ABSTRACT

Poster Presentations

Ultrasound of neonates in the neonatal intensive care unit

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Introduction: Neonates in the neonatal intensive care unit (NICU) require ultrasound examination for a number of clinical indications or screening.

Method: The presentation will outline the main sonography techniques performed in the NICU. This includes cranial, chest and abdominal sonography (cardiac imaging will not be discussed). Imaging may be carried out by sonographers or neonatology clinicians, as a POCUS examination.

Results: Each section of the presentation outlines various ultrasound techniques for examining critical care neonates.

Conclusion: Sonographers performing ultrasound imaging in the NICU will require specialised training in the techniques used to diagnose abnormalities specifically found in critically ill neonates.

Take home message: Specialised training may be required for performing ultrasound in the NICU.

HELLP! What am I looking for?

Mr Vincent Lam, Ms Priscilla Tran, Ms Kirsty Chung, Ms Kirsty Miller, Ms Joylin Sam
Barwon Medical Imaging

Introduction: 25 year old pregnant female (20 + 5) presented to emergency with 3 days of sudden right upper quadrant pain. An ultrasound examination of the abdomen was requested querying gallstones. Serial abdominal and obstetric ultrasounds and a subsequent abdominal MRI, depict progression of disease, the importance of assessing prior imaging and being able to qualitatively describe changes in the liver.

Method: Initial imaging of the patient's abdomen was performed on presentation to emergency with no apparent pathology and a single live intrauterine pregnancy noted. Two days later, due to increasing pain and erratic alterations in LFTs, an abdominal ultrasound was again requested. Persistently elevated foetal heart rate was noted in conjunction with a sudden increased, patchy echo texture of the liver, which at the time of reporting was of uncertain significance. Subsequent MRI found an irregular liver capsule that was deemed of unknown significance. The disease was progressing with no diagnosis. On day 7 of admission, an obstetric ultrasound sadly showed, the foetus was demised.

Conclusion: This reflective case study highlights the importance of previous imaging, patient history and creates awareness of the criteria of HELLP syndrome (Haemolysis, Elevated Liver Enzymes, Lowered Platelets). HELLP syndrome is a rare disorder of unknown cause affecting less than 1% of all pregnancies. Assessment of the maternal liver can provide evidence of intraparenchymal rupture and haematomas, however these findings can be subtle.

Take home message: Ultrasound of the maternal liver can be a useful tool for aiding in the diagnosis of HELLP syndrome.

First impressions of introducing peer review into postgraduate sonography education

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Introduction: Case studies and literature reviews are standard publication types that communicate relevant themes in sonographic journals. Postgraduate sonography students are educated and assessed to develop written communication skills in these formats. Peer review is an essential step in ensuring high-quality publication; however, to the author’s knowledge, the peer review process has not yet been integrated into postgraduate sonographic education. Consequently, many students complete their studies with little understanding or experience of the peer-review process. Peer review is a collaborative learning process that encourages metacognition (thinking about learning). It is common in other fields (e.g., law and business) and is recognised to aid the development of essential real-world skills, such as leadership and teamwork. We postulate that embedding a simplified peer-review practice into the curriculum will benefit both reviewer and reviewee and may encourage students to participate in formal peer-review in future.
Methods: In the first semester of 2022, an anonymous peer-review process was introduced into our Graduate Diploma of Medical Ultrasound course curriculum. This process was applied to one first-year unit assessment (case study) and two second-year unit assessments (case study and narrative review). Following submission and review, students were issued a short survey to determine their perspective on the usefulness of this process.

Results: In this work, we report on the general themes and strategies used during the implementation of the peer-review process.

Fetal growth restriction and ultrasound parameters associated with adverse neurodevelopmental outcomes: A systematic review

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The University of Melbourne

Introduction: Ultrasound findings may predict which babies are at increased risk for poor neurodevelopmental outcomes. The aim of this study was to investigate which fetal ultrasound findings are associated with poor neurodevelopment in singleton growth restricted babies.

