

Validation of a scoring system and development of a training package for assessment of caesarean section scar characteristics and cervical length in pregnancy

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BACKGROUND

Previous Caesarean Section (CS) at full dilatation increases the risk of spontaneous preterm birth (PTB) in the next pregnancy. CS scar position and size can be assessed by mid-gestation transvaginal ultrasound scan (USS).^{Banerjee et al UOG, 2022}

A CS scar close to the internal os increases the risk of shortening cervical length (CL) and spontaneous PTB.^{Banerjee et al AJOG MFM, 2024}

AIM

To develop a scoring system and USS training package to assess CL and CS scar characteristics during pregnancy using a validated technique.

METHODS

A **6-point image scoring system** was developed and validated by two experts:

- Anonymised USS images were subjectively and objectively scored.
- 38 images giving six independent binary scores needed >80% agreement to validate the scoring system.

The **training video** was developed with input on the script from patients with lived experience of PTB.

- The animation was created and illustrated with anonymised videos of 2D USS with patient consent.
- Anonymous feedback was acquired from 20 UK PTB experts.

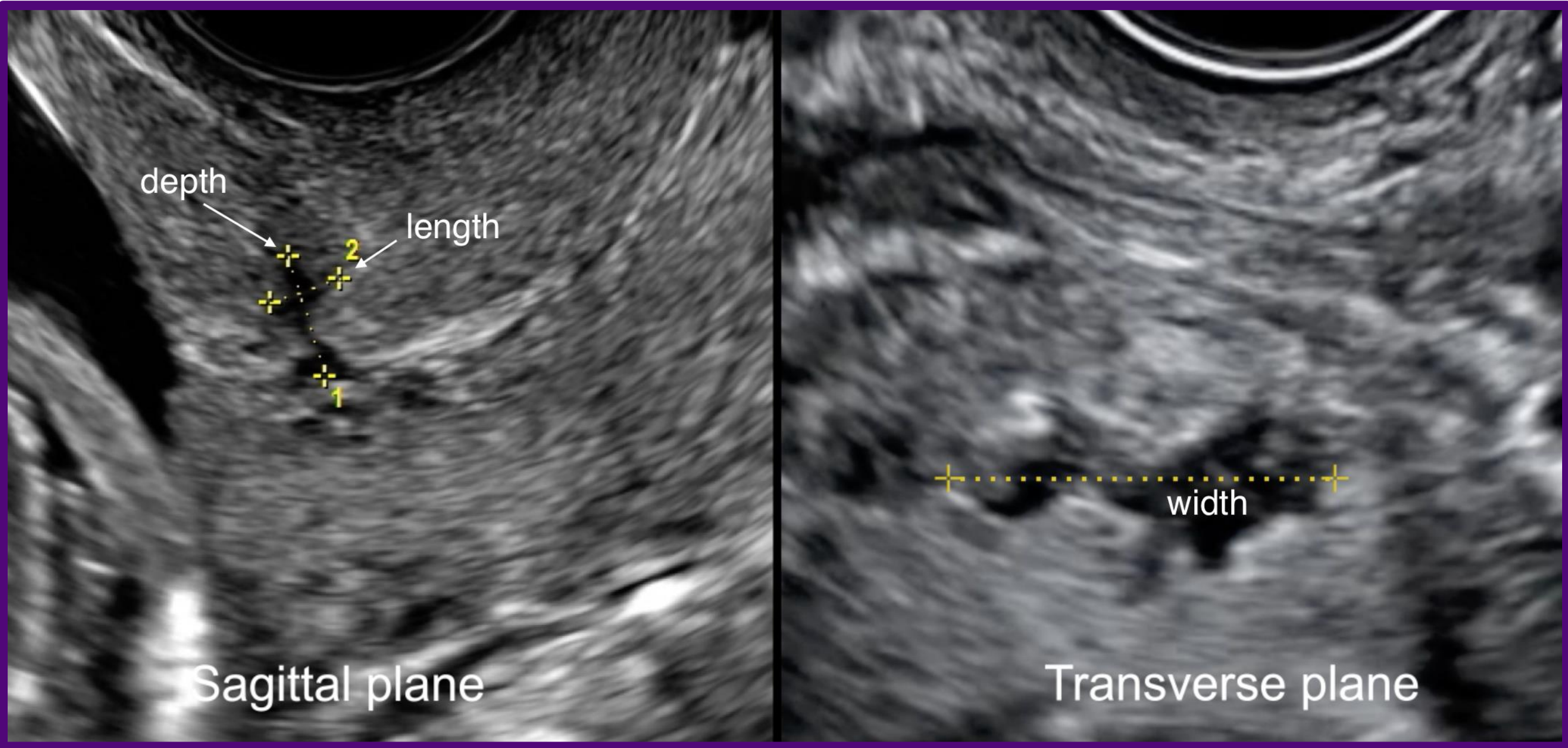


Figure 1: USS image of CS scar size.
Left: CS scar length and depth. Right: CS scar width.

RESULTS

The 6-point objective image scoring system includes: essential criteria for CL measurement, CS scar position (distance from internal os), and CS scar niche measurements. There are optional additional criteria (not included in validation).

Experts had overall agreement:

- Objective evaluation = 80.7% (184 of the 228 criteria matching)
- Subjective evaluation = 76.3%

The training video has animation: key annotations, and voiceover description, providing linguistic, visual, aural, and spatial learning.

Qualitative feedback on the video was analysed based on key themes: clear explanations, learning multimodal, and clinically relevant.

TRAINING VIDEO

Please scan QR code to watch.
Developed by UCL Media Centre.



