

Simplified sagittal approach for assessing umbilical vein blood flow in the first trimester: comparable accuracy to the standard transverse technique

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WHY CHANGE?

- UVBF reflects fetoplacental blood supply and can be assessed from 11+0 to 13+6 weeks.
- The established first-trimester technique uses transverse imaging for UV diameter and a Doppler acquisition for TAMXV.
- Multiple acquisitions may be time-consuming and involve movement and probe manipulation.

OBJECTIVE

To determine whether UV diameter, TAMXV and calculated UVBF obtained in the sagittal plane are comparable to the conventional transverse approach, and to assess intra- and inter-observer reliability.

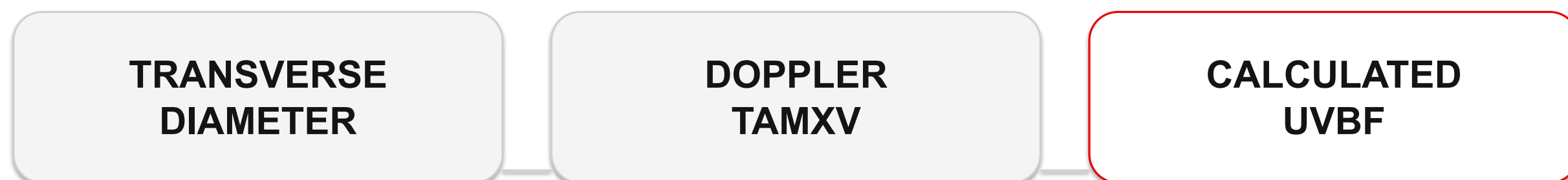
STUDY DESIGN

COHORT	INTER-OBSERVER	PRIMARY ANALYSES
110 singleton pregnancies 11+0 to 13+6 weeks	25 cases measured by two operators	3 UV diameter · TAMXV · UVBF

- Each participant had UV diameter and TAMXV assessed in both transverse and sagittal planes. **Figure 1**.
- UVBF was calculated from vessel diameter and TAMXV.
- Agreement was assessed with correlation, Bland-Altman analysis and ICC.
- Sagittal measurements were also used to derive CRL-specific reference intervals.

ONE-PLANE CONCEPT

Conventional transverse workflow



Proposed sagittal workflow



AGREEMENT: TRANSVERSE vs SAGITTAL

UV diameter	TAMXV	UVBF
r = 0.984 ICC 0.983 95% CI 0.976-0.988	r = 0.968 ICC 0.968 95% CI 0.954-0.978	r = 0.991 ICC 0.991 95% CI 0.980-0.994

All correlations $P < 0.001$; Figure 2

SAGITTAL INTER-OBSERVER RELIABILITY

• UV diameter ICC 0.964 • TAMXV ICC 0.995 • UVBF ICC 0.980	Excellent reproducibility with two operators
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WHAT CHANGES IN PRACTICE?

- Same anatomical plane already acquired for ductus venosus assessment.
- Both vessel diameter and flow can be obtained without switching to a transverse acquisition.
- Less probe manipulation for a more comfortable and stable study.
- A standardised view may simplify training and improve feasibility.

ADDITIONAL FULL-STUDY FINDING

CRL-specific sagittal reference intervals were derived for UV diameter, TAMXV and UVBF.

Sagittal reference equations:
UV diameter = $0.2371 + 0.0152 \times \text{CRL}$
TAMXV = $1.2767 + 0.1211 \times \text{CRL}$
UVBF = $8.4461 - 0.3014 \times \text{CRL} + 0.00393 \times \text{CRL}^2$

TAKE-HOME MESSAGE
First-trimester UVBF can be measured reliably in the sagittal plane, with excellent agreement with the standard transverse approach. Using the ductus venosus view may simplify acquisition and make UVBF more practical for routine ultrasound.

Next step: validate the technique in high-risk pregnancies and determine whether sagittal UVBF improves prediction of fetal growth and placental-related complications.

WHAT THIS STUDY ADDS

RELIABLE

Excellent agreement

Across methods: UVBF $r = 0.991$ and ICC = 0.991.
Sagittal inter-observer UVBF ICC = 0.980.

SIMPLER

One anatomical plane

The sagittal approach uses the routine ductus venosus view for both UV diameter and TAMXV, reducing extra acquisitions.

