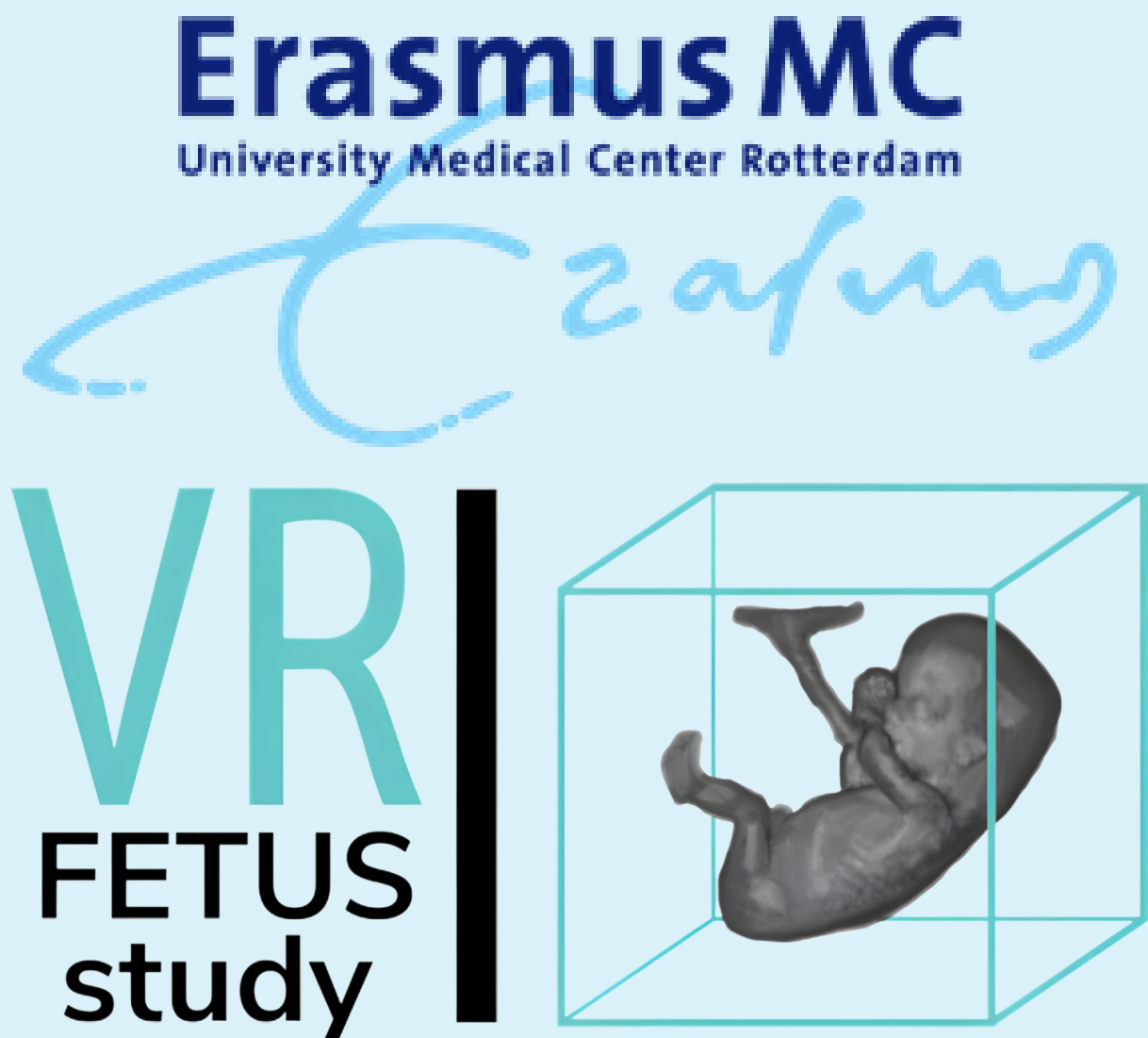


EP05.84 Can offline three-dimensional and virtual reality ultrasound replace hands-on two-dimensional ultrasound in first-trimester anomaly detection?

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OBJECTIVE

To determine feasibility and diagnostic accuracy of hands-on two-dimensional (2D) ultrasound and offline first-trimester three-dimensional (3D) and 3D virtual reality (VR) ultrasound (US) in fetal anomaly detection (Figure 1).

