DMU Calendar 2002

26 April 2002	Closing date for applications for an exemption
31 May 2002	Closing date for Part I and Part II applications
24 August 2002	Part I and Part II Written examination
October 2002	Part II Practical and OSCE examinations
December 2002	Part I Statement of Attainment mailed Part II results mailed

DMU Fees 2002

	ASUM Members	Non Members
Part I	A$450.00 + GST*	A$800.00 + GST*
Part II	A$800.00 + GST*	A$1200.00 + GST*

* GST applies to Australian Residents only

For Sale

Sonosite portable ultrasound machine for sale.
Brand new in boxes.
Please contact Digital Diagnostic Ultrasound® 02 6842 4237.
Best offer accepted.

DMU Exam Results 2000

The Board of Examiners Report

The Board of Examiners wishes to present the five candidates who undertook the DMU Part II examination under Regulation 6.2.4 which allows candidates to sit the examination provided they will attain the full 2 years experience within 6 months of the written exam.

The Board of Examiners extends congratulations and best wishes for a successful career

Part II Examination

The Board of Examiners has recommended to the ASUM Council that the Diploma of Medical Ultrasonography be awarded to the following candidates:
Anstis, Fay - NZ
Cameron, Helen - WA
Henman, Carl - NSW
Mathieson, Linda - NZ
Peters, Joshua - NSW

Sonographer

Sonographer required for either part/full-time attendance at either both or one of our Practices in Bondi Junction and Hurstville.

Clinical mix covers all forms of ultrasound except echocardiography.

Please apply to Dr Bryan Fain on 0412 648 029

Advanced Skills Radiographer - (Ultrasound), Medical Imaging Department, Mackay Base Hospital, Mackay Health Service District. Remuneration value up to $61 183 p.a., comprising salary between $49 022 - $53 624 p.a., employer contribution to superannuation (up to 12.75%) and annual leave loading (17.5%) (PO3) VRN: M085/01. **Duties/Abilities:** The successful applicant will perform a comprehensive range of medical imaging examinations including ultrasound. The incumbent will be prepared to participate in a roster including weekend, day, evening and oncall duties. Assistance with relocation and temporary accommodation will be considered. **Enquiries:** Brett Jackson (07) 4968 6041 or e-mail: Brett_Jackson@health.qld.gov.au **Application Kit:** (07) 4968 6525. **Closing Date:** 5.00 p.m. Monday, 8 October 2001.

HMKHMK0287

EXCITING OPPORTUNITY LONDON, UK

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Excellent hours, salary& holiday package Aus$82-96,000

Are you a friendly flexible experienced vascular sonographer? Would you be interested in working in London for 1-2 years as part of a small independent team of vascular technologists? The position offers excellent vascular experience in some of London's best hospitals. You will have team support and a good degree of day-to-day independence. Smart appearance and flexible working attitude are a must. Possibility of relocation package.

We require a minimum of 4 years full time vascular ultrasound experience and the full range of vascular tests. Applicants must hold British passport or be eligible for a work visa. Call Kate Sommerville on 00 44 207 720 3173 or email katesommerville@cs.com for more information.

SONOGRAPHER

The Department of Nuclear Medicine & Ultrasound at Westmead Hospital is seeking applications from an enthusiastic sonographer to be part of a friendly, professional team providing a wide range of examinations including general ultrasound, vascular ultrasound, obstetric ultrasound and echocardiography.

The department currently offers a 9 day fortnight and encourages and supports ongoing education including attendance at conferences, seminars and workshops.

Applications for part time/job share will be considered.

Essential

Previous ultrasound experience including obstetrics/gynaecology and abdominal ultrasound.
Diploma in Medical Sonography, DMU or equivalent or currently working towards completion of qualifications.
Eligible for membership with ASUM.
Willingness to participate in on-call duties, research, quality assurance and quality control.

Desirable

Minimum two years experience, although applicants who do not meet this criteria are still encouraged to apply.
Vascular or echocardiography experience, however training can be provided in these areas.
Background in Nuclear Medicine.

Duties

Responsible for the performance of high standard diagnostic ultrasound imaging.

Hours

Ranging from 0800-1800 hours and participation in on-call roster.

Enquiries

George Bonovas, Chief Technologist on 02 9845 6533 or email to ngb@imag.wsahs.nsw.gov.au

AUSTRALIAN INSTITUTE OF ULTRASOUND

GOLD COAST, ARE PROUD TO OFFER A NEW COURSE IN

INTENSIVE OBSTETRICS & GYNAECOLOGY

Begins with a weekend of theoretical ultrasound in obstetrics & gynaecology, followed by five days of intensive practical tuition in the skills required in high quality obstetric & gynaecological ultrasound practice.

Ultrasound Techniques in O&G - October 6th & 7th

This program covers a wide range of ultrasound applications in the evaluation of the fetus and the female pelvis. Program content is suitable for all practitioners of O&G ultrasound be they beginners or just wishing to update their knowledge. Registrations will be limited to 25

Course code OG01 Course Fees - $580.00

Practical Tuition Week - October 8th – 12th

This five-day program of intensive tuition is open to registrants of the weekend course but will be limited to a maximum of 6 applicants. Program content is suitable for those sonographers starting out in obstetrics, those who wish to update their technical skills and also for obstetricians wishing to complement their practical scanning skills.

Course code OG01-HO Course Fees - $2750.00

Contact us for further information...
Phone: (07) 55266655 Fax: (07) 55266041 Email: sue@aiu.edu.au
Program Information: Sue Davies Registration Information: Sally Ashwin

ROYAL ADELAIDE HOSPITAL

STATE OF THE ART IMAGING

2ND DENTAL RADIOLOGY CONFERENCE

23rd – 24th March 2002

The annual State of the Art Imaging Conference is held in Adelaide, South Australia. The year 2002 topic is **'DENTAL RADIOLOGY'**.