Methods: A literature search was performed in MEDLINE, Embase, PubMed, CINAHL and Clinicaltrials.gov. Studies were included where there was antenatal evidence of singleton fetal growth restriction, ultrasound was used to identify fetal growth restriction and neurodevelopment was measured after birth. There was no limitation on language or publication date.

Results: From 5933 articles, 47 met the inclusion criteria and were included in qualitative analysis. Placental and fetal Dopplers were the most frequently investigated ultrasound finding in those who had poor neurodevelopment after birth. Abnormal fetal Dopplers were associated with poor neurodevelopment beyond 12 years. There were no studies that included placental appearance, cord insertion, cervical length or uterine pathology in ultrasound assessments. Heterogeneity of the retrieved literature reporting resulted in limited quantitative analysis.

Conclusions: Abnormal ultrasound findings in conjunction with fetal growth restriction, are associated with poor neurodevelopmental outcomes. These additional findings may be able to identify infants requiring early intervention and/or long term follow up. These findings include abnormal umbilical artery and middle cerebral artery Dopplers, which were previously suggested to provide a protective effect on the fetal brain. Further research is required to determine additional ultrasound markers that may be of benefit in improving risk stratification.

Ultrasound of the intersex infant

Ms Allison Holley

Allison Holley

High-resolution ultrasound is an invaluable tool in the investigation of ambiguous genitalia when visual/clinical examination proves inconclusive in the newborn. It provides quick reliable information not only on the presence or absence of internal sexual organs but also their development that is, rudimentary vs normal development for age. In these cases, ultrasound can be used to establish the child’s biological sexual characteristics. This poster will present a case study of a 4 h old child with ambiguous genital who was determined to be intersex following ultrasound screening. The term ‘Intersex’ covers people who do not fit the typical binary notion of male or female body types. This can present in variations in their sex hormones, chromosomes, gonads or genitals. The term ‘Intersex’ does not define a person’s sexual orientation or gender identity.

The missing piece of the puzzle

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Introduction: 31 y/o Female G5P0 (2× TOP and 2× first trimester loss), Nil Significant Medical History, Low risk NIPS, Normal Morphology (external), U/S at 29/40 for APH and abdominal Pain.

Method: Initial imaging of fetal head included traditional axial views. On noting of absent cavum septum pellucidum (CSP) additional views were performed to ascertain the presence/absence of corpus callosum. Due to fetal lie only coronal views were obtained in addition to axial views. Ideally, sagittal views to assess for absence of the corpus callosum and the callosal artery would have been obtained in this particular case.

Results: Absence of the CSP. Isolated non-visualisation of the corpus callosum and bilateral colpocephaly were noted. Two tertiary centres confirmed absence of the corpus callosum with ultrasound, which was also confirmed with MRI. Amniocentesis showed 13q34 microduplications, which has associations with intellectual disability and facial dysmorphism. Patient underwent Mife and MISO termination of pregnancy at 34 + 4/40.

Conclusion: It is suggested that a normal CSP should be visualised in 100% of fetuses up till 37 weeks gestation and its absence in the second half of the second trimester is almost synonymous with absence of the corpus callosum.

Take home message: Sonographic visualisation of the CSP from mid-second trimester onwards is imperative. Sagittal views of the corpus callosum should be attempted on all fetuses at the 20 week morphology ultrasound examination.
Ultrasound estimation of fetal weight accuracy in a regional hospital: A retrospective audit

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Introduction: Ultrasound estimated fetal weight (EFW) is a vital part of prenatal care. We aimed to determine the accuracy of sonographic EFW at a regional Australian hospital, explore factors associated with EFW accuracy and review accuracy calculation methods.

Methods: Ultrasound EFW (Hadlock C) was calculated within one week of a live delivery, for 357 singleton pregnancies. EFW accuracy, the difference between EFW and live birthweight (LBW), was quantified using percentage error (PE); absolute error (AE); ‘signed’ error and AE ±10% of LBW.

Results: Estimations of accuracy varied by calculation method, with PE smaller (mean 2.3% [CI 1.5, 3.1], median PE 2.4% [IQR –3.4, 6.7]) than AE (mean 6.4% [CI 5.9, 6.9], median AE 5.1% [IQR 2.7, 9.0]). Signed error indicated the majority of EFWs were overestimates and 80.1% of EFW calculations had an AE within 10% of LBW. EFW inaccuracy (AE ≥10% of LBW) varied between sonographers (p = .023) and scan to delivery interval (p = .003).

