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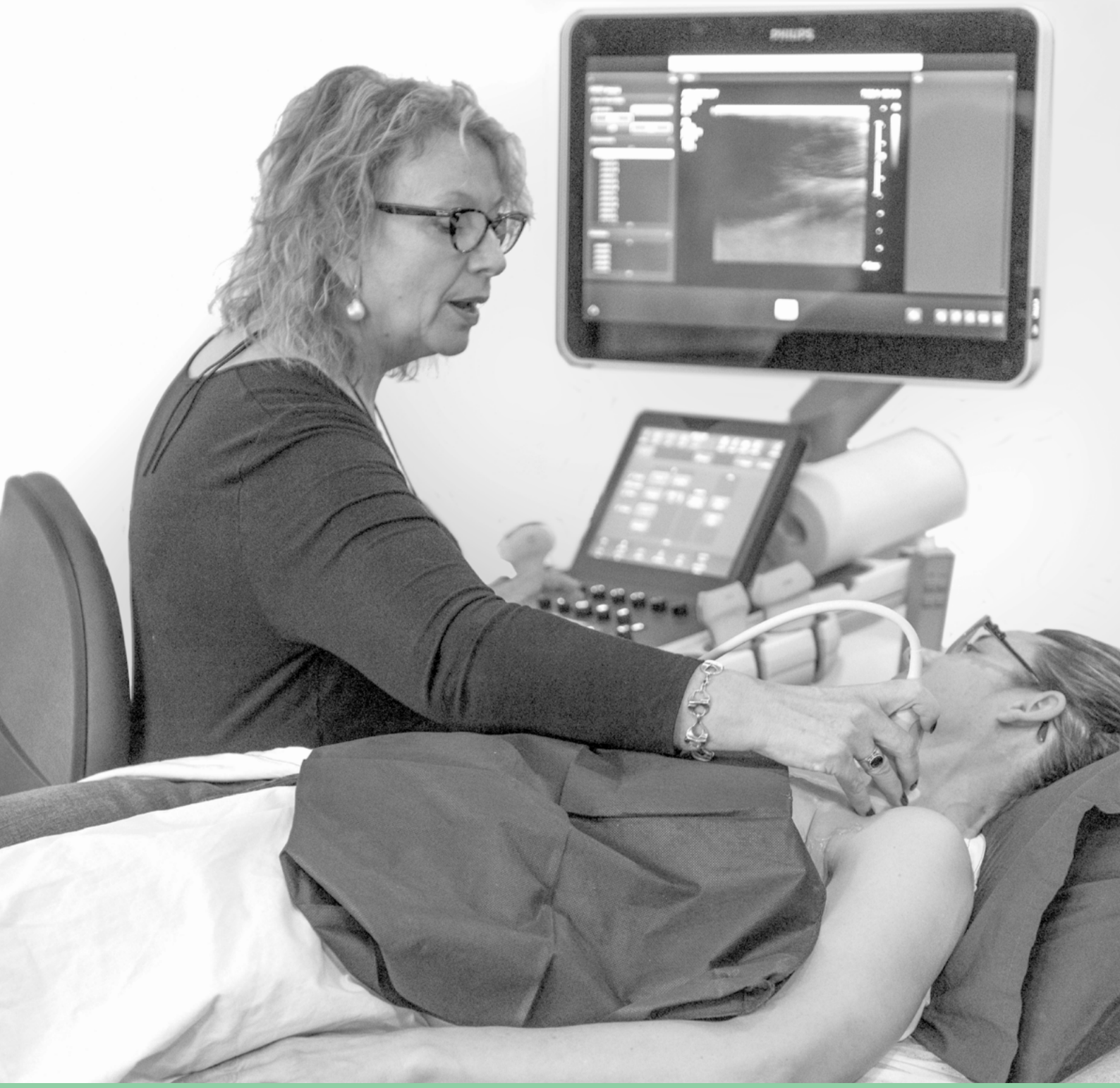
Making waves

IN SONOGRAPHY RESEARCH



FEBRUARY 2020

contents

Incidence of and risk factors for iliocaval venous obstruction in patients with active or healed venous leg ulcers

REFERENCE
Marston W, Fish D, Unger J, Keagy B. *J Vasc Surg.* 2011 May;53(5): 1303–8.
doi: 10.1016/j.jvs.2010.10.120. Epub 2011 Jan 7.