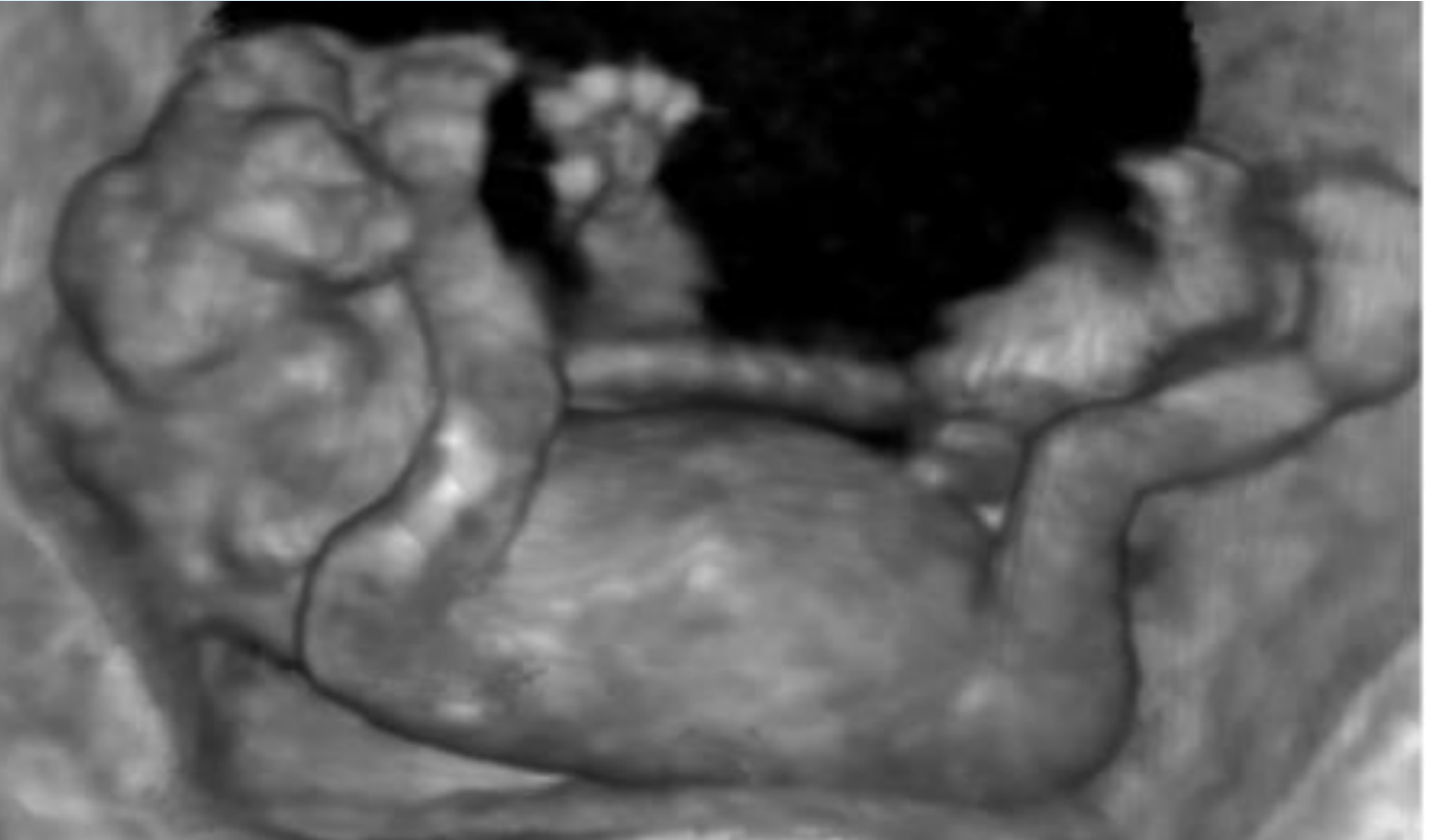