This 2 day Radiology Conference will be of interest to radiologists, dentists and others with an interest in dental imaging and dental radiology.

For further information you are invited to visit our website at http://**www.stateoftheartimaging.com.au** or contact Dr S Le P Langlois, or Susie Lazzaro, Department of Radiology, Royal Adelaide Hospital, North Tce, Adelaide SA 5000, Ph: 08-8222 5145, Fax: 08-8222 5964 or email: info@stateoftheartimaging.com.au

RMIT University

DEPARTMENT OF MEDICAL RADIATIONS SCIENCE

Since 1981, The RMIT University has offered a
Graduate Diploma in Ultrasonography.

The course is a two year part-time program designed for people who are already engaged in ultrasound practice, but wish to cultivate their knowledge in sonography and gain an accredited qualification. Distance education (external studies*) provides the flexibility necessary for remote and/or busy people to access university education and earn a living at the same time.

All subjects offered in the Graduate Diploma program may be undertaken as

Single Subject Enrolments.
People not wishing to undertake a whole course can choose to just enrol in subjects of particular interest. For example, Vascular Sonography, Ethics and Medico-legal Studies, Ultrasonic Instrumentation and Abdominal Sonography to name a few.

Course applications close November 30 for the start of year and June15 for the mid-year-intake. Late submissions will be considered. There is no closing date for single subject enrolments.

Admission requirements and further information:
Telephone (03) 9925 7700 Fax (03) 9925 7466 or email the Course Co-ordinator at paul.lombardo@rmit.edu.au

Extra information available at our website: http://www.bh.rmit.edu.au/mrs

*Some block attendance on campus is required.

Ballina 2001
Medical Imaging Conference

North Coast Sub-branch of the AIR
in conjunction with
North Coast Sub-branch of the ASUM

Ballina Beach Resort
Saturday 29th and Sunday 30th September

Saturday Ultrasound Program	
MRI for Dummies	Michael Watt
Workplace Ergonomics	Val Gregory
Medico Legal Update	
Hip Ultrasound	Rod McGregor
Sydney IVF	Dr Glen Taylor
Vascular Ultrasound	Dr John Graham
Soft Signs	Dr Frank Carmody
3rd Trimester Complications	Prof Benzie
Obstetric Case Studies	Peter Murphy
MRI vs US – Correlative Imaging	Dr Andrew Hooper, Dr Nick Repin
Sunday Ultrasound Program	
MAP insurance and superannuation	
Resuscitation	Catherine Johnson
Interactive Musculoskeletal Workshop	Mark Bryant, Barry Lennon, Peter Murphy

Contact co-convenors Peter Ogg (AIR) or Barry Lennon (ASUM) 02 6622 2288

Using MOSIPP to Meet ASAR CPD Requirements

Sonographer members of ASUM can use their MOSIPP diary to meet their ASAR CPD requirements. With accreditation becoming mandatory, sonographers will be required to demonstrate a level of involvement in continuing professional development in order to maintain their accreditation.

ASAR's requirement is 40 credit points over each triennium. Each February, ASUM transfers data for the past three years to ASAR, for those members who have requested this. For most members, this is not a problem, as their recorded hours far exceed the minimum requirement. It is not necessary to meet MOSIPP Certificate requirements (50 hours per year) in order to have your data transferred to ASAR.

Professional activity is characterised by a continual search for mastery in order to offer a service to one's patients and clients. Professional education is at the core of professionalism. The goal of continuing professional education and development (CPD) is to provide practitioners with enhanced knowledge and skills to continue professional practice, and the development of an increased sense of critical awareness. Research conducted by ASUM indicates that most members are diligent in maintaining their CPD. Nevertheless, changes in the regulatory environment have resulted in Societies such as ASUM, being asked to design continuing medical education programs and to enable members to demonstrate their involvement.

MOSIPP is ASUM's CPD program. It is a portfolio-based program that recognises the professional learning that individual members undertake to maintain professional competence. It has no compulsory activities. On completion of a learning activity simply take a minute to fill in the diary. Alternatively you may choose to set aside time each week, fortnight or month to reflect on your learning activity and update your record. In selecting what to include, you should ask yourself the question, "Does this entry fit within my plans for professional development?" If not, it probably should not be recorded.

What to Record

If you are selective your learning record will demonstrate the way that you have shaped your career, including the directions that you have chosen. It will reflect the importance that you place on continuous professional learning. Any learning experience that relates to your professional practice in Medical Ultrasound may be included. Your diary should be used to record items of learning that reflect the direction in which you are steering your career, relate to learning goals based on your assessment of practice needs, or reflect the adoption of innovations and changes. Examples of activities that are commonly recorded are:

1. Self-Directed Learning Activities
   - Reading articles in journals.
   - Studying/reviewing videotaped material.
   - First-time preparation for teaching.
   - Studying clinical and technical textbooks.
   - On-line learning.
2. Organised and Group Learning Activities
   - Attending scientific meetings, workshops, technical seminars, etc.
   - Clinical meetings or training sessions.
   - On-the-job training.
3. Professional Activity

Each year, in February, participants receive a profile comparing their record with that of the averaged data from the peer group of participants. Certificates are issued in February to members who have completed a total of at least 50 hours or points in categories 1 and 2 in the past year. Interim certificates may be issued to members who complete the 50 hours during the year.

To begin entering your data into your MOSIPP diary simply go on-line to http://www.asum.com.au/mosipp and follow the on-screen instructions. Alternatively contact Tim Brown tel 61 2 9958 6200 fax 61 2 9958 8002 education@asum.com.au to have a diary sent to you.

MOSIPP is a free service provided for ASUM members.

DMU Preparation Courses and DDU Physics Courses

February 2002

The DMU Part 1 Preparation Course will be held in Sydney, and has been tentatively scheduled for 20-24 February 2002. This is an intensive course to assist candidate's preparation for DMU Part I examination. The program includes lectures, laboratory sessions and tutorials for general and obstetric, vascular and cardiac specialities.