Available via Ebsco Host on the ASA website

REVIEWED BY
Daniel Rae
ASA SIG Vascular

WHY THE STUDY WAS PERFORMED

Iliocaval venous obstruction (ICVO) can be a significant contributor to venous hypertension in patients with advanced disease. Although femoral vein flow patterns have been used to detect outflow obstruction, the diagnostic accuracy of indirect Doppler parameters has not yet been fully elucidated.

HOW THE STUDY WAS PERFORMED

Seventy-eight patients with CEAP clinical class 5 and 6 venous insufficiency underwent evaluation with duplex ultrasound to identify the venous reflux in the deep and superficial system, and CT or MRI was performed to identify ICVO.

Compression manoeuvres and examination of flow patterns with augmentation allowed identification of both acute or chronic venous obstruction and incompetent perforating veins. The common femoral venous velocity patterns were examined carefully to evaluate for evidence of iliocaval outflow obstruction. Those not demonstrating typical respiratory variation were identified as patients with evidence of outflow obstruction.

A cut-off range was set at > 80% stenosis. Greater was identified as having a significant iliocaval obstruction, with below this point being less associated with chronic venous insufficiency symptoms.

WHAT THE STUDY FOUND

The study results showed that when a common femoral vein spectral trace waveform was taken with the Valsalva manoeuvre, it was a reliable diagnostic sign of proximal obstruction.

Sensitivity and specificity of common femoral vein duplex ultrasound findings of identifying ICVO > 80%:

- sensitivity = 77%
- specificity = 100%
- positive PV = 100%
- negative PV = 95%

It was found that when the ultrasound results were positive for an iliocaval obstruction > 80%, this was confirmed for all patients on the CT or MR venogram.

It was also found that a negative ultrasound scan for outflow obstruction was unreliable, as 23% of cases demonstrating a normal venous duplex study then went on to exhibit a high grade ICVO on CT or MRI.

All patients with < 50% obstruction on CT or MRI had normal common femoral duplex scan waveforms, including respiratory variation and flow augmentation with compression.

A higher incidence of iliocaval obstruction was seen in women, patients with a history of DVT, and those with deep vein reflux.

Incidence of and risk factors for iliocaval venous obstruction in patients with active or healing venous leg ulcers *cont.*

RELEVANCE TO CLINICAL PRACTICE

The findings in this study are in agreement with the results from similar research (Kayilioglu et al. 2016), concluding that monophasic flow of the common femoral vein is a reliable diagnostic tool for the detection of high grade iliocaval obstruction. If there is no variation of the respiratory cycle of the common femoral vein when Valsalva is performed, further investigation either with ultrasound or CT/MR venogram of the iliocaval veins is highly recommended.

Knowing risk factors when taking a clinical history can help to identify patients with potential iliocaval obstruction. The principles identified in this study may also be useful in the acute setting when performing lower limb Doppler ultrasound for deep vein thrombosis.

> "Duplex ultrasound scan examination of the CFV was assessed as a screening study and was found to be useful when the study was positive with a lack of respiratory variation or response to augmentation manoeuvres. If the duplex scan was positive, all patients were found to have high grade ICVO on CT or MR venography."

Emergency ultrasonography of the gastrointestinal tract of children

REFERENCE
Hwang JY. *Ultrasonography*. 2017 Jul;36(3):204–21. doi: 10.14366/usg.16052. Epub 2017 Jan 25.

REVIEWED BY
Ilona Lavender
ASA SIG Paediatric

WHY THE REVIEW WAS PUBLISHED

Ultrasound is often the modality of choice when imaging the paediatric patient as it's non-invasive, easily accessible and there is no ionising radiation. While many sonographers would be familiar with a referral with a differential diagnosis of acute appendicitis, not everyone would be familiar with other less common gastrointestinal (GI) examinations. In order to perform these less common examinations adequately, sonographers require thorough knowledge of the anatomy and ultrasound technique. This article covers the assessment of a number of GI ultrasound examinations.

WHAT THE ARTICLE LOOKED AT

The article commences by describing the most common clinical presentations of GI pathology which include pain, vomiting, diarrhoea and fever. The importance of using a high frequency transducer is emphasised and the value of graded compression is discussed.