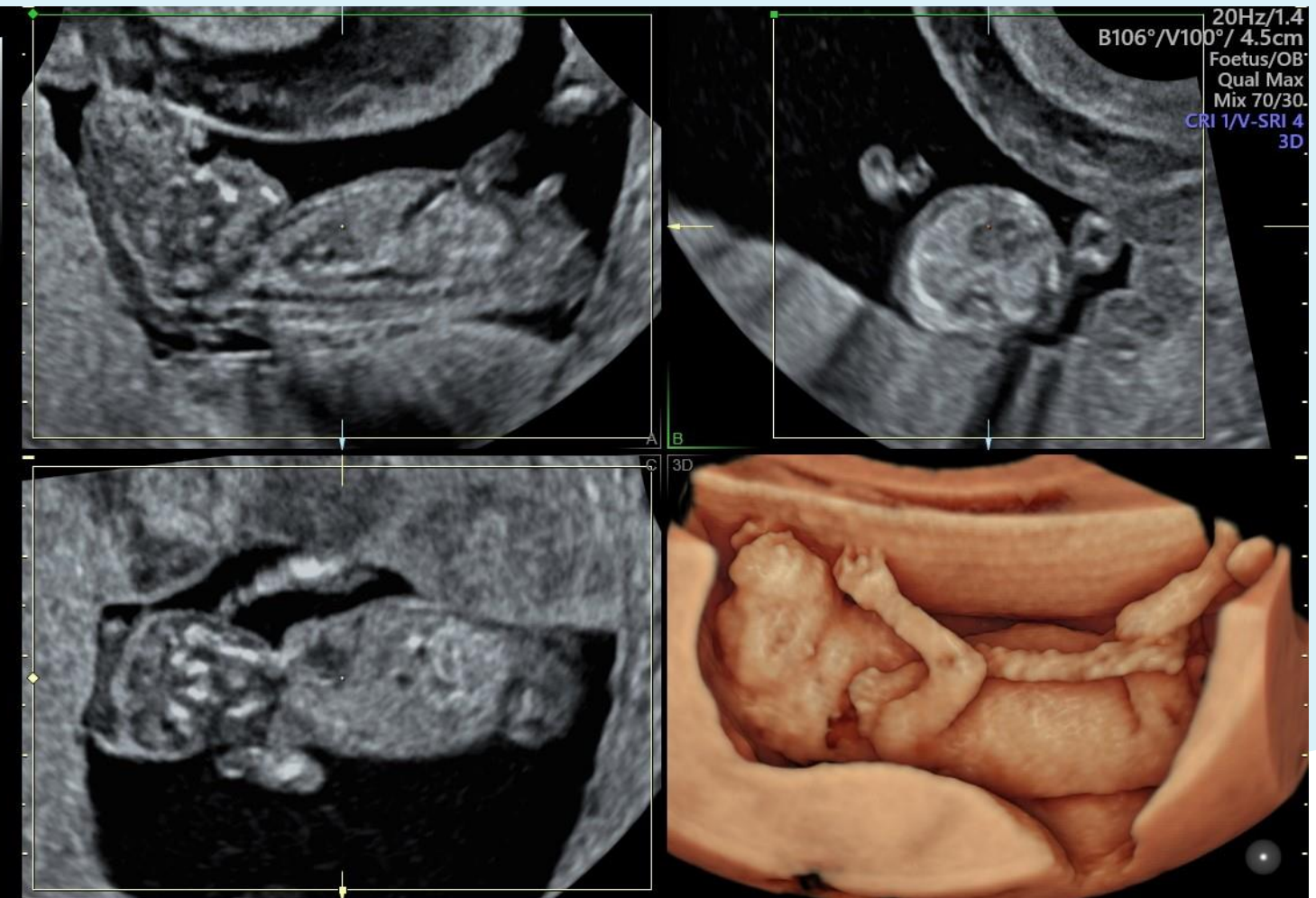


