Is There A Use For Ultrasound In The Detection And Characterization of CSDs?

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Introduction

Caesarean deliveries account for 34% of live births in the UK in 2022, and this figure has been increasing over the last decade[7]. A caesarean scar defect (CSD), is one complication and forms due to inadequate healing of the caesarean incision, on the anterior wall of the isthmus of the uterus. This causes the anterior uterine wall to thin. which can then form an indentation and a pouch of fluid at the caesarean scar (CS) site[8].

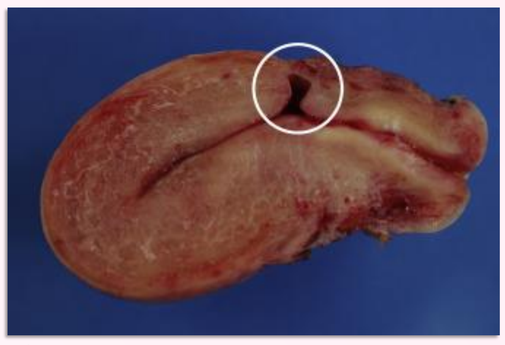


Figure 1
Frozen hysterectomy specimen - sagittal section, showing a deep anterior defect, covered with a thin layer of layer of myometrium (white circle) at the site of the caesarean scar[4].

Multiple papers suggest several factors that can have an impact on the healing of the CS and therefore formation of a CSD - how the uterus is closed, prolonged labour, oxytocin, cervical dilatation > 5cm, low incisions during the caesarean section and retroversion of the uterus. A CSD has been linked to various obstetric and gynaecological issues including uterine rupture and caesarean scar pregnancies (CSPs) which, although can be life threatening and potentially fatal, have been reported to be rare[1]. However, more commonly reported issues related to a CSD include post menstrual spotting, dysmenorrhea and chronic pelvic pain and the severity of these are linked to the size and appearance of the CSD[9].

No standardised guideline for measurements of CSDs, results in challenges for ultrasound reporting and subsequent management of defects

Methodology

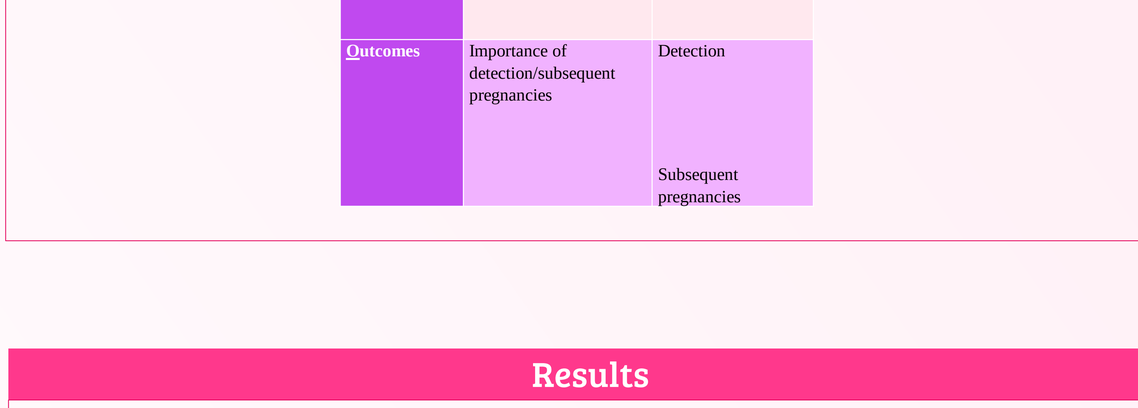
Using an adapted PICO framework, review of literature was undertaken to establish the current evidence base for the performance of ultrasound in identifying CSDs. A rigorous systematic search of medical databases including Medline, CINAHL, Science Direct, Web of Science, CINAHL complete and The Cochrane Library was performed. Eligibility criteria were used to select the final seven papers.