The normal anatomy of the bowel and its appearance on ultrasound is explained with schematic diagrams:

- mucosa – innermost echogenic layer
- deep mucosa – hypoechoic
- submucosa – hyperechoic layer and most pronounced in the colon
- muscularis propria – hypoechogenic ring
- serosa – outermost layer which is difficult to see on ultrasound

The following pathologies are then described: malrotation, hypertrophic pyloric stenosis, intussusceptions, acute appendicitis, mesenteric lymphadenitis, Henoch-Schönlein purpura and omental infarction.

Malrotation

Although ultrasound isn't the gold standard for this diagnosis, an abnormal relationship between the superior mesenteric artery and the superior mesenteric vein raises this diagnosis. Colour Doppler and the 'whirlpool' sign are indicative of midgut volvulus. If malrotation isn't diagnosed, a bowel obstruction can result. False positives, such as scanning off-centre, are described.

Hypertrophic pyloric stenosis (HPS)

Most typical clinical presentation is non-bilious, projectile vomiting and HPS is the most common reason for performing surgery on newborns. Ultrasound is the gold standard for this diagnosis, where a high frequency transducer is essential. The stomach can be filled with glucose or water and the pylorus assessed for fluid to pass through. Furthermore, a positive diagnosis is made when the pylorus thickness is > 3 mm and the length is > 17 mm. An equivocal finding is reported when the thickness is between 2–3 mm and another scan in a few weeks should be considered. A false negative result can occur in an overdistended stomach.

Intussusception

With a sensitivity and specificity of almost 100%, ultrasound is the modality of choice to make this diagnosis. While most cases are idiopathic, up to one quarter of patients have

Emergency ultrasonography of the gastrointestinal tract of children *cont.*

a pathological lead point and ultrasound can identify two thirds of these. A positive diagnosis can be made with a 'doughnut sign' in the axial view. When an intussusception is identified, ultrasound can predict the likelihood of it being reduced with an enema.

Acute appendicitis

This is likely a scan most sonographers would be familiar with. The article states that one third of patients present with nonspecific symptoms. The importance of graded compression and using the ileocecal valve as a landmark are described. Many secondary features of appendicitis are discussed, of which the size > 6 mm is one of the most reliable. To prevent false negatives the appendix should be visualised in its entirety.

Mesenteric lymphadenitis

Often this diagnosis is made when other pathology has been excluded. There is no consensus as to how many lymph nodes are required to make the diagnosis; however, abnormal lymph nodes need to be reported (rounded rather than oval, loss of fatty hilum and eccentrically thickened cortex).

Honoch-Schonlein Purpura (HSP)

HSP is systemic vasculitis and can mimic appendicitis. On ultrasound, a circumferential bowel wall thickening of the duodenum and proximal jejunum is seen. This is often accompanied by hyperaemia.

Omental infarction

Although this pathology is rare on ultrasound, an ovoid, echogenic mass between the abdominal wall and the bowel is seen. Peripheral hyperaemic changes are seen with colour Doppler. This diagnosis is very operator dependent but ultrasound is important to exclude/detect other pathology.

RELEVANCE TO CLINICAL PRACTICE

Ultrasound of the GI system isn't limited to acute appendicitis and this article covers other pathologies that sonographers are likely to encounter when scanning paediatric patients. The article describes how to perform these examinations with corresponding ultrasound images. ■

> "Hypertrophic pyloric stenosis (HPS) is the most common reason for conducting surgery in infants..."

Cranial ultrasound is a reliable first step imaging in children with suspected craniosynostosis

WHY THE STUDY WAS PERFORMED

Radiography and computed tomography (CT) of the skull are still considered the first-line imaging modalities for diagnosing craniosynostosis in children. In the child with an abnormal head shape these techniques expose them to ionising radiation. The study aim was to assess the diagnostic accuracy of cranial ultrasound (US) and confirm if it could be a reliable initial imaging modality when diagnosing craniosynostosis in the newborn.

HOW THE STUDY WAS PERFORMED

All infants included in the study were clinically suspected of having abnormal closure of the cranial sutures, and were examined with ultrasound, by a single operator. The ultrasound examination included assessment of all vault sutures including the sagittal, metopic, bilateral coronal and bilateral lambdoid sutures. Imaging was performed using an 11-MHz linear transducer with the transducer held perpendicular to the long axis of the suture. Infants who were found to have abnormal sutures on US subsequently underwent volumetric CT scan performed blinded to the cranial US findings.

Sutures were considered to be patent if there was no bridging present and the anechoic gap of the suture was 0.5 mm or wider for its whole length.