Figure 1: Fetus (13⁺ weeks' gestation) with anencephaly reflected by 3 US techniques: 2D US (1a), 3D US (1b), and 3D VR US (1c).

METHODS



Advanced first-trimester anomaly scanning (11⁺ to 14⁺ weeks' gestation) in a high-risk population at a tertiary care center.



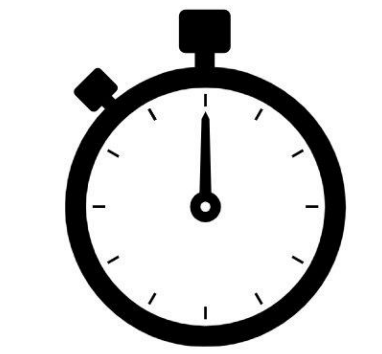
N = 150 fetus of which 38 with a normal outcome and 112 with one or more confirmed anomalies.



Hands-on 2D and offline 3D and 3D VR evaluation by blinded and experienced sonographers.



Diagnostic accuracy analyzed at three levels: 1) fetal classification, 2) organ system classification, both as normal or abnormal, and 3) organ-specific diagnosis.



Feasibility is assessed by recording evaluation time.

RESULTS

Preliminary analyses of level 1 (Figure 2) and level 2 (Figure 3) diagnostic accuracy and evaluation time (Figure 4).

N = 73 fetus, of which 18 with a normal outcome and 55 with one or more confirmed anomalies.

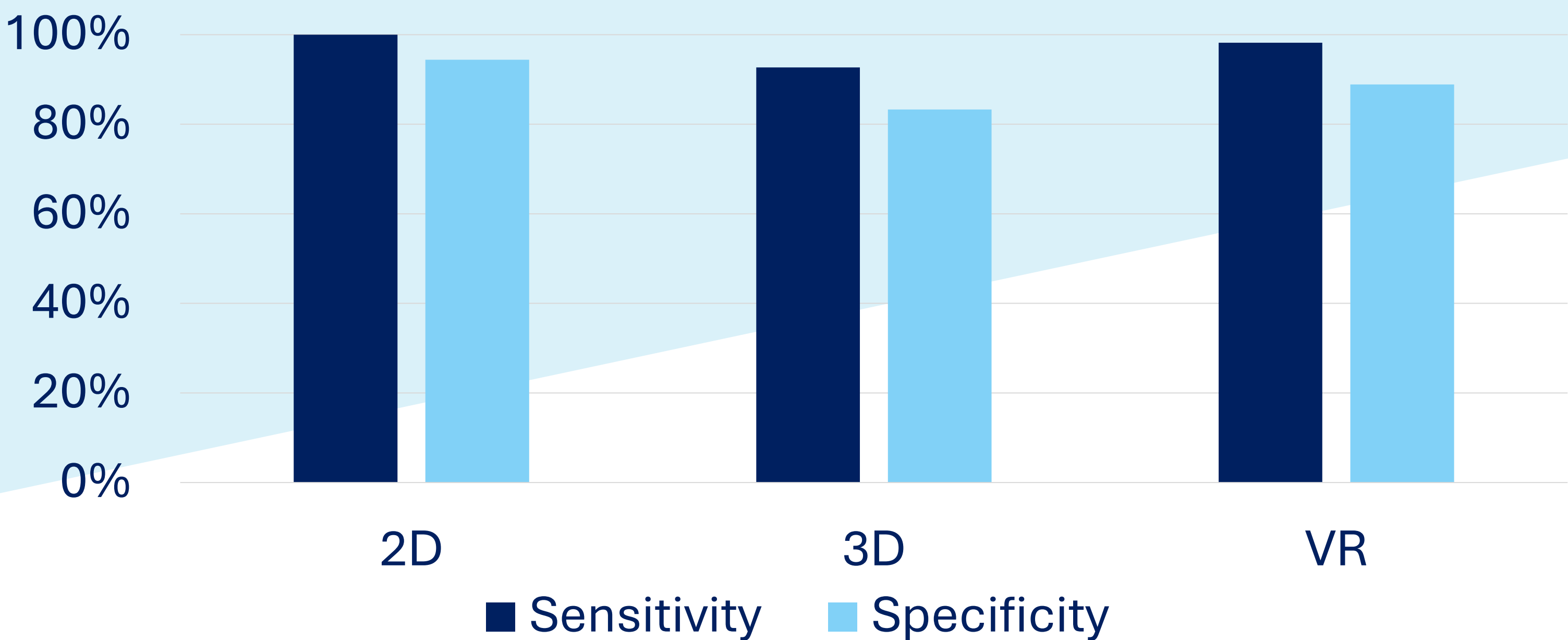
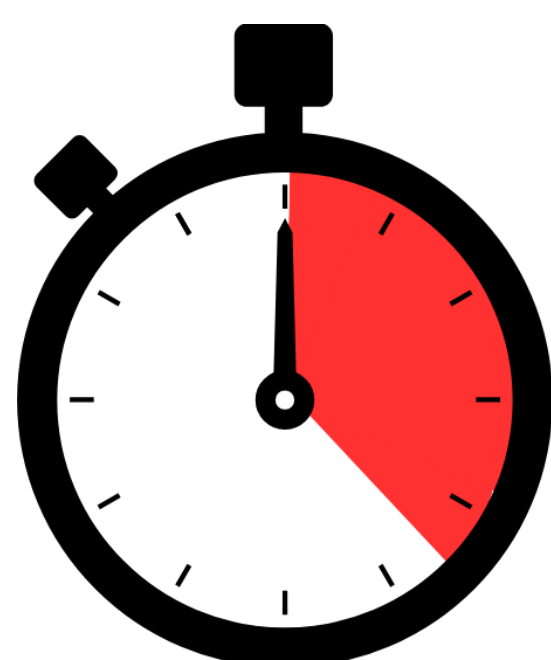
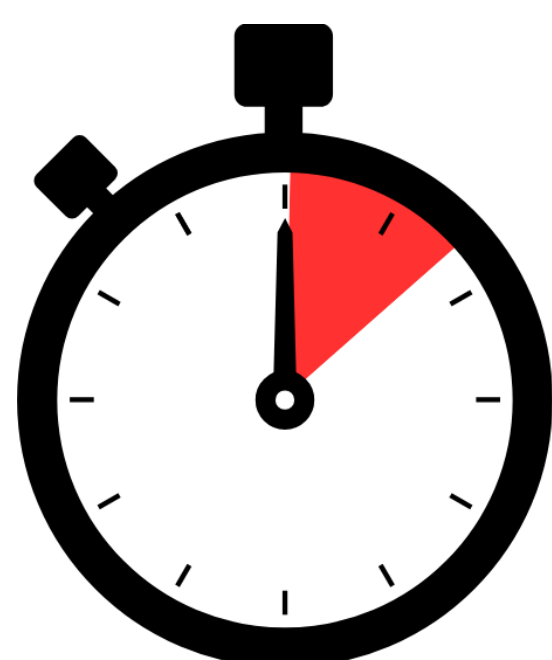