Conclusions: EFW accuracy rates at Orange Hospital, NSW, were similar to published error rates. EFW accuracy varied with sonographer and with time from scan to delivery. Absolute error provides more useful and comparable information than percentage error of EFW.

Take home message: EFW accuracy should be reported as absolute error to reflect the true magnitude of any inaccuracies and/or a signed percentage error to indicate over or underestimation.

Pattern of renal blood flow in sickle cell disease adult patients

Professor Akram Asbeutah
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Introduction: Sickle cell disease (SCD) patient are at risk of developing sickle nephropathy (SN). The aim of this study was to evaluate renal blood flow patterns and reno-vascular parameters in adult SCD patients without laboratory evidence of renal impairment.

Methods: Sixty-five steady-state adult patients with SCD, and 30 age- and sex-matched healthy controls were studied. Kidney length, echo pattern, peak systolic velocity (PSV), end-diastolic velocity (EDV), renal-aortic ratio (RAR), resistive index (RI), acceleration time (AT) and renal vein velocity (RVV) were acquired, recorded and analysed using a curvilinear transducer of 1–5 MHz.

Results: The highest mean for renal length and cortical thickness in the SCD and control groups were 11.78 ± 1.30 cm and 11.27 ± 0.77 cm, and 1.86 ± 0.41 cm and 1.78 ± 0.28 cm, respectively. The figures were significantly higher in the SCD patients group than the control group (p < .05). Sixty (90.8%) patients had a mild diffuse increase in cortical echogenicity with preserved renal cortical thickness. The highest mean extra-renal PSV in the SCD and control groups were 138.46 ± 56.32 cm/s and 101.75 ± 31.48 cm/s, respectively (p < .05). However, the highest intrarenal RI and AT in SCD and control groups were 0.69 ± 0.07 and 0.06 ± 0.02 s and 0.63 ± 0.05 and 0.04 ± 0.01 s, respectively (p < .05). There was no significant correlation between RI and AT and PSV among the SCD patients (p > .05).

Conclusions: Increased renal length and cortical echogenicity with elevated PSV, RI and AT values can serve as early sonographic changes in SCD adult patients without renal impairment.

Transvaginal protocol for placental cord abnormalities

Miss Vanessa Rischitelli
Barwon Health

Introduction: The umbilical cord is a fetal structure providing connection from placenta to fetus; it provides a pathway for nutrients and oxygen to be delivered and for waste products to be removed from fetal circulation. Several placental cord insertion (PCI) abnormalities exist, each potentially causing problems with placental development which can affect fetal growth and development. The objective of this study was to develop a transvaginal protocol with an accompanying worksheet for use within our department.

Method: ASA Guidelines recommend that at all mid-trimester ultrasound examinations a B-mode and colour doppler assessment be performed over the placental cord insertion, and a dynamic sweep of the lower uterine segment with colour Doppler be performed to assess for vasa previa.

Results: After review of current literature and scanning guidelines, it was determined that if an abnormal cord insertion were detected on the transabdominal ultrasound, a transvaginal scan be performed to demonstrate or exclude vasa previa. A protocol and sonographer worksheet were developed to be implemented within our department.

Conclusion: Diagnosing a placental cord insertion abnormality is imperative to both maternal and fetal wellbeing as appropriate screening, intervention and tertiary care can be established throughout the pregnancy and peri- and postnatally.

Take home message: Identification and documentation of placental cord insertion abnormalities allows for an appropriate course of monitoring, tertiary care and birth plan to be implemented. This decreases the likelihood of antenatal and perinatal morbidity and mortality, and ensures the highest form of maternal and fetal care is delivered to the patient.
Straight to the point!—A case study of a subungual glomus tumor of the finger

Mrs Angela Farley

University Of South Australia

Introduction: Glomus tumours are a rare benign growth that can occur in any part of the body. A 40-year-old female presented for x-ray and ultrasound of her right middle finger. She was experiencing a sharp pain in the nail, deformation, nail elevation and a bluish/purple discoloration under the nail bed was clinically evident.