DMU Part 2 Preparation Courses will be held in Melbourne and Sydney. They have been tentatively scheduled for 6-10 February 2002 in Melbourne and 20-24 February 2002 in Sydney. These courses involve interactive programs, comprising lectures, tutorials and workshops designed to assist candidate's preparation for the DMU Part II examination. Separate programs for vascular and cardiac specialties will be conducted in Sydney only, conditional upon sufficient registrations being received.

The DDU Physics course is held in conjunction with the DMU Preparation Courses in Sydney. This intensive program of lectures has been tentatively scheduled for 21-23 February 2002.

Registration brochures will be published on ASUM's website: http://www.asum.com.au and included with the next issue of the Bulletin. For further information contact Tim Brown tbrown@asum.com.au tel 61 2 9958 6200 fax 61 2 9958 8002.

ASUM Obstetrics and Gynecology Workshop

April 2002

Sydney

Further details will be published in the November 2001 edition of the Bulletin.

Local and international speakers with hands-on workshops.

Contact: Tim (02) 9958 6200 education@asum.com.au

Coming soon, online registration information at http://www.asum.com.au

Chris Kohlenberg Teaching Fellowship 2001

(Sponsored by Diasonics GE)

In 2001, two Chris Kohlenberg Teaching Fellowships have been organised:

South Australia/Tasmania

Dr Victor Hurley will be the fellow for the meetings and workshops being conducted in South Australia and Tasmania. Victor is an obstetrician and gynaecologist, certified as a sub specialist in ultrasound by the Royal Australian and New Zealand College of Obstetrics and Gynaecology (RANZCOG). He is a partner in Melbourne Ultrasound for Women and is a staff specialist at Mercy Hospital for Women. Previously a medical councillor with ASUM, he is currently the Chairman of the Australasian Association of Obstetric and Gynaecological Ultrasonologists (AAOGU) and a member of the ultrasound sub-specialty committee for RANZCOG.

The planned activities will include formal presentations on recent developments in ultrasound in obstetrics and gynaecology, and fetal echocardiography as well as on-site workshops. Victor will be teaching in the following locations:

- Mt Gambier Tuesday 6th November
  For details contact: Brendan Goode, 08 8721 1600
- Whyalla Thursday 8th November
  For details contact: Wendy Blackwell, 08 8306 5612
- Adelaide Saturday 10th November
  For details contact: Stephen Bird, 08 8297 0588
- Hobart Sunday 11th November
  For details contact: Rob Jones, 03 6233 9333

New Zealand

Thanks to the generosity of Diasonics GE, a second teaching fellowship will be held in New Zealand in 2001, with a series of evening lectures to be held in:

- Hastings Wednesday 12th September
- Christchurch Thursday 27th September
- Dunedin Friday 28th September
- Wellington Saturday 29th September
- Workshop in Auckland on Saturday 3rd November.

For details contact Mike Heath 649 520 1003

This year's fellow is Quentin Reeves, an experienced musculoskeletal radiologist with a particular interest in MSK ultrasound. Quentin was a fellow in Musculoskeletal Imaging at UCLA 1990-91 and worked for 8 years in Sydney in private practice and at Prince of Wales Hospital. He developed a large practice in MSK imaging, in particular MRI and US, and was a founding member of the Australasian Musculoskeletal Imaging Group. He has been involved in registrar teaching of MSK ultrasound for the RACR and has given a number of presentations and has been involved in workshops. He was a radiologist at the Sydney Olympic Games where ultrasound was widely used. More recently he has been based at Palmerston North, New Zealand working in private practice.

The presentations will include Ultrasound in the Foot and Ankle, Ultrasound guided MSK Intervention and Tips and Pitfalls in MSK Ultrasound. Other MSK topics will also be covered at the workshop where he will be assisted by Mike Heath an experience ultrasonographer at Auckland Radiology Group.

Videotape library scheme catalogue

A mail order videotape lending scheme has existed for the benefit of ASUM members since early 1990.

New Material

Due to the success of the Vascular Ultrasound Workshop conducted in Melbourne in June, two new videotapes have been added to ASUM's Video Lending Scheme, with the plan of adding other titles from this workshop in coming months. The two new videotapes are:

- Planning carotid surgery with duplex: What a surgeon wants to know before and after the operation. (Gary Frydman, 2001); How do we validate carotid duplex when no DSA is available? (Gary Frydman, 2001)
- Ultrasound follow-up after arterial intervention: clinical perspectives. (Ken Myers, 2001); Duplex follow-up post arterial interventions: technical aspects. (Peter Coombs, 2001)

Videotapes are ideal for the professional development of those who were unable to attend the conference. For a complete videotape catalogue see http:\\www.asum.com.au/open/video.htm or contact ASUM, 2/181 High Street, Willoughby NSW 2068 Ph: 02 9958 7655 Fax: 02 9958 7655 Email: education@asum.com.au

How to Borrow a Videotape

Simply fill in the order form printed in this catalogue and send it, with payment, to ASUM VLS, 2/181 High Street, Willoughby NSW 2068. Orders will not be processed until full payment is received.

What does it cost?

The charge of $36 for members and $72 for non-members covers the cost of hire of up to 3 tapes and forwarding and returning charges.

