

EP05.58

Cumulative muscle load during 2D versus 3D first-trimester ultrasound scanning: An electromyography (EMG) study.

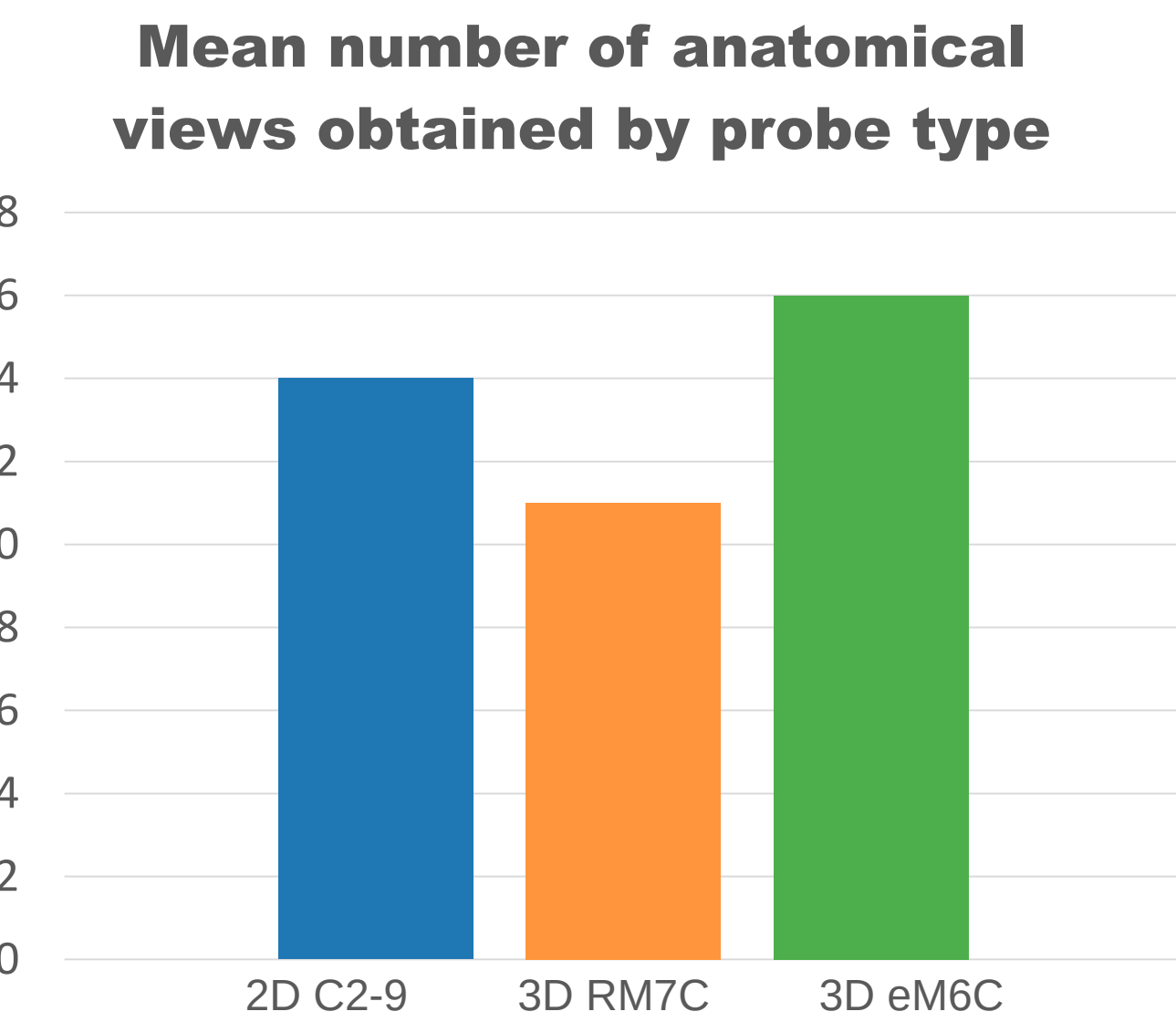
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Objective

To investigate whether 3D ultrasound probes reduce scan time and sonographer muscle load compared to traditional 2D imaging.