WHAT THE STUDY FOUND

In 34/194 patients, cranial US revealed one or more closed sutures and all of these patients were offered a 3D-CT. Of this group, 30/34 continued on to have 3D-CT scans and in 28/30 cases the CTs confirmed the ultrasound findings exactly with the same suture closures. The two false positive cranial US examinations were noted to be both performed early in the study and the study acknowledged that operator experience was an issue.

There were also 12 infants with significant head deformity who had CT despite having a normal US result. In eleven of these cases, the CT findings were the same as the US, and all were reported as normal. The remaining case was a case of bitemporal suture closure and this was missed on ultrasound as the temporal sutures were not examined in the US studies. All infants who had normal cranial US and mild deformity were followed up clinically and spared radiation exposure. Some required helmet treatment but all improved over time and were diagnosed as non-craniosynostotic.

There was a male prevalence (28/34) of craniosynostosis in the study group.

Closure of the sagittal suture was the most common suture affected (16/28, five being partial). Metopic (8/28) and coronal (4/28) occurred less frequently.

RELEVANCE TO CLINICAL PRACTICE

Early diagnosis of craniosynostosis is important in order to obtain good surgical results. This study shows that ultrasound can be considered a safe first-line imaging modality in the detection of craniosynostosis. Restricting CT to those cases that have positive cranial US would reduce the radiation exposure to a large proportion of infants presenting with abnormal head shape. ■

REFERENCE

Pogliani L, Zuccotti GV, Furlanetto M, Giudici V, Erbetta A, Chiapparini L, Valentini L. *Child's Nerv Syst.* 2017 Sept;33(9):1545–52. doi: 10.1007/s00381-017-3449-3. Epub 2017 Jun 3.

Access through Ebsco Host on the ASA website

REVIEWED BY

Glenda McLean
ASA SIG Paediatric

"Early diagnosis of true craniosynostosis is of most importance, to obtain the best surgical result.."

Accuracy of shoulder ultrasound examination for diagnosis of rotator cuff pathologies: a single-center retrospective study.

REFERENCE
Mohtasib RS, Alzahrani AM, Asiri YN, Rayes ZF, Alshaalan MA. *Ann Saudi Med.* 2019 May–Jun;39(3):162–71. doi: 10.5144/0256-4947.2019.162. Epub 2019 May 30.

REVIEWED BY
Sharmaine McKiernan
ASA SIG MSK

WHY THE STUDY WAS PERFORMED

The rotator cuff stabilises the shoulder while allowing for free movement. Clinically, the demand for diagnosis of rotator cuff tears and associated shoulder pathology is increasing. Accurate diagnosis allows for best management and treatment. This study looked at a centre's accuracy in ultrasound diagnosis when compared to MRI.

HOW THE STUDY WAS PERFORMED

This is a retrospective, analytical study looking at 6 years of data and finding 86 conforming studies.

Ultrasound was used to determine the presence of rotator cuff pathology. Studies included had been correlated with shoulder MRI findings within 6 months. Positive predictive value (PPV), negative predictive value (NPV), sensitivity, specificity and accuracy of ultrasound were calculated.

WHAT THE STUDY FOUND

The most commonly affected tendon was the supraspinatus followed by the infraspinatus and subscapularis.

For the ultrasound detection of full-thickness tears, compared with MRI, PPV 35%,

NPV 97%, sensitivity 78%, specificity 83% and accuracy 83%.

For partial-thickness tears, the PPV 51%, NPV 60%, sensitivity 51%, specificity 60% and accuracy 56%.

For tendinosis, the PPV 84%, NPV 25%, sensitivity 74%, specificity 38% and accuracy 67%.

RELEVANCE TO CLINICAL PRACTICE

Ultrasound is an amazing modality for imaging the shoulder that also allows for dynamic, functional evaluation. It is readily available, less costly than MRI and most patients can tolerate the exam. The user, however, needs to be aware of its limitations and difficulties.

This study concluded that ultrasound has high sensitivity, specificity and accuracy for the detection of supraspinatus full-thickness tears compared with the detection of partial-thickness tears. For the other tendons, ultrasound has high specificity for the detection of both full-thickness and partial-thickness tears. ■

> "US has distinct advantages in that a dynamic assessment of muscle contraction can also be performed."

Meta-analysis in medical research

REFERENCE
Haidich AB. *Hippokratia*. 2010 Dec; 14 (Suppl 1):29–37. PMID: 21487488; PMCID: PMC3049418.