New Zealand borrowers should contact Tanya O'Connor, Product Manager, Schering New Zealand Limited, 5 William Pickering Drive, North Harbour, Auckland, Ph: (649) 415 2856; fax: (649) 415 6497

Videotape Catalogue

25/131	Ultrasound follow-up after arterial intervention: clinical perspectives. (Ken Myers, 2001); Duplex follow-up post arterial interventions: technical aspects. (Peter Coombs, 2001)	30 mins
25/130	Planning carotid surgery with duplex: What a surgeon wants to know before and after the operation. (Gary Frydman, 2001); How do we validate carotid duplex when no DSA is available? (Gary Frydman, 2001)	30 mins
25/129	Diagnosis of focal hepatic lesions (Rob Gibson, 2000); Thyroid and parathyroid ultrasound - current applications (Rodger Colbert, 2000)	60 mins
25/128	Non immune hydrops - obtaining a diagnosis (Janet Vaughan, 2000); Congenital diaphragmatic hernia: prediction of outcome (Alistair Roberts, 2000)	60 mins
25/127	Novel fetal imaging methods (Nick Fisk, 2000); The nuchal thickness assessment (Victor Hurley, 2000)	60 mins
25/126	Ultrasound in the assessment of fibroids (Victor	60 mins

	Hurley, 2000); Vascular interventional techniques involving the uterus - the role of ultrasound assessment (David Rogers, 2000); Ultrasound guided uterine biopsy (Victor Hurley, 2000)	
25/125	Transplant Sonography (Andrew Little, 2000); Ultrasound in Portal Hypertension (Rob Gibson, 2000)	60 mins
25/124	Hip Ultrasound and Live Scanning (Ethna Phelan, 1999)	70 mins
25/123	Normal Female Pelvis (Ethna Phelan, 1999)	35 mins
25/122	Neonatal Spine (Ethna Phelan, 1999)	25 mins
25/121	Paediatric Cranial Ultrasound (Ethna Phelan, 1999)	80 mins
25/120	Fetal Growth Abnormalities (Michelle Melany, 1999)	45 mins
25/119	Fetal GU Tract. AIUM and ACR Guidelines (Michelle Melany, 1999)	35 mins
25/118	Ultrasound Assessment of the Fetal GI Tract (Michelle Melany, 1999)	55 mins
25/117	Fetal Neurosonography (Michelle Melany, 1999)	37 mins
25/116	Interventional Sonography in Children (John Pereira, 1999)	44 mins
25/115	The child with a limp (Roger Gent, 1999)	41 mins
25/114	The acute abdomen in the paediatric patient (Lyndal Cohen, 1999)	25 mins
25/113	The uses of ultrasound in the upper limb - the orthopaedic surgeon's point of view (Michael Hayes, 1999); Interventional shoulder ultrasound (Neil Simmons, 1999)	52 mins
25/112	Imaging the child with urinary tract infection; Ultrasound of the acute abdomen in the pediatric patient (Diane Babcock, 1999)	59 mins
25/111	Fetal abdominal masses (Tina Hayward, 1999); Common paediatric malignancies (Ethna Phelan, 1999)	54 mins
25/110	Male infertility and ultrasound (Charles Lott, 1999); Female fertility (Karen Shand, 1999)	60 mins
25/109	Evaluation of arterial injuries with color duplex ultrasonography; Non-invasive evaluation of the radial artery for coronary artery bypass grafting (Gail Sandager, 1999)	60 mins
25/108	Hepatobiliary intervention (A Little, 1999); Interventional Sonography in the new millennium (M Brooks, 1999)	60 mins
25/107	Thoracic intervention (M Andrews, 1999); Vascular intervention (J Vrazas, 1999); O & G intervention (L de Crespigny, 1999).	105 mins
25/106	Genitourinary intervention (J Vrazas, 1999); Prostate intervention (A Lavoipierre, 1999)	90 mins
25/105	Interventional sonography: evolution to revolution (A Little, 1999); Essentials and accessories in interventional sonography (M Andrews, 1999)	90 mins
25/104	The 18-20 Week Obstetric Ultrasound Examination (K Devonald & D Ellwood, 1993)	43 mins
25/103	'New horizons in ultrasound of the liver - part 1' (P Burns, 1998); 'New horizons in ultrasound of the liver - part 2' (S Wilson, 1998)	45 mins
25/102	'Sonographic evaluation of early twinning' (I Timor, 1998); 'A sonographic approach to skeletal dysplasia' (J Oldham, 1998)	45 mins
25/101	'The acute abdomen of hollow visceral origin. Ultrasound evaluation (S Wilson, 1998); 'Ultrasound of acutely traumatised ER patient (J McGahan, 1998)	60 mins
25/99	'Sonography of AIDS' (S Wilson, 1998)	30 mins
25/98	'Testicular ultrasound and surgical correlation' (P Graham, 1998)	20 mins
25/97	'A new look at the sonographic appearance of pelvic inflammatory disease' (I Timor, 1998)	25 mins
25/96	'Interventional tissue ablation' (J McGahan, 1998)	25 mins
25/95	'Haemodynamics and blood flow: interpreting the vascular examination' (P Burns, 1998)	20 mins
25/94	'Malformations detected using the transvaginal probe from 9 -16 weeks'; 'Fetal neurosonography: the new sections and planes proposed emulate neonatal neurosonography' (I Timor, 1998)	60 mins
25/93	'Transvaginal puncture procedures' (I Timor, 1998)	25 mins
25/91	'Ultrasound Contrast agents: update' and 'Harmonic imaging and Doppler' (P Burns, 1998)	60 mins
25/90	'What to say to a patient whose fetus has an abnormality' (N Anderson, G Duff, R. Allan, 1997)	10 mins
25/89	'Abdominal colour Doppler sonography' (A Lupetin, 1997) 'Ultrasound evaluation of portal hypertension' (C Owen, 1997)	60 mins
25/88	'Carotid sonography – lessons learnt from the NASCET, ACAS and ECST studies' (J Polack, 1997) 'Transcranial Doppler sonography' (A Lupetin, 1997)	50 mins
25/87	'Basic echocardiographic examination techniques' (B Anderson, 1997); 'Advanced echographic techniques – assessment of valvular stenosis and valvular regurgitation' (B. Anderson, 1997)	120 mins
25/86	'Power Doppler and the 18 week heart' (G Davison, 1997); 'Modern management of twin to twin transfusion' (R Cincotta, 1997)	60 mins
25/85	'What structures should be examined in first trimester scans?' (L de Crespigny, 1997); 'The role of Doppler in the management of fetal well-being' (J Vaughan, 1997)	60 mins
25/84	Male Urinary Tract 'Scrotal Sonography' 'Prostate Ultrasound' (A Lupetin, 1997), ''Sperm Lake' – xtratesticular echography' (A Patel, 1997), 'Ultrasound of impotence' (A Lupetin, 1997)	120 mins
25/83	Paediatric Ultrasound 'Paediatric craniospinal ultrasound', 'Paediatric female pelvic ultrasound – what it can tell us?' (E Phelan, 1997) 'Paediatric hip ultrasound - current criteria and techniques', 'Paediatric renal ultrasound update' (L Coleman, 1997)	120 mins
25/82	Renal and Mesenteric Arteries 'Visceral arterial scanning: Practice and pitfalls in assessing the mesenteric and renal circulations.'; 'How I evaluate renal and liver transplants.' (M Neumyer, 1997)	45 mins
25/81	Extremities II 'Arteriovenous access grafts: The value of blood flow analysis and long term follow up.' (M Neumyer, 1997); 'How to successfully compress femoral false aneurysms' (A Burnett, 1997); 'Surveillance of infrainguinal grafts' (J Kidd, 1997); 'How does upper extremity venous imaging impact on therapy?' (M Katz, 1997)	60 mins
25/80	Extremities I 'What drives blood flow from the lower extremity?'; 'Venous insufficiency: Combining air plethysmography and venous duplex scanning' (M Katz, 1997)	50 mins
25/79	Carotid Artery Ultrasound 'Current trends in carotid artery diagnosis' (K Myers, 1997); 'The fibrous cap: what can ultrasound tell us?' (M Appleberg, 1997); 'What is the current role of transcranial Doppler?' (M Katz, 1997); 'Adapting carotid reports for surgery without angiography' (J Harris, 1997)	60 mins
25/78	Vascular Imaging Techniques 'Conventional angiography' (R Waugh, 1997); 'Spiral CT/MRI' (P Walker); '3-D ultrasound and power Doppler' (R Gill, 1997); 'Early experience with ultrasound contrast agents' (P Walker, 1997); 'Intravascular ultrasound' (G White, 1997)	75 mins
25/77	An Introduction to Duplex Scanning of the Carotid Artery (J Harris and J Kidd)	17 mins
25/76	Upper Abdomen Scan Technique (M Harkness)	42 mins