Method: The right middle phalanx was scanned in longitudinal and transverse planes, using a 18 MHz linear probe, on the dorsal aspect, from the distal phalanx to the fingertip.

Results: An isoechoic, rounded, 3 × 2 × 3 mm nodule was detected under the nail bed of the right middle phalanx. It appeared solid, with internal echoes, and was slightly more hypoechoic than the surrounding dermis. Colour Doppler demonstrated internal vascularity. Erosion of the underlying distal phalanx correlated to focal scalloping in the dorsal subungual region of the distal phalanx observed on x-ray. The x-ray, ultrasound and clinical findings led to the diagnosis of a subungual glomus tumour of the right middle phalanx.

Take home message: Subungual glomus tumours are rare and can be overlooked by inexperienced sonographers. In this case, obtaining a thorough clinical history, making comparison with x-rays, and understanding the nail bed anatomy led to the diagnosis and subsequent improvement in the patient's quality of life.

Vasculitis incidentally discovered on a DVT study

Ms Ellen Chen

Truescan

Introduction: A 33 year-old female presented with left calf pain for a DVT ultrasound study of the left lower limb.

Method: The ultrasound approach followed a standard DVT lower limb protocol, beginning from the common femoral vein (CFV). A short patient history revealed the patient experienced worsening of pain upon exercise.

Results: During scanning of the left CFV, it was incidentally noted that the left common femoral artery (CFA) demonstrated no flow where was mural intimai thickening. CFA waveforms were triphasic and elevated by over 40%. No DVT in the venous system was detected. A recommended CT angiogram demonstrated significant arterial stenoses in the left lower limb arteries and left renal artery (causing left kidney atrophy). There was large/medium vessel vasculitis. Vasculitis can cause thickening of blood vessel walls, reducing vessel width, blood flow restriction and subsequent organ and tissue damage. As in this case, it can also result in lower limb intermittent claudication, especially on exertion.

Take home message: This case highlights how in DVT studies, paying attention to the sonographic appearances of the leg arteries can provide clues about the diagnosis, especially when the DVT study is negative and the patient has calf pain. It also illustrates the complementary roles of ultrasound and CT in the diagnosis of vasculitis.

Grading fatty liver and detecting liver pathological features—Is there consensus between sonographers and radiologists?

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Introduction: Hepatic steatosis is the leading cause of chronic liver disease. Reliable detection and staging of liver disease is important to facilitate diagnosis and treatment. This study evaluated the interobserver agreement between trainee sonographers, qualified sonographers and radiologists in grading non-alcoholic fatty liver disease (NAFLD) and detecting common B-mode pathological liver features.

Methods: 150 B-mode liver ultrasound images from 50 adult patients referred for an abdominal ultrasound were obtained retrospectively from a PACS system. Images were independently graded for hepatic steatosis severity (normal, mild, moderate or severe) and the presence or absence of incidental findings, focal fatty sparing, liver surface irregularity and rounded liver edge by qualified sonographers (n = 17), trainee sonographers (n = 6) and radiologists (n = 6). Fleiss’ kappa statistic was used to calculate interobserver agreement in detecting common liver pathological features. Intraclass correlation coefficient (ICC) was used to calculate absolute agreement in grading NAFLD.

Results: Interobserver agreement rates among trainee sonographers for the detection of incidental findings, focal fatty sparing, liver surface irregularity and rounded liver edge were: $\kappa = 0.243, 0.486, 0.155$ and 0.079, respectively. Agreement rates were for qualified sonographers: $\kappa = 0.323, 0.428, 0.167$ and 0.152, respectively, and for radiologists: $\kappa = 0.156, 0.266, 0.015$ and 0.154, respectively. ICC scores among trainee sonographers, qualified sonographers and radiologists were: 0.927, 0.978 and 0.951, respectively.

Conclusion: Interobserver agreement was low for visual assessment of common liver pathology, but excellent in grading NAFLD.