REVIEWED BY
Helen Beets
ASA SIG Research

WHY THE STUDY WAS PERFORMED

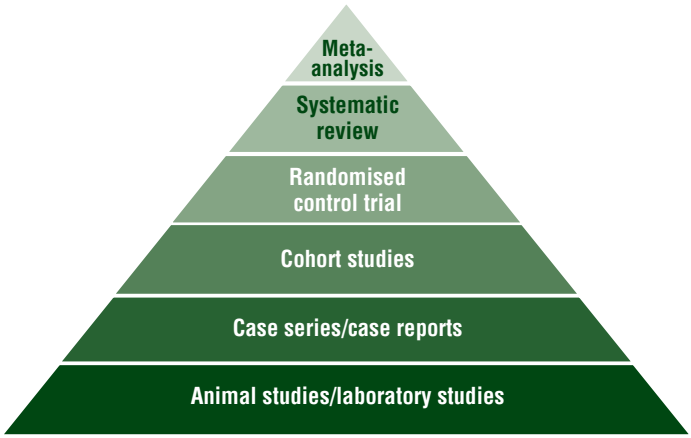
This article was written to discuss the statistical method and reasoning for performing meta-analysis and to review the relevance for use in evidence-based medicine practice.

HOW THE STUDY WAS PERFORMED

This was a review article looking at the different key aspects of meta-analyses, including the data types used, criteria for exclusion, statistical analysis and presentation of results.

WHAT THE STUDY FOUND

The introduction describes a hierarchy of research methods based on merit and the strength of freedom from bias, placing meta-analysis in the top position.



A meta-analysis study uses statistical analyses of data from multiple studies of the same investigation. By examining heterogeneity in multiple groups of studies, this reduces bias and integrates data, resulting in more effective evidence-based practice.

Data collection

Usually data is taken from original trials, which is thought to be the 'gold standard' of method, making it easier to explore differences across subgroups and populations.

It is the best way to obtain a global view of outcomes and predictors of outcomes in risk management, treatment plans, protocols and guidelines.

Researchers who are aware of meta-analysis methods should maintain original results and data bases that may contribute to future meta-analyses. Cooperation with other researchers is essential.

Literature research

A meta-analysis, like all other research methods, requires a thorough literature review of the topic before data collection. It is imperative to include all the most relevant studies, as excluding important research papers can result in bias.

Inclusion and exclusion

Studies are usually chosen based on their hypothesis, and if there is more than one hypothesis in each study, then analyses must be performed separately for the additional

Meta-analysis in medical research *cont.*

research question. If studies are excluded from the meta-analyses then the reasoning should be clearly stated in the report. Usually exclusions are decided by more than one researcher and are a result of quality assessment protocols designed at the beginning of the investigation.

Statistical analysis

A standardised means method is most commonly used for analysis of data with the researcher choosing between studies with the same outcome or variable outcomes. Discovering heterogeneity in results from different studies lets the researcher know to view each study results with caution and to interpret carefully.

Presentation of results

Results of meta-analysis are often presented in flow diagrams and forest plot graphs. Flow diagrams outline the number of studies sourced, the inclusions/exclusions and how many studies were included in the final results.

A forest plot diagram demonstrates the results of the meta-analysis with cumulative percentages, ratios, effect size and confidence intervals.

Relevance to clinical practice

Decisions about best practice are better derived from evidence-based medicine. A meta-analysis combines data from multiple independent studies for the purpose of integrating the findings.

Meta-analysis findings and outcomes may estimate more precise and effective treatment outcomes. In the case of ultrasound, it may lead to protocol design and set radiological guidelines that are more effective and tailored suitably. ■

> "...meta-analytic approaches have demonstrable benefits in addressing the limitations of study size."

Assessing quality in qualitative research

REFERENCE
Mays N, Pope C. *BMJ* 2000;320:50.

REVIEWED BY
Helen Beets
ASA SIG Research

WHY THE STUDY WAS PERFORMED

In more recent years, qualitative research methods have become popular in health services and health technology assessment. It is important to examine the claims made by these researchers and validate their qualitative results and the findings made by them. This has led to the scrutiny of qualitative methods and how they are performed, with this paper investigating criteria in qualitative research methods in order to attempt the design of guidelines.