25/75	Artifacts (Laurie Wilson, 1997)	40 mins
25/74	Bioeffects / Safety (Stan Barnett, 1997)	60 mins
25/73	Basic Doppler and Colour Doppler and Doppler Artifacts (Rob Gill, 1997)	120 mins
25/72	Transducer Beams and Arrays and Advanced Imaging (Dave Carpenter, 1997)	112 mins
25/71	Displays and Storage (Mike Dadd, 1997) and Power Measurements / Standards (Dave Carpenter, 1997)	120 mins
25/70	Basic Physics and Basic Imaging (Mike Dadd, 1997)	70 mins
25/63	Closing Plenary Session 1996 'Is there a future for the generalist?' (E.Grant, 1996); 'Invasive and non invasive tests for chromosome abnormalities: Present and future studies.' (W Holzgreve, 1996); 'Where are we with choroid plexus cysts?' (T Chudleigh, 1996); 'Quo vadis?' (P Burns, 1996)	108 mins
25/62	Vascular Plenary Session 1996 'Technological advances enhancing vascular ultrasound examination' (P Burns, 1996); 'Consensus on carotids: Can we find this Holy Grail?' (D Cavaye, 1996); 'Where are we today with renal scanning? Parenchymal versus main renal artery scanning.' (E Grant, 1996); 'Training, Accreditation and Quality Assurance for Vascular Laboratories.' (B Thiele, 1996)	127 mins
25/61	General Plenary Session 1996 'Should all pregnancies have a transvaginal ultrasound? What would it tell us?' (W Holzgreve 1996); 'Significance of fetal renal pelvic dilatation' (T Chudleigh 1996); 'Ultrasound in the emergency room' (E Grant 1996); 'Managing your image in the network age'. (P Burns 1996)	125 mins
25/60	Abdominal and Scrotal Doppler 'Hepatic vasculature' (W Middleton, 1995); 'Inflammation conditions'; 'Renal artery stenosis and renovascular hypertension'; 'Colour duplex sonography of the scrotum'; 'Colour duplex sonography in acute scrotal pain' (T Stavros, 1995)	180 mins
25/59	Abdominal Imaging 'Abdominal sonography'; 'Advanced gall bladder' (W Middleton, 1995); 'The normal appendix', 'The normal appendix and RLQ pain'; 'Inguinal canal and inguinal hernias' (T Stavros,1995)	180 mins
25/58	Technical '3D ultrasound'; 'Contrast agents'; 'Ultrasound artifacts'; 'Doppler ultrasound' (W Middleton,1995)	140 mins