Study Design

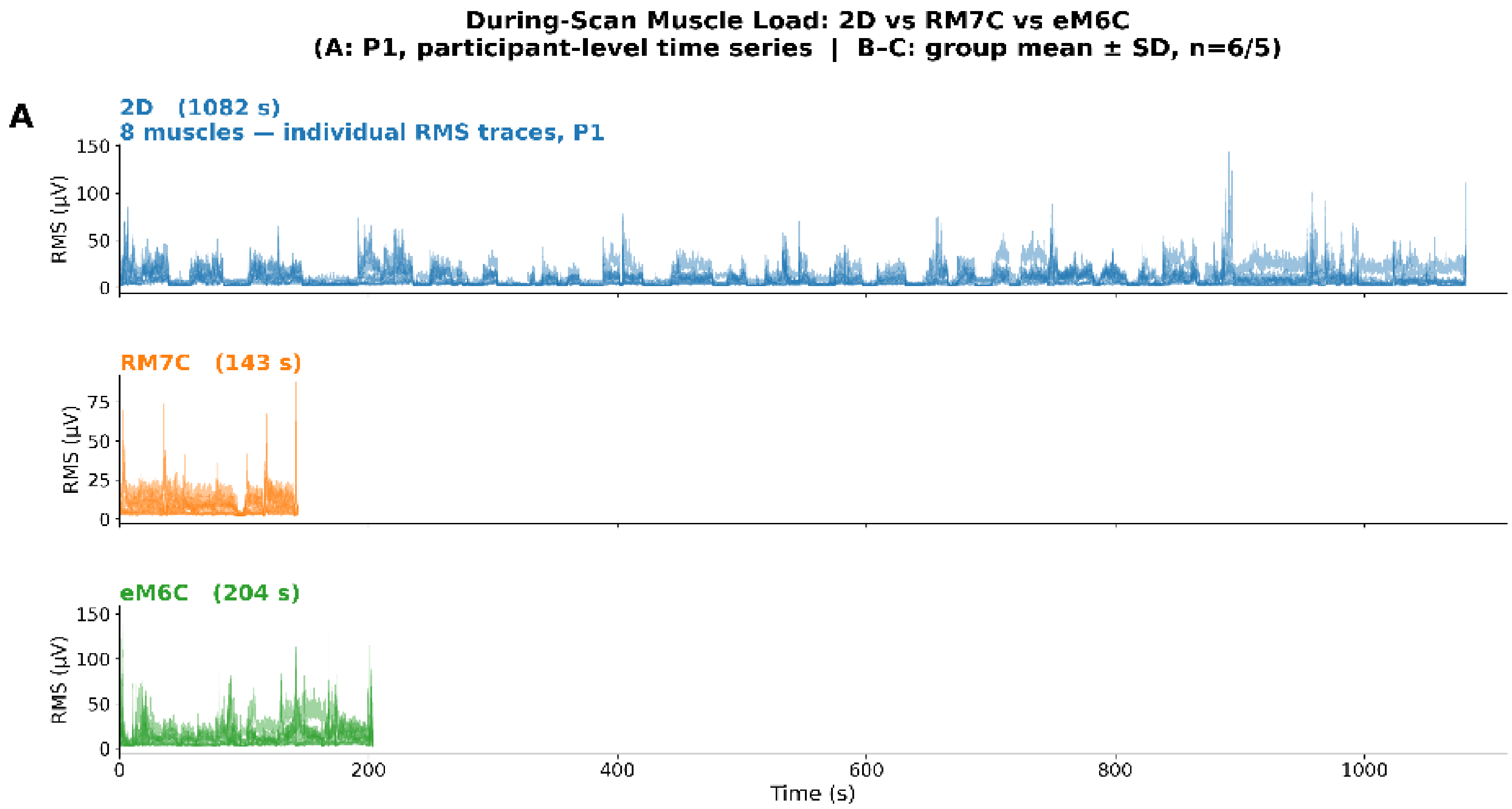
- Prospective feasibility study of first trimester scans
- Oxford, UK, 2026
- One sonographer scanned 6 participants
- GE Expert 22 and GE 4D View software
- **2D:** C2-9-D probe; 19 fetal views attempted
- **3D:** RM7C mechanical and eM6C electronic probes; 5 fetal volumes acquired; one volume selected to extract the same 19 2D views
- Scan order: randomised
- Rest periods: 15min between 2D/3D; 5min between 3D probes
- Delsys Trigno surface electromyography (EMG) recorded electrical activity from 8 sonographer upper-limb muscles (**B**)



