

Background:

Previous studies have extensively investigated the angioarchitecture of the monochorionic placenta, with particular emphasis on vascular anastomoses between the fetal circulations. However, knowledge remains limited regarding the extent to which umbilical cord characteristics may influence the risk of complications in monochorionic twin pregnancies.

Objective:

Abnormal umbilical cord insertion may play a key role in influencing the risk of adverse outcomes in monochorionic twins, and the correlation between cord insertion type and twin-specific complications highlights the clinical relevance of this parameter. This study aims to assess the diagnostic accuracy of prenatal ultrasound in identifying different types of umbilical cord insertion across different trimesters

Methods:

This prospective study included 184 monochorionic twins with at least one ultrasound at our twin clinic, known obstetric outcomes, delivery at our center with macroscopic placental examination. Cord insertion (eccentric, marginal, velamentous) was assessed at the first visit and each trimester. Placental pathology at delivery served as the reference. Proximal cord insertion (<4 cm between cords) was also evaluated. Sensitivity, specificity, predictive values and likelihood ratios with 95% CIs were calculated.

Results:

Diagnostic measure	Cord insertion type Estimate (95% CI)	Proximate cord insertion Estimate (95% CI)
Apparent prevalence	0.59 (0.54–0.64)	0.10 (0.06–0.16)
True prevalence	0.53 (0.48–0.58)	0.10 (0.06–0.15)
Sensitivity	0.93 (0.89–0.96)	0.97 (0.77–1.00)
Specificity	0.79 (0.72–0.85)	0.99 (0.96–1.00)
Overall accuracy	0.87 (0.83–0.90)	0.99 (0.96–1.00)
Diagnostic odds ratio	53.28 (27.21–104.31)	3838.33 (158.58–97843.00)
Number needed to diagnose	1.38 (1.23–1.63)	1.04 (1.00–1.37)
Youden index	0.73 (0.61–0.81)	0.96 (0.73–1.00)
Positive predictive value	0.83 (0.78–0.88)	0.92 (0.70–0.99)
Negative predictive value	0.91 (0.86–0.95)	1.00 (0.97–1.00)
Positive likelihood ratio	4.49 (3.35–6.01)	107.59 (21.83–530.24)
Negative likelihood ratio	0.08 (0.05–0.14)	0.03 (0.00–0.43)

Predictor	OR (95 % CI)	p-value
Cluster-robust logistic regression adjusting for BMI, placenta position, and trimester.		
BMI (per 5 kg/m ²)	0.89 (0.73 – 1.08)	0.248
Posterior placenta	0.24 (0.12 – 0.43)	<0.001***
Second trimester (vs 1st)	2.53 (1.08 – 5.85)	0.031***
Third trimester (vs 1st)	1.93 (0.83 – 4.36)	0.118

Cluster-robust logistic regression adjusted for BMI, placenta position, trimester, and pathological insertion type (reference = Eccentric).		
BMI (per 5 kg/m ²)	0.92 (0.75 – 1.11)	0.407
Posterior placenta	0.23 (0.12 – 0.42)	<0.001***
Second trimester (vs 1st)	2.30 (0.97 – 5.39)	0.055
Third trimester (vs 1st)	1.74 (0.75 – 3.99)	0.190
Marginal insertion (vs Eccentric)	0.38 (0.17 – 0.79)	0.013***
Velamentous insertion (vs Eccentric)	0.42 (0.18 – 0.97)	0.045***

Conclusion

- The prenatal ultrasound assessment of umbilical cord insertion in monochorionic pregnancies can achieve high diagnostic accuracy (87%).
- The period between 17 and 25 weeks of gestation represents the optimal window for diagnosis.
- Ultrasound identification of abnormal cord insertions may improve risk stratification and prenatal counselling.
- Proximal cord insertion may represent an underestimated risk factor, ultrasound evaluation of the insertion site may optimize monitoring and clinical management of these high-risk pregnancies