UL/RHW Collection

25/69	Venous Ultrasound Workshop. Assessing varicose veins and venous insufficiency (T Beckwith, 1995)	180 mins
25/68	'Deep Venous Thrombosis' (W. Lees, 1995); 'Doppler of mesenteric ischemia' (T Stavros, 1995)	60 mins
25/67	Doppler sonography of the hepatic vasculature (W Middleton, 1995)	60 mins
25/66	Musculo Skeletal Ultrasound 1995 – II. Live scanning of shoulder, knee & ankle workshop (Bruno Giuffre and John Read, 1995)	92 mins
25/65	Musculo Skeletal Ultrasound 1995 -I 'Sonography of the shoulder' (W Middleton, 1995); 'Sonography of the knee' (B.Giuffre, 1995); 'Sonography of the forearm and hand' (J Read, 1995); 'Sonography of the ankle tendons' (W Middleton, 1995)	113 mins
25/64	Sports Medicine (John Read, 1995)	91 mins
25/57	Pancreatic Sonography (Phil Ralls, 1994)	45 mins
25/56	The Painful Hip in Childhood and Parenchymal Renal Disease in Children (Garry LeQuesne, 1994)	90 mins
25/55	Cerebral Vascular Disease (Michael Appleberg, 1994) and Carotid Artery Scanning (Alison Kelly, 1994)	90 mins
25/54	Window on the Leg (Trevor Beckwith, 1994)	45 mins
25/53	High Resolution Colour Flow Sonography (Phil Ralls, 1994)	45 mins
25/52	Basic Imaging (Michael Dadd, 1994) and New Imaging Technology (David Carpenter, 1994)	75 mins
25/51	Ovarian Sonography (Phil Ralls, 1994)	45 mins
25/50	Basic Doppler (Laurie Wilson) and Doppler Artifacts (Rob Gill, 1994)	95 mins
25/49	Haemodynamics (Thanasis Loupas, 1994) and Colour Doppler (Rob Gill, 1994)	85 mins
25/48	Fetal Echocardiology (James Grimwade, 1994)	45 mins
25/47	Breast sonography (John Read, 1994)	39 mins
25/46	Tendons (John Read, 1993)	60 mins
25/43	Normal Circulation of the Liver. Segmental Liver anatomy and normal Hepatic and Portal circulation. (Michael Lafortune, 1993)	60 mins
25/42	Paediatric Liver Disease (Heidi Patriquin, 1993)	60 mins
25/41	Haemodynamics (Thanasis Loupas, 1993)	35 mins
25/39	Fetal Abnormalities (Peter Warren, 1991)	50 mins
25/37	Colour Doppler of the Kidneys (Ed Grant, 1991)	76 mins
25/35	Colour Doppler in Arteries and Veins (Ed Grant,1991)	50 mins
25/34	Carotid Ultrasound Revisited (Barbara Carroll, 1989)	60 mins
25/25	Introduction to Anatomy of the Liver, Biliary Tract & Pancreas (Stuart Heap, 1989)	80 mins
25/24	Neonatal Heads (Lachlan de Crespigny, 1989)	60 mins

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Orders will not be processed until full payment is received.

Ultrasound Events

Fri 24 Aug 2001 - 3days Practical Aspects of Obstetrical and Gynecological Ultrasound: Optimize Your Skills (AIUM). *Venue:* Crowne Plaza Manhattan, New York, NY USA. *Contact:* The American Institute of Ultrasound in Medicine Ph: 301 498 4100; Fx: 301 498 4450; Email: conv_edu@aium.org; Website: www.aium.org

Sat 25 Aug 2001 DMU Part I and Part II Written Examinations. *Contact:* DMU Co-ordinator, ASUM, 2/181 High Street, Willoughby NSW 2068 Ph: 02 9958 7655; Fx: 02 9958 8002; Email: dmu@asum.com.au

Sun 2 Sep 2001 - 3 Days International Course - The Fetus as a Patient. *Venue:* Ioannina, Greece *Contact:* Ph: 01 749 9315; Fx: 01 770 5752; Email: lianae@triaenatours.gr

Thur 6 Sep 2001 ASUM 2001-Skills Development Day *Venue:* Darling Harbour Convention Centre, Sydney *Contact:* The Hotel Network, PO Box 236, Roseville NSW 2069 Ph: 61 2 9411 4666; Fx: 61 2 9411 4243; Email: asum@hotelnetwork.com.au

Fri 7 Sep 2001 ASUM 2001-Annual Scientific Meeting *Venue:* Darling Harbour Convention Centre, Sydney *Contact:* The Hotel Network, PO Box 236, Roseville NSW 2069 Ph: 61 2 9411 4666; Fx: 61 2 9411 4243; Email: asum@hotelnetwork.com.au

Tue 11 Sep 2001 BMUS Oncology Workshop. *Venue:* The Western Infirmary, GLASGOW. *Contact:* Oncology Workshop, BMUS, 36 Portland Place, London W1B 1LS Ph: 44 0 20 7636 3714

Wed 12 Sep 2001 ASUM NZ Branch Meeting. Lectures with Chris Kohlenberg Teaching Fellow, Quentin Reeves *Venue:* Hastings *Contact:* Mike Heath Ph: 649 520 1003

Wed 12 Sep 2001 ASUM WA Branch. Vascular Meeting with Dr A Kaard. *Venue:* Radiology Department, Royal Perth Hospital. *Contact:* Michelle Pedretti Ph: 08 9400 9030.

Wed 12 Sep 2001 BMUS Deep Venous Thrombosis Workshop. *Venue:* Postgraduate Centre, Morriston Hospital, SWANSEA. *Contact:* DVT Workshop, BMUS, 36 Portland Place, London W1B 1LS Ph: 44 0 20 7636 3714

Sun 16 Sep 2001 - 4 days Health Care in Perspecitive 2001. *Venue:* Hobart. *Contact:* Casemix Conference Secretariat: Conference Logistics, PO Box 201, Deakin West, ACT, 2600 Ph: 02 6281 6624; Fx: 02 6285 1336; Email: conference@conlog.com.auconference@conlog.com.au

Tue 18 Sep 2001 ASUM Queensland Education Program. Vascular Meeting *Venue:* RBH. *Contact:* Roslyn Savage Fx: 07 3881 2464; Email: markros@powerup.com.au

Mon 24 Sep 2001 BMUS Arterial Ultrasound Study Day. *Venue:* British Institute of Radiology. *Contact:* Arterial Study Day, BMUS, 36 Portland Place, LONDON W1B 1LS Ph: 44 0 20 7636 3714