READY FOR NEXT STUDIES

Reference framework

The full study derived CRL-specific sagittal equations and centiles, enabling future work on growth and placental dysfunction.

UVBF TRANSVERSE vs SAGITTAL ACQUISITION

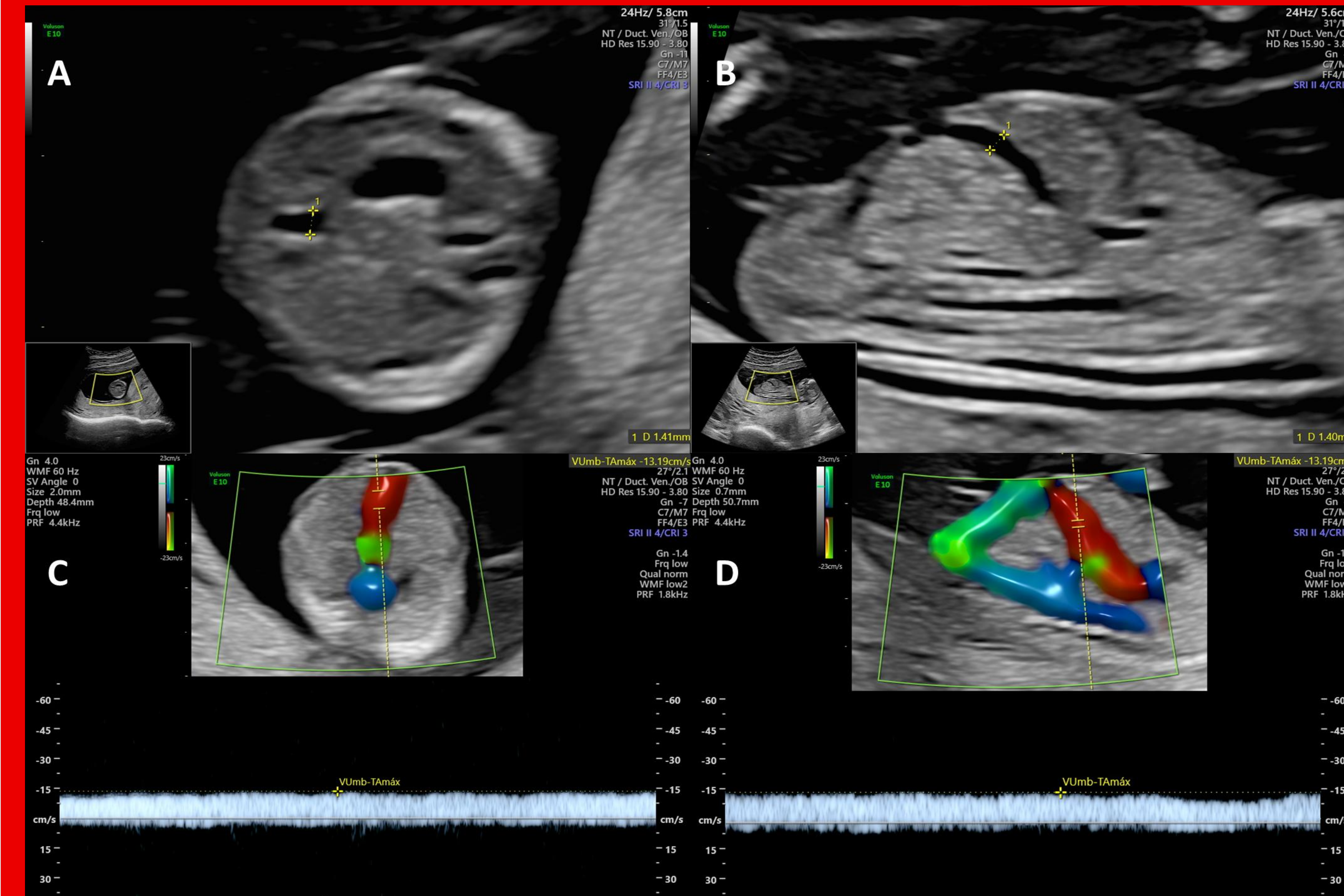


Figure 1. Ultrasound images demonstrating the two approaches for calculating the UVBF in the same first-trimester fetus. Left images show the transverse plane imaging (A and C), while right images (B and D) show the sagittal plane one. In the upper row the umbilical vein diameter is measured in the transversal (A) and sagittal (B) views, measuring the diameter at the inner-to-inner edges at the point of maximal size of the UV. The lower row presents colour Doppler imaging used to measure the TAMXV of the umbilical vein in the transverse (C) and sagittal (D) planes.