Patient or problem addressed	**Women with CSDs**	**Caesarean scar defects**
Intervention	Ultrasound	Ultrasound
Comparison intervention/Control	Women without CSDs	
Outcomes	Importance of detection/subsequent pregnancies	Detection Subsequent pregnancies

Results

After the exclusion and inclusion criteria were applied, the final 7 papers from between were critically reviewed. Although the sample sizes from the studies were not all representative, the review showed that Ultrasound was the first line imaging tool to assess a CSD due to being readily available and less expensive than alternatives, however the sensitivity and specificity of Ultrasound in detecting a CSD, as reported across the seven papers reviewed, ranges from: 90.9 – 76.8% and 97% - 61.1% respectively. This could be down to multiple variables such as Sonographer training, experience, equipment and technique, all of which that can affect the results. Probe position and application of pressure of the probe, can also affect the appearance of the defect, either positively or negatively[6].

Figure 2
Transvaginal Ultrasound demonstrating Ultrasound measurements taken to assess a CSD;
1. Adjacent myometrial thickness (AMT), **2**. Residual myometrial thickness (RMT). **3**. Width of defect, **4**. Distance between the scar and external os, **5**. External os, **6**. Myometrial defects without contact with the uterine cavity[5].



The review showed that Ultrasound was the first line imaging tool to assess a CSD and that the length, depth, width, Residual Myometrial Thickness (RMT) and Anterior Myometrial thickness (AMT) are the ultrasound measurements that should be taken to assess a CSD. This will aid the gynaecologist in their decision of how to manage the complication as there are no current management guidelines. A thin RMT and AMT, with increased length, depth and width measurements, characterise a CSD. An RMT of ≤ 2cm and a scar depth of ≥ 0.5cm are the cut off values to define a large CSD, with a highly significant relationship ($p<0.0001$) demonstrated between large CSDs and prolonged menstruation. CSD detection rates in symptomatic women were reported at 80.9% ($p<0.05$).

Discussion

It remains unclear why a CSD forms after a caesarean delivery, though the risk factors for developing a CSD are well recognised, including the number of previous caesarean sections, the site of the uterine incision, suturing technique used to close and maternal conditions such as smoking and diabetes.

A readily available and less expensive imaging tool, Ultrasound is the first imaging modality of to identify and assess CSDs. With the large range of sensitivities in this review, it suggests that not all positive defects are being detected by TVUS, and this means that some women are being told there is no defect seen on the scan when there is. Those that may desire a subsequent pregnancy could be at risk of a CSP or PAS, which can be life threatening for the woman if undiagnosed or not managed appropriately.