Thu 27 Sep 2001 ASUM NZ Branch Meeting. Lectures with Chris Kohlenberg Teaching Fellow, Quentin Reeves *Venue:* Christchurch *Contact:* Mike Heath Ph: 649 520 1003

Fri 28 Sep 2001 ASUM NZ Branch Meeting. Lectures with Chris Kohlenberg Teaching Fellow, Quentin Reeves *Venue:* Dunedin *Contact:* Mike Heath Ph: 649 520 1003

Sat 29 Sep 2001 ASUM NZ Branch Meeting. Lectures with Chris Kohlenberg Teaching Fellow, Quentin Reeves *Venue:* Wellington *Contact:* Mike Heath Ph: 649 520 1003

Sat 29 Sep 2001 - 2 days Ballina Imaging Conference 2001. Combined AIR/ASUM meeting. *Venue:* Ballina Beach Resort. *Contact:* Barry Lennon Ph: 02 6622 2288; Email: lemonhed@ncrad.com

Sun 30 Sep 2001 ASUM Victorian Branch Meeting. Vascular Ultrasound. *Venue:* Ground floor lecture theatre, Mercy Hospital for Women *Contact:* Dr Mark Brooks Ph: 03 9496 5431; Fx: 03 9459 2817

Tue 9 Oct 2001 - 3 days The Theory of Obstetric Medicine. *Venue:* The Royal College of Physicians, Regents Park, London NW1. *Contact:* The Symposium Office, Division of Paediatrics, Obstetrics and Gynaecology, IRDB, Imperial College School of Medicine, Hammersmith Campus, Du Cane Road, London W12 0NN Ph: 44 0 20 7594 2150; Fx: 44 0 20 7594 2155; Email: sympreg@ic.ac.uk; Website: www.symposia.org.uk

Thu 11 Oct 2001 - 3 days Australian & New Zealand Society of Vascular Surgery Annual Scientific Meeting and Vascular Imaging Symposium. *Venue:* Westin Hotel, Martin Place, Sydney. *Contact:* ANZSVS 2001 Secretaria, Abacus Management Pty Limited, PO Box 77, Pymble 2073 Australia Ph: 61 2 9439 7477; Fx: 61 2 9439 5616; Email: abacus@abacusconf.com

Sat 13 Oct 2001 - 2 days Course on Vascular Ultrasound: State-of-the-art. *Venue:* The Crowne Plaza Union Square, San Francisco, CA, USA. *Contact:* UCSF, Radiology Postgraduate Education, 3333 California St, Suite 375, San Francisco, CA 94143-0629, USA.

Mon 22 Oct 2001 An Introduction to Cardiac Morphology. *Venue:* Lecture Theatre, Sydney Children's Hospital, Randwick. *Contact:* Lynne Portelli, Cardiac Society of Australia and New Zealand, Macquarie Street, Sydney 2001 Email: csanz@racp.edu.au

Tue 23 Oct 2001 - 4 days Congress of the Asian Fed of Soc for Ultrasound in Medicine and Biology. *Venue:* The Shangri-La Hotel, Kuala Lumpus, Malaysia. *Contact:* Mrs Janet Low, Ex Secretary, Department of Radiology, University of Malaya, Medical Centre, 59100 Kuala Lumpur, Malaysia Ph: 60 3 7502069; Fx: 60 3 7581973; Email: janetl@medicine.med.um.edu.my

Tue 23 Oct 2001 - 5 days 11th World Congress on Ultrasound in Obstetrics and Gynecology *Venue:* Convention Centre, Melbourne, Australia. *Contact:* Andrew Ngu, c/- ISUOG, 3rd fl, Lanesborough Wing, St George's Hospital Medical School, Cranmer Terrace, London SW17 ORE, UK Ph: 44 20 8725 2505; Fx: 44 20 8725 0212; Email: johnson@sghms.ac.uk

Fri 26 Oct 2001 - 3 days Annual Meeting Society of Radiologists in Ultrasound. *Venue:* Inter-Continental Hotel, New Orleans, LA, USA. *Contact:* Susan Roberts, Administrative Director, 44211 Slatestone Court, Leesburg, VA 20176-5109, USA Ph: 1 703 858 9210; Fx: 1 703 729 4839; Email: info@sru.org

Sat 3 Nov 2001 ASUM NZ Branch Meeting. Workshop with Chris Kohlenberg Teaching Fellow, Quentin Reeves *Venue:* Auckland *Contact:* Mike Heath Ph: 649 520 1003

Sat 3 Nov 2001 ASUM Tasmanian Branch Meeting. *Venue:* University of Tasmania - Sandy Bay Campus *Contact:* Fiona Thompson; Ph: 03 6223 2941

Tue 6 Nov 2001 ASUM SA Branch Meeting. Chris Kohlenberg

Teaching Fellow, Dr Victor Hurley to present on Obstetrics and Gynaecology in Ultrasound. *Venue:* Mount Gambier *Contact:* Brendan Goode Ph: 08 8721 1600

Thu 8 Nov 2001 ASUM SA Branch Meeting. Chris Kohlenberg Teaching Fellow, Dr Victor Hurley to present on Obstetrics and Gynaecology in Ultrasound. *Venue:* Whyalla *Contact:* Wendy blackwell; Ph: 08 8306 5612

Sat 10 Nov 2001 ASUM SA Branch Meeting. Chris Kohlenberg Teaching Fellow, Dr Victor Hurley to present on Obstetrics and Gynaecology in Ultrasound. *Venue:* Adelaide *Contact:* Stephen Bird Ph: 08 8297 0588

Sat 10 Nov 2001 – 2 days Fetal Echo Update and, Use of Ultrasound in the Emergency Patient (AIUM). *Venue:* Alexis Park Resort, Las Vegas, NV USA *Contact:* The American Institute of Ultrasound in Medicine Ph: 301 498 4100; Fx: 301 498 4450; Email: conv_edu@aium.org; Website: www.aium.org