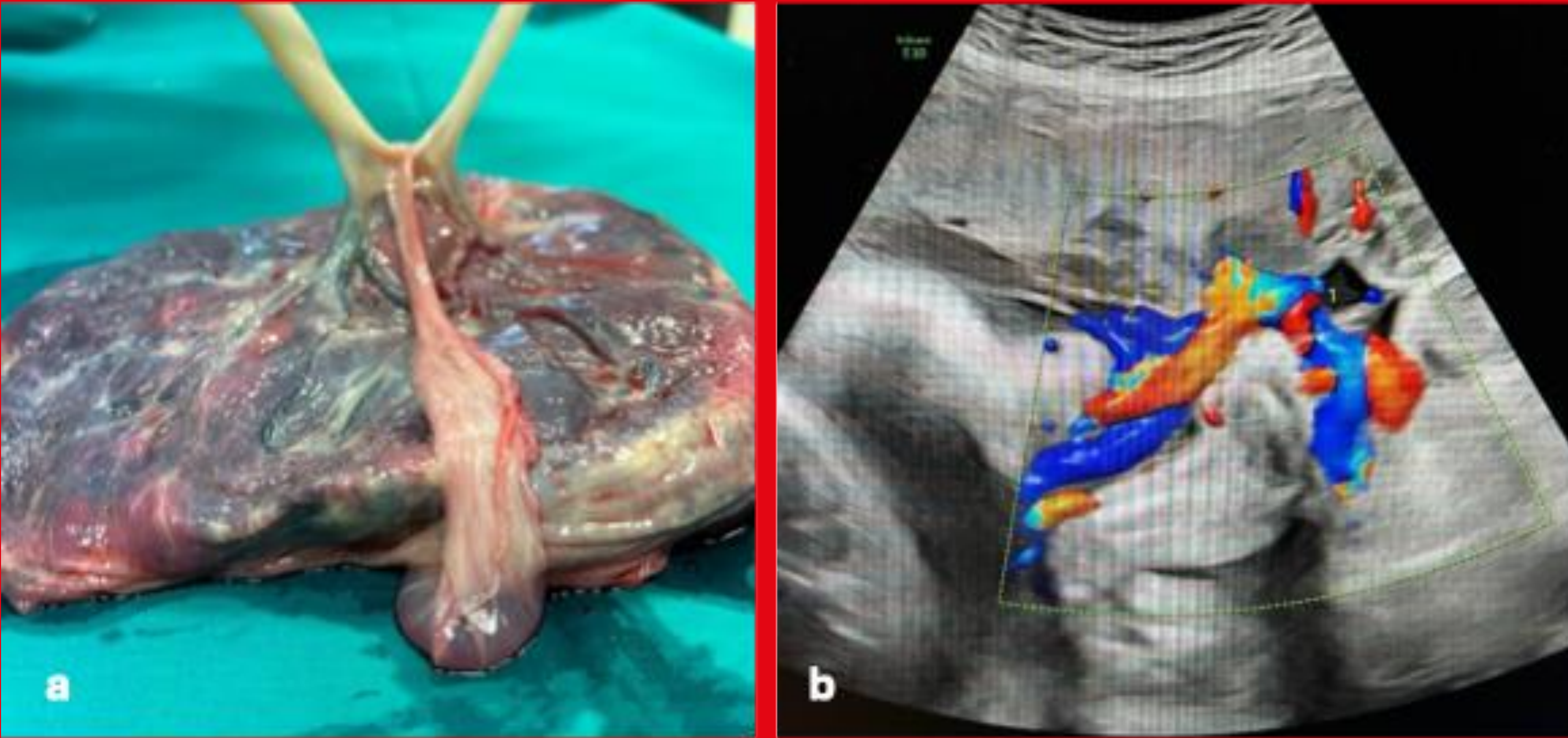


Figure 1. a) Gross placental photograph showing proximal placental cord insertions; b) ultrasound image of proximal placental cord color Doppler.