Table 1: Essential Criteria	Scoring
1. Sagittal view of cervical canal and empty bladder	Bladder empty and sagittal section achieved
2. Magnification	Correct magnification
3. Internal os identified	Internal os marked
4. Cervical length	Correct calliper placement from internal to external os
5. Shortest internal os to CS scar distance	Correct calliper placement from inferior extremity of CS scar to the internal os position
6. Measure CS niche in sagittal plane	CS niche length and depth measurement

Table 2: Optional Additional Criteria	Description
Measure dimensions of niche in transverse plane	Measure width of niche in transverse plane
Measure myometrial thickness	Measure adjacent myometrial thickness (AMT) and residual myometrial thickness (RMT) in sagittal view

Table 3: Validation Results	Agreement	Kappa Coeff
Subjective Score	76.32%	0.4738
Objective Score	80.70%	0.5911
Criterion 1 - Sagittal view of cervical canal and empty bladder	76.32%	0.4738
Criterion 2 - Magnification	84.21%	0.6358
Criterion 3 - Internal os identified	86.84%	0.6713
Criterion 4 - Cervical length	73.68%	0.4345
Criterion 5 - Shortest internal os to CS scar distance	81.58%	0.6275
Criterion 6 - Measure CS niche in sagittal plane	81.58%	0.6254

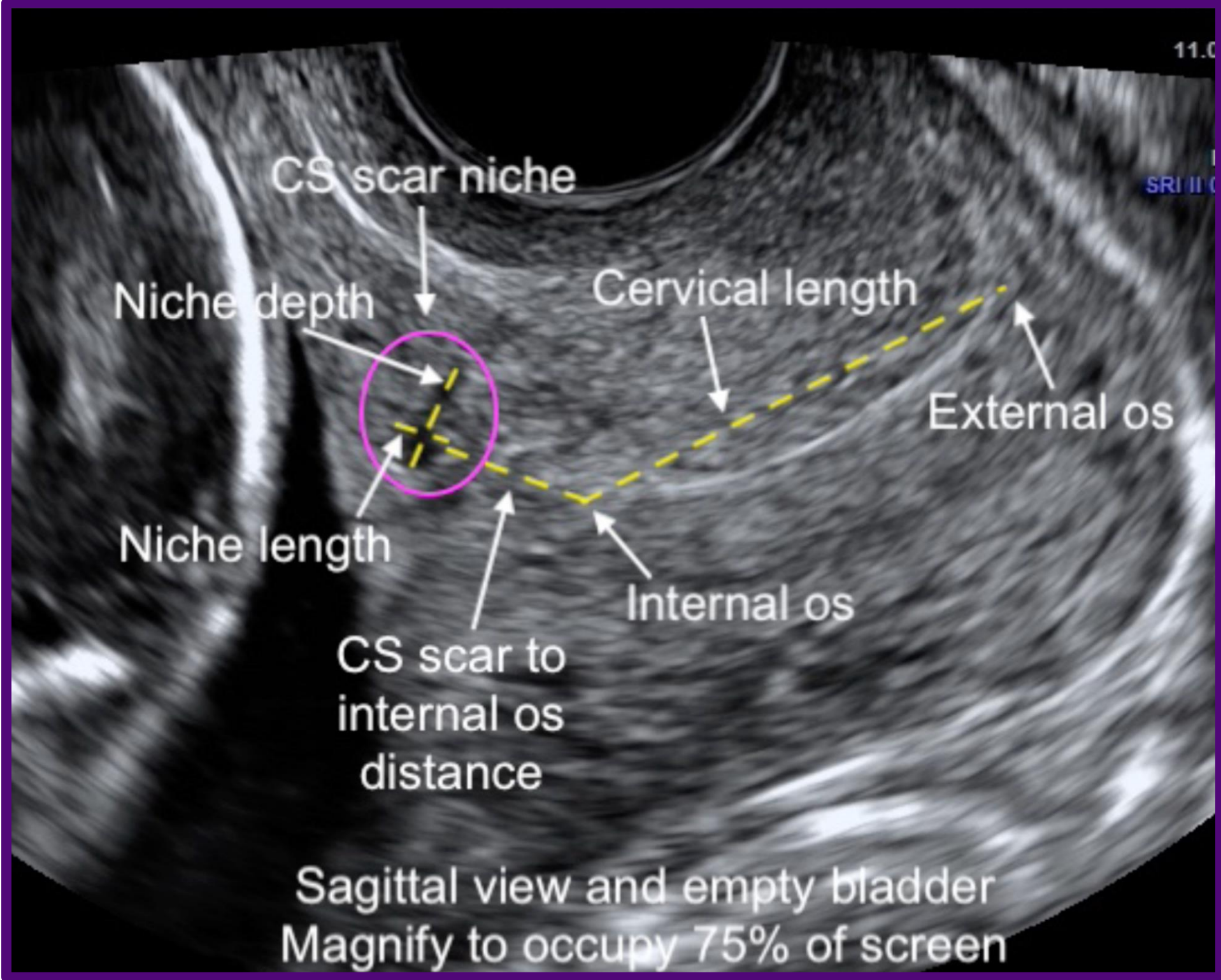


Figure 2: Sagittal transvaginal USS image demonstrating a CL and CS scar niche. All 6 essential criteria have been achieved and labelled



Figure 3: Training video with animation illustrating the USS examination.

CONCLUSION

We have validated a 6-point scoring system of transvaginal 2D USS images of the cervix and CS scar. Objective image assessment was more reliable and reproducible than subjective. PTB experts found the training video to be effective and clinically applicable. The training package is ready for use.



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Banerjee et al UOG,
2022



Banerjee et al AJOG MFM,
2024

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