HOW THE STUDY WAS PERFORMED

The study debates commonly used quantitative methods of analysing the validity of research such as:

Triangulation – Comparing two or more different data collection methods such as interviews and observational investigations or interviews of different groups.

Respondent validation – Involves correspondence and feedback from the participants about their perception of the validity of the data they have given, the method in which it was collected and the interpretation of it.

Clear exposition of methods of data collection – A clear description of the data collection methods must be presented. It should be possible to give a clear account of how the researcher developed the methods and came to the final concept. This may be a lengthy process; however, it enables the reader to decide for themselves if the interpretation of results is supported by the data presented.

Reflexivity – Assessing the way the researchers have shaped the data collected due to assumptions and bias.

Attention to negative cases – A researcher must present an alternative viewpoint on the data results collected where there is contradiction or outliers.

Fair dealing – Making sure a wide range of perspectives are investigated and represented.

WHAT THE STUDY FOUND

Qualitative researchers can assess the quality of their research by being vigorous in research design, data collection, interpretation and communication. Some traditional quality guidelines can be used and integrated; however, they may not always be appropriate with each research project requiring an individualised approach. Failing to do so may result in missed points of view and valid content, thus paradoxically reducing the quality.

RELEVANCE TO CLINICAL PRACTICE

The status of all research depends on the quality of methods used, and investigating those methods promotes better results. Qualitative research has much to offer in health by increasing knowledge of health and healthcare, including disease and disease investigation in sonography. Research can be relevant when it adds to knowledge or supports previous findings and increasing confidence in prior knowledge. ■

> "...the basic strategy to ensure rigour, and thus quality...is systematic, self-conscious research design, data collection, interpretation, and communication."

Is there still a role for nuchal translucency measurement in the changing paradigm of the first trimester screening?

WHY THE STUDY WAS PERFORMED

This study poses the question: 'In a world of non-invasive prenatal testing (NIPT) and cell-free DNA (cfDNA), is there a place for the nuchal translucency (NT) measurement?' Research has identified that fetuses with an increased NT thickness ≥ 3.5 mm have an increased risk of congenital (chromosomal, genetic and structural) abnormalities. The authors performed the retrospective study, as since 2017, NIPT technologies have seen the uptake of cfDNA as the preferred test for fetal aneuploidy screening in the first trimester. As a result, there has been a significant reduction in the combined first trimester screening test (CT) performed between 12–13 +6 weeks. The authors conducted the study to illustrate the importance of the NT measurement and early anatomy ultrasound in identifying congenital abnormalities that would be missed if cfDNA testing was solely performed in the first trimester.

HOW THE STUDY WAS PERFORMED

This was a national retrospective study conducted across seven university hospitals in the Netherlands between January 2010 and January 2016. The study data was collected from 1901 pregnancies where the NT measurement was ≥ 95th percentile between 11–13 +6 weeks gestation. NT measurements were performed by sonographers accredited for CT by the FMF*. Patients having undertaken CT with an NT measurement ≥ 95th centile by crown rump length adjusted centiles, were included. Participants were further included only if they had pre- and post-natal clinical information, a detailed ultrasound examination, karyotyping and a post-mortem or neonatal physical examination. Ethics approval for this study was granted.

WHAT THE STUDY FOUND

Across the seven sites, 23494 NT measurements were recorded with 2008 measurements ≥ 95th centile. After the exclusion criteria was applied, 1901 cases were analysed and reported. Mean maternal age 34 years (range 18–48), the median NT measurement was 3.6 mm (IQR 2.8–5.1). In total, 841 (43%) had at least one abnormality described as chromosomal, genetic or structural, with rates increasing proportionally to NT enlargement.

Abnormalities were observed in 21.3% of cases where the NT measurement was between 95th–99th centile and in 62% of cases when the NT measurement was ≥ 99th centile. The greater the NT measurement above 4.9 mm, the greater the percentage of congenital abnormalities. Of all fetuses, 33.3% had a genetic abnormality and 29.4% had a chromosomal abnormality, while structural abnormalities were detected in 9.3% of chromosomally normal fetuses in the presence of a thickened NT. Of these isolated structural abnormalities, cardiac defects were the most common (3.9%), followed by pulmonary, gastrointestinal, genitourinary and musculoskeletal.

REFERENCE

Bardi F, Bosschieter PFN, Verheij JBGM, Go ATJI, Haak MC, Bekker MN, Sikkel E, et al. *Prenat Diagn*. 2019 Nov 7. doi: 10.1002/pd.5590.