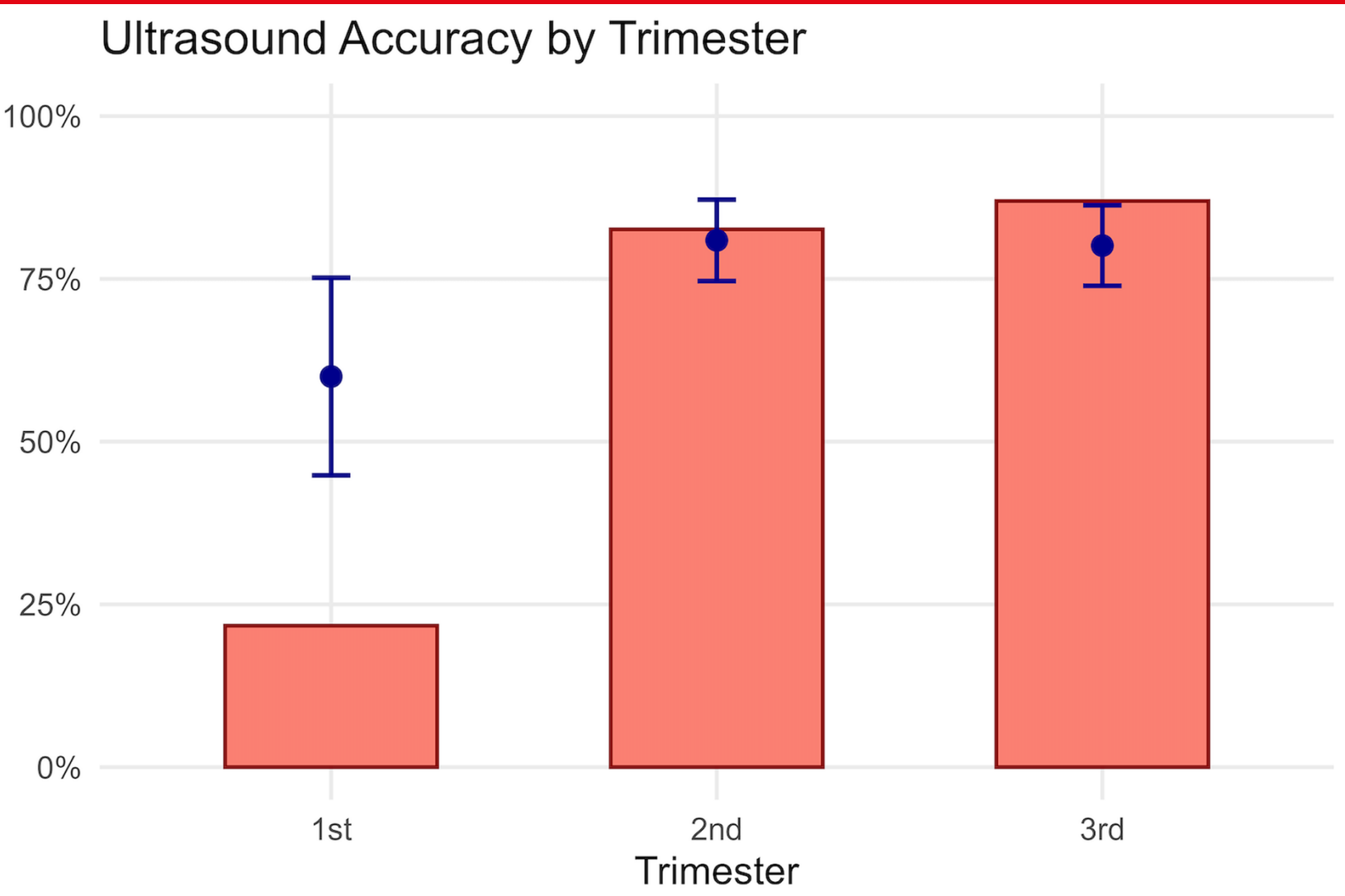


Figure 2. Ultrasound accuracy in the diagnosis of cord insertion's type by trimester