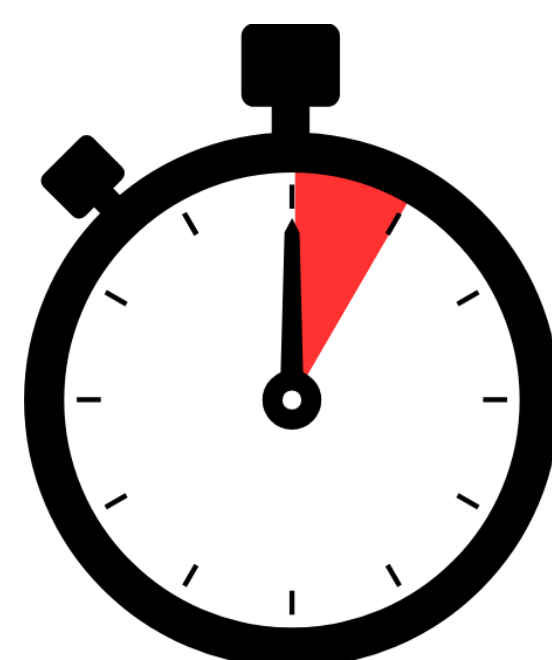
Figure 2: Diagnostic accuracy in level 1 (overall fetal classification). No significant difference was seen between the 3 US modalities.



2D: 22:39



3D: 08:34



3D VR: 05:17

Figure 4: Mean evaluation time (mm:ss). 3D VR is significantly the fastest modality, and 3D was significantly faster than 2D as well.



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Organ system	2D			3D			3D VR		
	Sensitivity, %			Specificity, %			Specificity, %		
Cranium	100	100	100	98	97	98	98	98	98
Brain	95	91	100	98	96	100	98	100	100
Face	75	63	100	90	90	97	90	97	97
Neck/Skin	100	95	95	98	96	94	98	96	94
Thorax	67	56	100	93	93	100	93	93	100
Spine	82	82	82	93	93	97	93	93	97
Abdominal wall	94	81	100	100	97	98	100	97	98
Abdomen	100	0	100	91	94	99	91	94	99
Kidneys/Bladder	100	83	98	57	23*	80*	100	80*	80*
Limbs	94	53	65	94†	87†	93	94	87	93

Figure 3: Diagnostic accuracy in level 2 (organ system classification).
* p = 0,012 between 3D and 3D VR. † p = 0,039 between 2D and 3D.

Legend:
Green: ≥95%
Light Green: 90-94%
Yellow: 80-89%
Orange: 70-79%
Red: <70%

CONCLUSION

This is the first study to compare hands-on 2D and offline 3D and 3D VR US for fetal anomaly assessment in a high-risk population.

Preliminary findings indicate comparable diagnostic performance, especially between 2D and 3D VR US, with reduced evaluation time for 3D and 3D VR US.

These findings suggest that offline 3D VR US analysis may improve workflow efficiency and represent a promising direction for future clinical implementation.