REVIEWED BY

Dr Jennifer Alphonse
ASA SIG O&G

Is there still a role for nuchal translucency measurement in the changing paradigm of the first trimester screening? *cont.*

This study demonstrates the strong link between the degree of NT thickness and congenital abnormalities. Had cfDNA been the only screening tool offered, 34% of congenital abnormalities (including sex chromosome abnormalities, triploidies, single gene disorders and submicroscopic aberrations) would have remained undiagnosed in the first trimester. Additionally, 64.6% of structural abnormalities would have remained undiagnosed (including cardiac, urogenital, body stalk, skeletal, abdominal wall, pulmonary, digestive and facial defects) if cfDNA was offered as the only screening tool and in the absence of a first trimester ultrasound.

RELEVANCE TO CLINICAL PRACTICE

The study recommended that where the NT thickness is ≥ 3.5 mm, a thorough early anatomy ultrasound examination and genetic investigation should be co-performed. This is particularly relevant to clinical practice when patients presenting with normal karyotyping and NT thickness ≥ 95th centile as a structural abnormality (i.e cardiac) may exist. The study concluded that despite advances in cfDNA, the NT measurement and first trimester anatomy ultrasound play an important role in the screening for genetic, chromosomal and structural abnormalities in the first trimester.

*FMF – Fetal Medicine Foundation

"Considering the fact that structural abnormalities, and especially many lethal ones, can already be diagnosed in the first trimester of pregnancy, an ultrasound scan remains an essential part of the screening paradigm."

Value of transvaginal two-dimensional contrast-enhanced ultrasonography in diagnosing atypical ovarian corpus luteum hematoma

REFERENCE
Liu H, Xiang H, Mu R, Tuoerhan P, Zeng Q, Zhou H, et al. *Biomed Res Int*. 2018 Oct 9;2018:3120579. doi: 10.1155/2018/3120579.

REVIEWED BY
Janessa Baddeley, ASA SIG O&G

WHY THE STUDY WAS PERFORMED

Corpus luteum cysts are a common finding in the female pelvic ultrasound; however, the different appearances of the internal architecture, in particular those with haemorrhagic changes, can lead to over management and repeat sonograms in unwarranted cases. In these cases, defined by the authors as an atypical ovarian corpus luteum haematoma (AT-OCLH), it may be difficult to differentiate from a solid tumour, endometrioma or mature cystic teratomas (dermoid) cyst, of which the management is clinically important. Current diagnostic criteria have high sensitivity for Typical OCLH – defined as a cystic structure with peripheral vascularity – but a high misdiagnosis rate for AT-OCLH. This study aimed to improve diagnostic accuracy through the introduction of contrast enhanced ultrasound (CEUS) in cases of AT-OCLH.

HOW THE STUDY WAS PERFORMED

This was a prospective diagnostic analysis study using consecutive recruitment methods. Patients were included if they were not menopausal, had a diagnostic ultrasound finding of a solid or mixed echogenic lesion suspected of an AT-OCLH, and consented to the use of contrast. Patients in which contrast agent was contraindicated were excluded from the study. This included allergy to contrast, cardiac, respiratory or renal dysfunction, pregnant or breast feeding. A total of 53 patients were included, ranging in age from 19–50 years with a mean age of 36.4 years; one patient was lost to follow-up and was therefore excluded from the study.

The research was granted ethics approval.

WHAT THE STUDY FOUND

Pathological and long-term follow-up of the 52 adnexal masses investigated with CEUS diagnosed 23 as AT-OCLH and 29 cases of non-luteal haematoma, which quantified endometriomas, cystic teratomas and ovarian tumours (benign and malignant) under one subcategory. CEUS description criteria included perfusion characteristics, perfusion pattern type, intensity, presence of perfusion vessels, AT and wall thickness, which the authors classified as Type I–IV and grade 1–3.

Using this criteria, CEUS features of AT-OCLH were described as no contrast perfusion inside the mass, while the cyst wall demonstrated rapid, annular, high-intensity perfusion. This yielded a 95.7% sensitivity and 96.6% specificity positive predictive value for AT-OCLH.