Key Findings

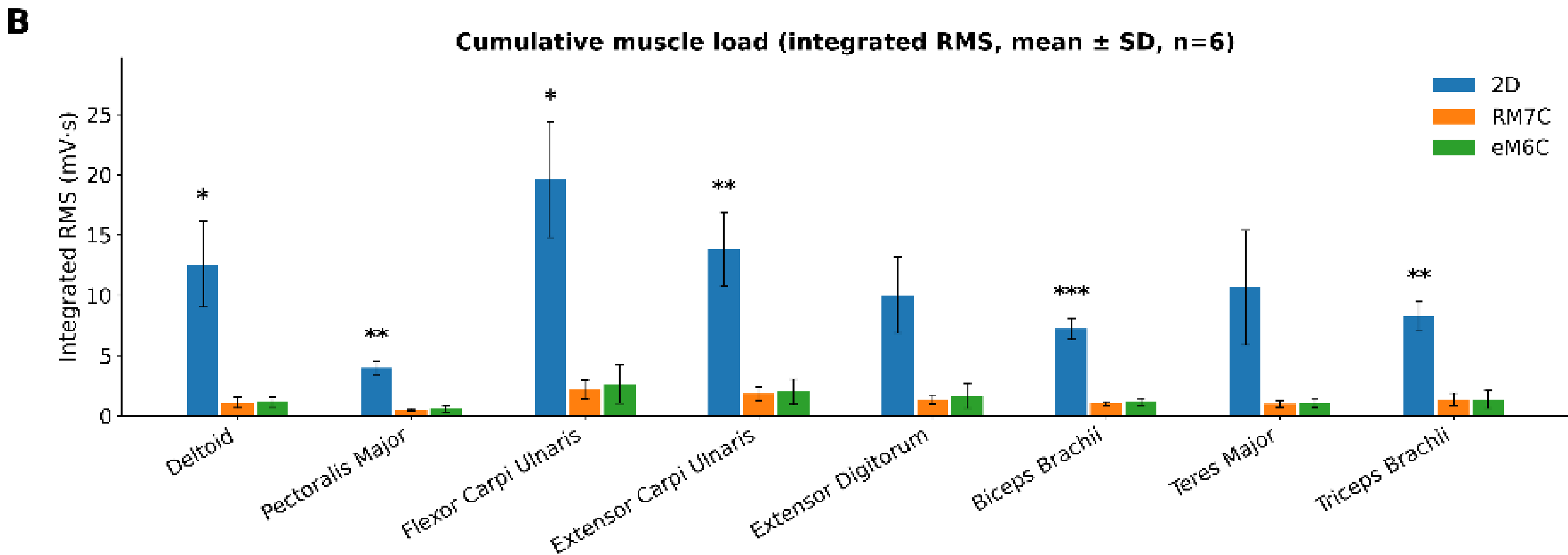
2D scans were 9.7x longer than 3D

- 19.6±3.5 vs 2.0±0.7min eM6C, 2.1±0.3min RM7C; both $p<0.0001$, $d\approx 4.7$.
- eM6C acquired volumes **4.6× faster** than RM7C (1.3±0.4s vs 6.1±1.5s, $p=0.0004$, $d=3.66$).
- Mean views obtained: 14 for 2D, 11 for RM7C and 16 for eM6C.



Cumulative load consistently greater for 2D than 3D

- 6/8 muscles remained significant after Bonferroni correction ($p=0.0004$ – 0.015 , $d=3.1$ – 6.8).



Contraction frequency was significantly higher in 2D than 3D across all muscles

- 3 muscles remained significant after correction (BB $p=0.002$; TM $p<0.001$, FCU $p=0.047$).

Discussion

3D ultrasound has the potential to reduce scan duration, sonographer muscle load and strain while increasing image acquisition. Faster acquisition with the eM6C probe improved volume capture efficiency. Our future work will aim at optimising data extraction from 3D volumes and examine whether this could be a viable alternative to conventional 2D imaging in the first trimester.

Conclusion
Trans-abdominal 3D ultrasound probes reduced scan time and sonographer muscle load compared to traditional 2D ultrasound imaging.