Take home message: Development of standardised criteria for staging NAFLD and assessing liver pathological features are recommended.
Ductus arteriosus aneurysm—A case study

Mrs Debbie Slade

Hunter Imaging Group

Introduction: Ductus Arteriosus Aneurysm (DAA) is a rare entity and although usually follows a benign course, may be associated with severe complications and chromosomal abnormalities in the fetus. This case study describes a 30 year old female who presented for a 3rd trimester scan at 33 weeks gestation with the findings defining the etiology, ultrasound appearances, diagnoses and associated complications common to DAA.

Method: A thorough 3rd trimester examination was performed using a Canon Apio 600 unit and a 6 MHz array transducer. Biometry, AFI, Dopplers, fetal wellbeing, placenta, cervix, uterus and adnexa were documented. Anatomy was also performed and documented including an in-depth interrogation of the fetal heart using B-mode and colour Doppler in transverse and sagittal planes. Pulsed wave Doppler could also have been utilised to give more information.

Results: Ultrasound appearances: A bulbous Ductus Arteriosus (DA) was identified with mild dilatation of the pulmonary artery exiting the heart with a stenotic segment identified as it joined the DA. Other findings included fetal macrosomia and mildly dilated renal pelves.

Conclusion: The purpose of this presentation is to inform sonographers of the importance of completing a full interrogation of the fetal heart in the 3rd trimester to diagnose DAA and its complications. Research indicates that DAA likely develops in the 3rd trimester and is only apparent on the three vessel view, arrow or arch views.

Right-dominant unbalanced atrioventricular septal defect (R-UAVSD): A first trimester case study

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Introduction: Right dominant unbalanced atrioventricular septal defect (R-UAVSD) is an uncommon congenital cardiac abnormality. R-UAVSD is characterised by: an atrial septum primum defect, variable ventricular inlet defect, abnormal atrioventricular valve and preferential valve positioning over the right ventricle. These structural abnormalities lead to reduced left heart flow and a spectrum of underdevelopment/obstruction of the left ventricle and its outflow tract. This case study details a multigravida patient who presented for first trimester routine combined first trimester screening (CFTS) at 12 + 4/40. Background risk factors included advanced maternal age and type 2 diabetes.

Method: An early structural assessment was conducted, including the following b-mode and colour cardiac views: situs, apical and lateral four-chamber view (4CV), left ventricular outflow tract (LVOT), three vessel view and arrow view. CFTS produced a low risk result for Trisomy 13, 18 and 21.

Results: Multiple abnormal sonographic findings were noted in the 4CV and LVOT. These included: absent offset crux, absent septum primum, central crux defect, apical forming right ventricle, malalignment of remnant septa, loss of equal atrioventricular canals, mixing of flow in the central and atrial regions and minimal left ventricular/proximal LVOT filling. Ter- tiary review at 15/40 confirmed euploidy via amniocentesis, and provided a preliminary diagnosis of R-UAVSD with significant right AV regurgitation.

Conclusion: The 4CV is key to the identification of early R-UAVSD presentation.

Take home message: carefully assess the 4CV with B-mode and colour, in systole and diastole, extend screening views to include: LVOT, aortic arch and atrioventricular valve spectral doppler.

Sonography of the shoulder replacement

Mrs Karen Moulton

SKG Radiology

Introduction: Sometimes the sonographer is asked to scan a post Part or Total Shoulder Replacement and it can be confusing to know what to do. There are various number of different types of shoulder replacements and it’s important to know what the surgeon has done so the sonographer can scan appropriate post-surgical structures.

Method: This e-poster gives a very basic explanation of the four different types of shoulder replacement surgeries available and what the sonographer should expect (with regards to anatomy) when scanning.

Results: Only the Reverse Total Shoulder replacement has the absence of the rotator cuff tendons. All other replacements have the rotator cuff tendons in situ (either native or surgically) therefore the ultrasound imaging is like a pre surgical replacement shoulder scan +/- rotator cuff repair.

Conclusion: Ultrasound of the post shoulder replacement is not tricky to perform. As long as the sonographer is aware of the particular technique used by the surgeon, scanning should not be too daunting.