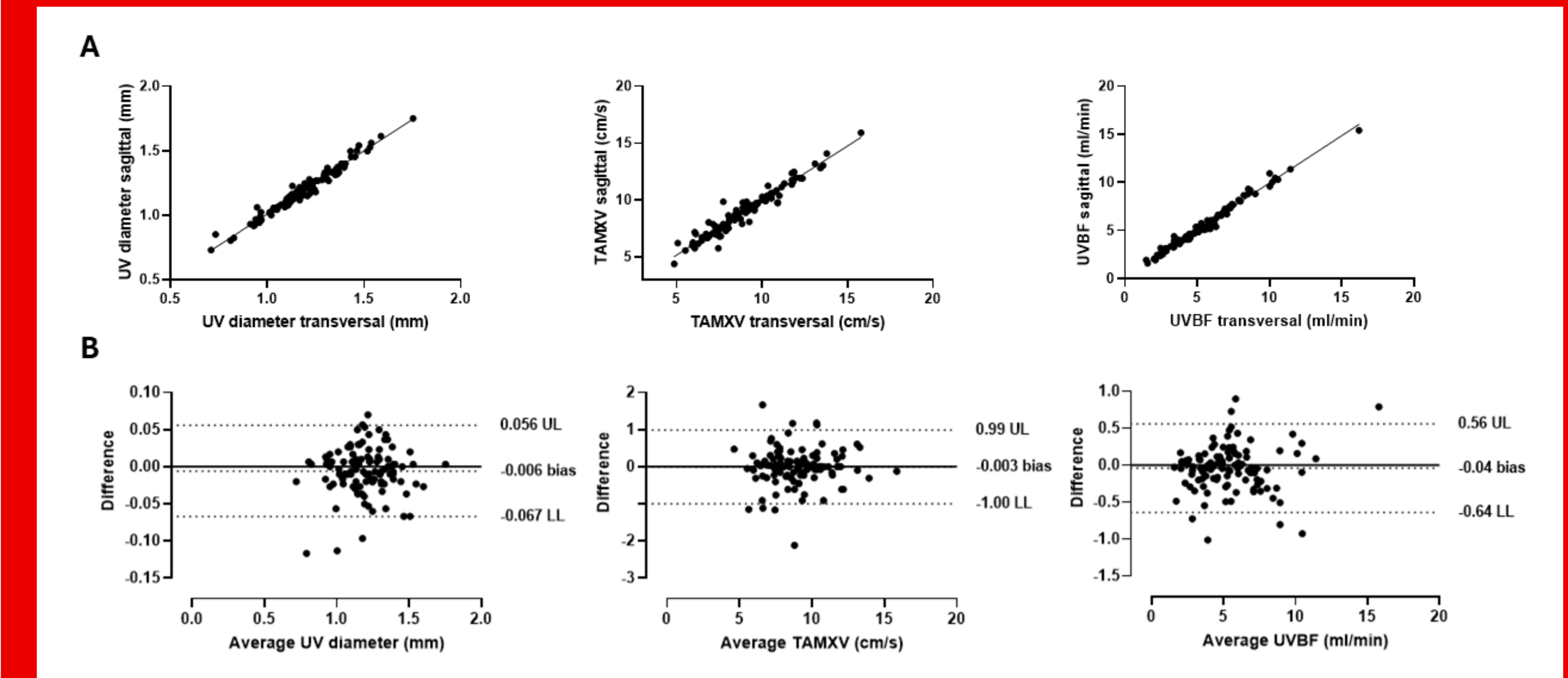


Figure 2. Correlations and Bland-Altman plots from ultrasonographic measurements of the study population (n=110). A: Correlation between intra-observer measurements of UV diameter, TAMXV and UVBF at the transversal and sagittal planes with 95% confidence intervals. B: Bland-Altman plots for the percentage mean difference and 95% limits for intra-observer measurements of UV diameter, TAMXV and UVBF.

FIRST-TRIMESTER UVBF REFERENCES

Rizzo G, Capponi A, Elena Pietrolucci M, Arduini D. Umbilical vein blood flow at 11 + 0 to 13 + 6 weeks of gestation. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2010;23(4):315-319. doi:10.3109/14767050903121464

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