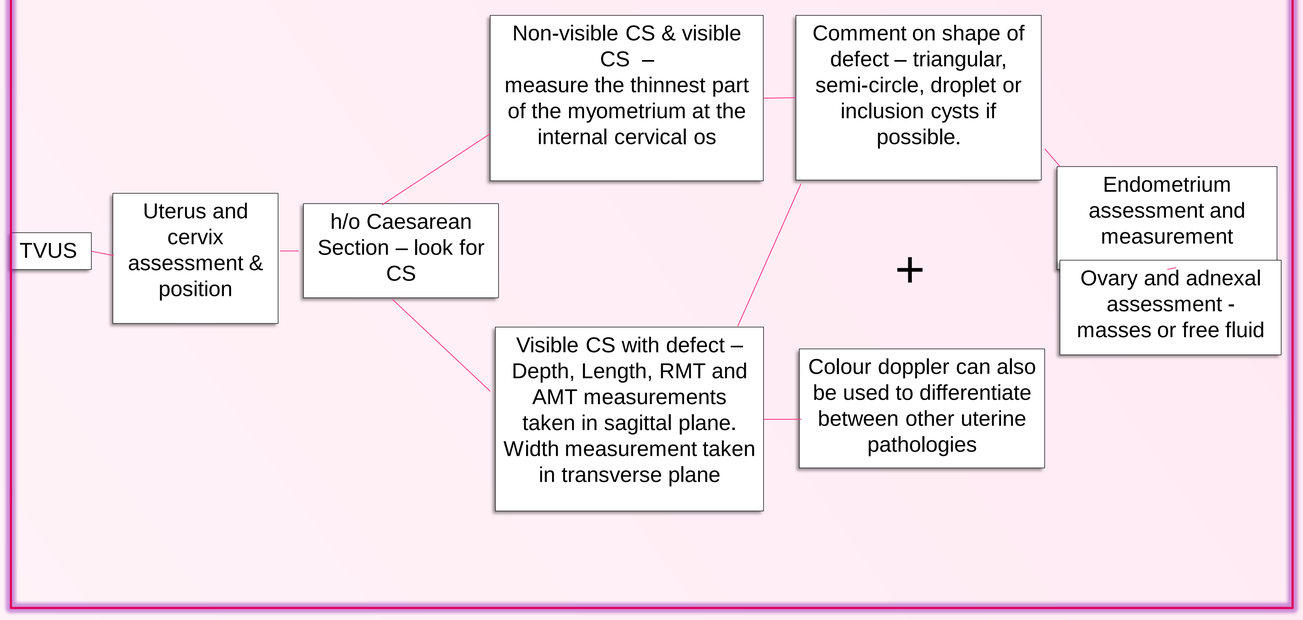
If detected, then the length, depth, width, RMT and AMT should all be measured in the sagittal plane, to assess a CSD. This not only standardises practice of Sonographer's but will aid the gynaecologist in their decision of how to manage the complication as there are no current management guidelines.

The best sagittal section is when in midsagittal, with a good view of the cervical canal and moving the probe laterally from side to side, to visualise the CSD at its largest. Varying the pressure of the probe may also be of use to see if this changes the visualisation of the CSD. The ultrasound report should be a standard gynaecology scan report – position of uterus, endometrium, adnexa and ovaries and any pathology seen, whether a scar can be seen, whether a scar can be seen without a defect, whether a scar can be seen with a defect, its position and measurements as described above. A suggested guide to reporting on CSDs can be found in Figure 3.

With this increasing rate, it would be impossible to implement screening of all women that have had CDs in the NHS. Though the papers reviewed are from outside the UK, this does not change the fact that the caesarean section rate is increasing worldwide, and therefore more primary research needs to be conducted in the UK surrounding potential complications.

With an increasing rate of caesarean sections, further research is required to identify women who may be considered high-risk for CSP / PAS, for whom screening may be beneficial. As there are no current guidelines regarding the diagnosis and management of CSDs in the UK, with a significant lack of research looking at treating and repairing CSDs, with an emphasis on the need for more primary research to be conducted regarding this complication with potential catastrophic consequences in subsequent pregnancies.

Figure 3 - A suggested guide of how to scan and report Gynaecology scans and CSDs, Based on the review of the current literature and Savukyne et al, 2021. 'Transvaginal Sonographic Evaluation of Cesarean Section Scar Niche in Pregnancy: A Prospective Longitudinal Study.'



Conclusion

TVUS can detect CSDs in both non-pregnant and pregnant women, however with the serious complications associated with a defect, it is of benefit to be aware before a subsequent pregnancy, to reduce the risk of a CSP. It is vital that CSD awareness is raised amongst Sonographers and Gynaecologists, and that they know how to assess and report them, using a standardized practical guideline.

At present, CSDs are assessed and managed based upon whether a woman is symptomatic or not, their desire for future fertility and the effect their symptoms are having on their life. Availability of resources in each local area also has an impact upon management of these women and in turn the outcomes. This does make it difficult to make direct comparisons and does highlight the need for a local SOP (as in Figure 6's suggested scan/reporting algorithm), for Sonographer's to be able to identify and assess CSDs and suggest referral to a gynaecologist.

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