I’m in so much pain! A case study on renal transplant biopsy complications

Miss Belinda Frith

Royal Melbourne Hospital

Transplant renal biopsy is usually performed when an acute or chronic renal transplant rejection is suspected. Whilst there are other alternative, non-invasive techniques to investigate rejection. Renal biopsy is the ‘gold standard’ to diagnose these complications. The
discussion involves a patient with a renal transplant undergoing renal biopsy at the ultrasound department at Royal Melbourne Hospital. Ultrasound findings were supported with documentation demonstrating the affected transplant kidney. Relevant to the patients’ symptoms post biopsy were sonographic findings which included ultrasound appearances consistent with post biopsy complications, active bleeding into the collecting system, bladder haematoma and an arteriovenous fistula in the transplant kidney. These ultrasound findings enabled fast, effective treatment for the patient. The key finding was confirmed on angiography, where an arteriovenous fistula was coiled.

Take home message: In the acute setting post a transplant kidney biopsy, our role as a sonographer impacts the patients’ diagnosis and management, which results in effective and time critical management for the transplant kidney.

Assessing short-term shoulder pain outcomes with and without physiotherapy exercise in patients undergoing ultrasound guided corticosteroid injection into the subacromial bursa: A two-group comparison study

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Introduction: The objective of this research was to determine if there is evidence that a physiotherapy program post corticosteroid injection treatment for subacromial bursitis improved shoulder pain and disability scores. The aim of this study was to determine if participants with subacromial bursitis who complete a physiotherapy program have significantly lower pain scores after an ultrasound guided corticosteroid injection than those who do not complete a physiotherapy program after an ultrasound guided corticosteroid injection.

Method: Utilising the Shoulder Pain and Disability Index allowed this research study to obtain a full assessment of the symptomatic shoulder pre and post treatment outcome with respect to range of motion, pain and function. In this prospective two-group longitudinal observational study, the short-term outcomes with or without physiotherapy after an ultrasound guided corticosteroid injection into the symptomatic subacromial bursa were evaluated.

Results: This small sample study demonstrated that the physiotherapy group had a mean improvement in SPADI scores of 75%, compared with the non-physiotherapy group, which only had a mean improvement of 42%. There was no difference in the pre injection SPADI scores in the physiotherapy versus non-physiotherapy group, however, there was a significant difference in the SPADI scores between the two groups at follow up.

Conclusion: The results of this study affirm that physiotherapy improves shoulder pain relating to subacromial bursitis and function after an ultrasound guided corticosteroid injection.

Take home message: This information can be applied to the clinical setting to help assist in improving patient outcomes.

Dorsal lisfranc ligament (DLL) ultrasound: Current & future insights

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Introduction: The Lisfranc joint ligamentous complex refers to the tarsometatarsal joints, ligaments and other relevant soft tissues of the mid-forefoot. It plays a significant role in foot mechanics. Injuries may involve ligament tears, fractures and joint dislocations. Plain radiography is estimated to fail to identify up to twenty percent of injuries, with purely ligamentous pathologies providing additional diagnostic challenge. Delayed diagnosis may significantly affect patient outcome, and misdiagnosis has been associated with high rates of litigation.

Research into the application of ultrasound has been increasing over the last decade, with the dorsal Lisfranc ligament (DLL) showing the most promise. However, ultrasound remains absent from the standard imaging pathway. This poster aims to summarise and evaluate current DLL research; and identify areas that may benefit from further investigation.

Method: A literature search on DLL ultrasound anatomy, normal and abnormal ultrasound findings, sonographic technique and relevant clinical findings was conducted via CQU Library Search and Google Scholar.

Results: Literature on DLL ultrasound is limited. Refinement of future research approaches is needed to increase corroboration of DLL sonographic findings, and address existing gaps in literature.

Conclusion: Sonographers and radiologists may improve patient outcomes through the recognition of suspicious DLL ultrasound findings in patients with early presentation, or previous misdiagnosis.

Take home message: Examiners should ensure to incorporate contra-lateral comparison and erect with 15-degree abduction DLL assessment in their routine ankle sprain/midfoot injury ultrasound protocol.