Sun 11 Nov 2001 ASUM Tasmanian Branch Meeting. Chris Kohlenberg Teaching Fellow, Dr Victor Hurley, to present an Obstetrics and Gynaecology in ultrasound *Venue:* Hobart *Contact:* Rob Jones Ph: 03 6233 9333

Tue 13 Nov 2001 ASUM Queensland Education Program. Vascular Meeting *Venue:* Queensland X-ray. *Contact:* Roslyn Savage Fx: 07 3881 2464; Email: markros@powerup.com.au

Tue 27 Nov 2001 ASUM Victorian Branch Scientific Meeting. Combined ASUM/ASA case presentation night. *Contact:* Mark Brooks Ph: 03 9496 5431; Fx: 03 9459 2817

Tue 11 Dec 2001 - 4 days 13th EUROSON/33rd BMUS Annual Scientific Meeting & Exhibition *Venue:* Edinburgh International Conference Centre, Scotland. *Contact:* The British Medical Ultrasound Society, 36 Portland Place, LONDON W1B 1LS, UK Ph: 44 0 20 7636 3714; Fx: 44 0 20 7323 2175; Email: euroson@bmus.org; Website: www.bmus.org

2002 Annual Convention Society of Diagnostic Medical Sonographers (SDMS) *Venue:* Las Vagas, NV, USA. *Contact:* Beth Plater, Dir Of Meetings and Conv, 12770 Coit Road, Ste 708, Dallas, TX 75251, USA Ph: 1 972 239 7367; Fx: 1 972 239 7378; Email: bplater@sdms.org

2002 18th Annual congress International Society "The Fetus as a Patient". *Venue:* Budapest, Hungary. *Contact:* Dr FA Chervenak, MD, Cornell Univ Dept of OB/GYN, 525 East 68th Street, New York, NY 10021, USA Ph: 1 212 746 3184; Fx: 1 212 746 8717; Email: mad2011@mail.cornell.com

Fri 8 Feb 2002 - 3 days 6th World Congress of Echocardiology and Vascular Ultrasound. *Venue:* Hotel Ashok, New Delhi, India. *Contact:* Dr Satish K. Parashar, C-144 Sarita Vihar, 110044 New Delhi, India Ph: 91 11 6945873/694 6552; Fx: 91 11 694 2222/695 1055; Email: parashar@ndf.vsnl.net.in

Sat 9 Mar 2002 - 5 days Joint meeting of the Perinatal Society of Australia and New Zealand with the Federation of Oceania and Asia Perinatal Societies. *Venue:* Christchurch, New Zealand *Contact:* Susan Day at Wyeth Clinical Services: days@labs.wyeth.com

Sun 10 Mar 2002 – 3 days 46th AIUM Annual Convention. *Venue:* Opryland Hotel, Nashville, TN USA. *Contact:* The American Institute of Ultrasound in Medicine Ph: 301 498 4100; Fx: 301 498 4450; Email: conv_edu@aium.org; Website: www.aium.org

Sat 1 Jun 2002 - 6 days AIUM hosting World Federation for Ultrasound in Medicine and Biology (WFUMB). *Venue:* Montreal Convention Centre, Montreal, Canada. *Contact:* The American Institute of Ultrasound in Medicine Ph: 301 498 4100; Fx: 301 498 4450; Email: conv_edu@aium.org; Website: www.aium.org

Wed 26 Jun 2002 - 5 days Euroson 2002: 14th Congress of the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB). *Venue:* Palace of Culture, Warsaw, Poland. *Contact:* Imaging Diagnostics Department, Brodno Country Hospital, ul Kondratowicza 8, 03-242 Warszawa, Poland Ph: 48 22 8119677; Fx: 48 22 8119591; Email: usgptuwj@euroson.edu.pl

Thu 19 Sep 2002 - 4 days ASUM 2002. *Venue:* Jupiters Casino on the Gold Coast. *Contact:* ASUM, 2/181 High Street, Willoughby, NSW, 2068 Ph: 61 2 9958 7655; Fx: 61 2 9958 8002; Email: asum@asum.com.au

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Guidelines for authors

Authors are invited to submit papers for publication in the following categories. Final responsibility for accepting a paper lies with the Editor, and the right is reserved to introduce changes necessary to ensure conformity with the editorial standards of the *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 *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.

FEATURE ARTICLES

Feature articles are original papers, or articles reviewing significant areas in ultrasound and will normally be illustrated with relevant images and line drawings. Feature articles are commissioned by the Editor who will indicate the size and scope of the article.

FORUM ARTICLES

Members are invited to contribute short articles expressing their observations, opinions and ideas. Forum articles should not normally exceed 1000 words in length. 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 in the *Bulletin*. Each listing must contain: activity title, dates, venue, organising body and contact details including name, address, phone number, facsimile number (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

Manuscripts should be submitted in triplicate in print and on PC formatted diskette as MS Word documents.

- Font size: maximum 12, minimum 10
- Double spacing for all pages
- Each manuscript should have the following components: Title page, abstract, text, references, tables, legends for illustrations.
- Title Page should include the following:
  - ❖ 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.
- Relevant 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. **Vancouver style format should be used.**

  Examples of Vancouver style:

  1. In-text citation: ....as documented in previous studies (1-3). Note: Not superscript
  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

All 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. All images sent must have all personal and hospital or practice identifiers removed. Please do not embed images in text. Separate images are required for publication purposes. Figure legends must be provided for the images. 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 (eg Letraset). (Please send one copy of illustrations without labelling as this can be added electronically prior to publication.) On the back of the print include the authors name, figure number and a directional arrow indicating the top of the print. Digitised graphics should be supplied on PC formatted 3.5" diskette, ZIP disk or CD, which must be clearly labelled with the author's name and the names of the image files. JPG or TIFF files are preferred. ZIP disk and CD will be returned after publication if requested. Please do not submit images direct from CPD cameras as these may presentproblems.

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