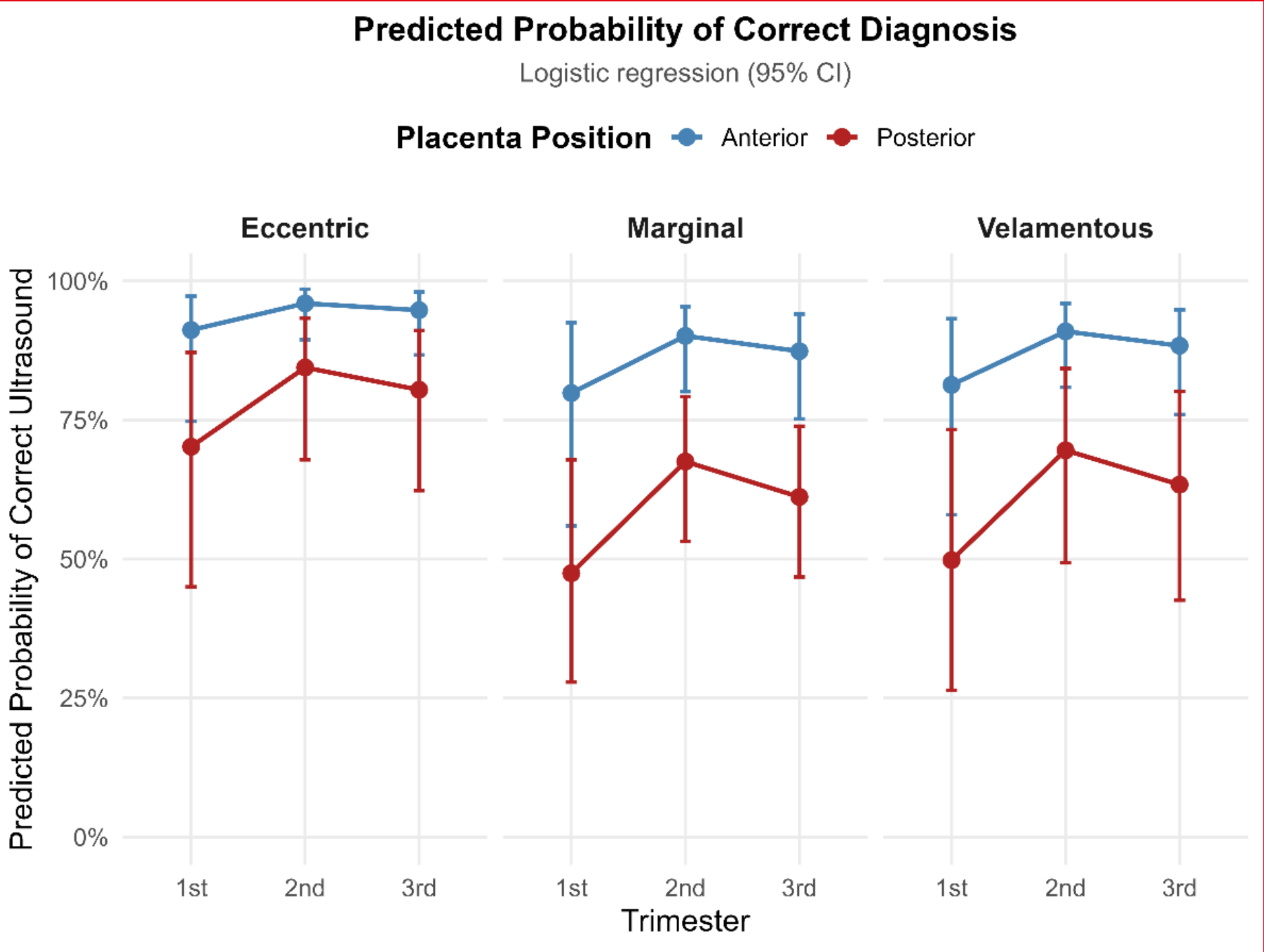


Figure 3. Predicted probability of correct ultrasound diagnosis by trimester and placenta position, stratified by pathological insertion type (cluster-robust logistic model, 95% CI).