Description of the CEUS characteristics in the non-luteal haematoma groups found that in the eight cases of malignant tumour, the CEUS showed interior perfusion with either a rapid inhomogeneous appearance or mixed mass with thick septa and papilla perfusion. In the seven cases of theca fibromas, CEUS showed perfusion of the whole mass, mostly homogenous perfusion from the margin to the centre. In the cases of mature cystic teratomas and endometriomas, CEUS showed no perfusion with the mass but slow annular, low-intensity cyst wall perfusion.

RELEVANCE TO CLINICAL PRACTICE

This study demonstrates the potential advantages of CEUS over conventional 2D-transvaginal imaging for the differential diagnosis of AT-OCLH from a solid mass in the menstruating patient. The adaption of the six CEUS diagnostic criteria of perfusion characteristic, pattern, intensity, presence of perfusing vessels, earlier (contrast) arrival time and wall thickness in the screening of solid ovarian masses may help reduce unnecessary follow-up in cases of AT-OCLH, or quicker management for cases of non-luteal haematoma diagnoses. ■

> "2D-CEUS can be used to distinguish whether there are active tissues within the solid mass."

Consensus definition of fetal growth restriction: A Delphi procedure

REFERENCE
Gordijn SJ, Beune IM, Thilaganathan B, Papageorghiou A, Baschat AA, Bakers PN, et al. *Ultrasound Obstet Gynaecol* 2016;48:333–9

REVIEWED BY
Ffion Humphries-Hart
ASA SIG O&G

WHY WAS THE STUDY PERFORMED

The study was conducted to determine clear parameters to distinguish between fetuses compromised by fetal growth restriction (FGR) from fetuses that are small for gestational age (SGA). SGA encompasses a physiologically small but healthy fetus that is at lower risk of adverse perinatal outcomes. FGR is when a fetus is pathologically small and does not reach its biological growth potential due to placental dysfunction and is at higher risk of perinatal morbidity and mortality. The aim of the study was to create a consensus-based FGR definition and distinguish between early and late FGR. Prior to the study there was no gold standard to define FGR, with diagnosis made on a statistical deviation of fetal size from a population-based chart with a threshold of estimated fetal weight (EFW) at the 10th, 5th or 3rd centile. This definition made it difficult to distinguish between SGA and FGR in the third trimester resulting in SGA fetuses with EFW < 10th percentile overdiagnosed and compromised fetuses with EFW > 10th percentile underdiagnosed.

HOW THE STUDY WAS PERFORMED

The study was performed by a multi-centred international team of FGR experts. One hundred and six experts were requested to join the procedure with 56 participants entering the first round and 45 (80%) completed all four rounds. The study used the Delphi method survey, which is a process framework based on the results of multiple rounds of questionnaires sent to a panel of experts with anonymous responses. The study had four phases of questionnaires, and the results were reported to the participants after each phase. In the first phase, the distinction between early and late FGR was defined. The second and third stages discussed the parameters that could be separately considered for diagnosing FGR. In the final stage, some possible algorithms were presented and the algorithms with the most support were considered to be the consensus-based definition of FGR.

WHAT THE STUDY FOUND

- Early and late FGR is demarcated by a gestational age (GA) of 32 weeks.
- To define FGR, congenital abnormalities must be absent.

Definition of early FGR (< 32 weeks' gestation)

1. Solidary requirement:
   - Abdominal circumference (AC) < 3rd percentile OR EFW < 3rd percentile OR absent end-diastolic flow in the umbilical artery (UA)
2. Two contributory parameters required:
   - AC OR EFW < 10th percentile
   - UA OR uterine artery (UtA) pulsatility index (PI) > 95% percentile

Definition of late FGR (≥32 weeks' gestation)

1. Solidary requirement:
   - AC < 3rd percentile OR EFW < 3rd percentile
2. Two out of three contributory parameters required:
   - AC < 10th centile OR EFW < 10th centile
   - AC OR EFW crossing centiles by > two quartiles on growth charts
   - UA PI > 95th percentile OR abnormal cerebroplacental ratio (CPR) < 5th percentile

Consensus definition of fetal growth restriction: A Delphi procedure *cont.*

RELEVANCE TO CLINICAL PRACTICE

The recommended framework to diagnosed FGR will assist sonographers and consultants to distinguish between fetuses that are SGA and fetuses that are compromised with FGR in the third trimester. This will enable compromised fetuses to be identified, monitored and managed appropriately and improve their perinatal outcomes.

> "While current standards for fetal growth now allow international comparisons of the prevalence of SGA to be made, no such consensus exists for the definition of FGR."