

EP16.216 Maternal Ophthalmic Artery Doppler in Suspected Pre-Eclampsia: Prediction of Disease Progression and Comparison with Angiogenic Markers

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Introduction

Preeclampsia (PE) remains a leading cause of maternal/perinatal morbidity and mortality, especially in low- and middle-income countries. The sFlt-1/PIGF ratio is highly predictive of PE but costly and often inaccessible. Ophthalmic artery Doppler (OAD) reflects the cerebrovascular adaptation to PE's vasospasm and endothelial dysfunction, offering a non-invasive, low-cost alternative. This study evaluated OAD indices across confirmed PE, suspected PE and healthy pregnancies; assessed their utility in predicting adverse outcomes; and compared their performance with the sFlt-1/PIGF ratio for predicting short-term progression to PE among suspected cases.

Methodology

Prospective cohort study at AIIMS, New Delhi (June 2023–June 2025); IEC clearance taken. Of 254 screened, 210 women (singleton, 20–40 wks, normal anomaly scan) were allocated equally (n=70 each) to: Group A – Preeclampsia (ACOG 2020); Group B – Suspected PE (PROGNOSIS criteria); Group C – normotensive controls. OAD performed via Voluson E6, 7–15 MHz linear probe over closed upper eyelid; PSV, PSV2, EDV, PI, PSV ratio averaged from 4 readings (2/eye). sFlt-1 & PIGF additionally measured in suspected-PE group. Composite adverse maternal outcomes: eclampsia, HELLP, abruption, AKI, pulmonary edema, ICU admission. Adverse neonatal outcomes: NICU admission, respiratory distress, stillbirth/death. ROC/AUC, ANOVA, Pearson correlation, logistic regression used (SPSS v21.0).

Results

PSV ratio and PSV2 were highest in PE, then suspected PE, then healthy pregnancies ($p<0.01$); PI showed the reverse pattern. PSV ratio had the best overall diagnostic performance for PE (cut-off ≥ 0.73 , AUROC 0.995, accuracy 97.8%) and for adverse outcomes (cut-off ≥ 0.8 , $p<0.01$); PI had better specificity/PPV. Among suspected-PE cases, 14 (20%) progressed to PE; PI (≤ 1.23) was the strongest OAD predictor (AUROC 0.78, NPV 91%), while sFlt-1/PIGF outperformed all OAD indices (AUROC 0.946, $p=0.017$).

Cut-offs for Adverse Maternal & Neonatal Outcomes

Predictor	Cut-off
PSV Ratio	≥ 0.80
Pulsatility Index	≤ 1.23
Peak Systolic Velocity	≥ 36.09
PSV 2	≥ 29.30
End Diastolic Velocity	≥ 12.24

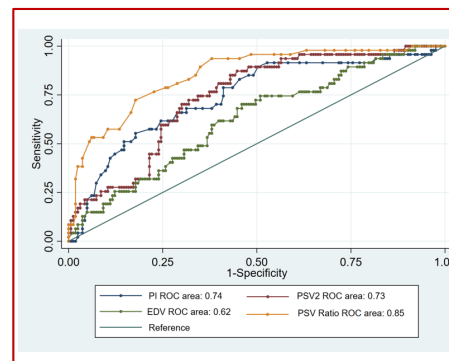
Cut-offs for Diagnosis of PE

Predictor	Cut-off
PSV Ratio	≥ 0.73
Pulsatility Index	≤ 1.38
Peak Systolic Velocity	≥ 37.63
PSV 2	≥ 28.57
End Diastolic Velocity	≥ 12.85

Diagnostic Ability of OAD Indices for PE (n=140)

Predictor	AUC	Sn	Sp	DA
PSV	0.548	47.9%	70.1%	58.7%
PSV2	0.837	77.5%	83.6%	80.4%
EDV	0.616	60.6%	62.7%	61.6%
PI	0.815	85.9%	68.7%	77.5%
PSV Ratio	0.995	97.2%	98.5%	97.8%

ROC Curves of OAD Indices for Predicting PE



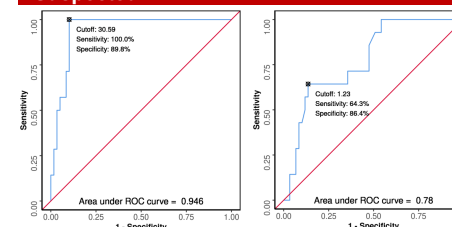
ROC Analysis: PI & PSV Ratio vs sFlt-1/PIGF

For predicting short-term progression to PE in suspected-PE cases (n=70): PI (OAD) achieved AUC 0.78 vs 0.946 for sFlt-1/PIGF (DeLong's $p=0.017$). PI gave a high NPV (91%) to help rule out progression when biomarkers are unavailable; sFlt-1/PIGF gave superior overall discrimination.

Diagnostic Performance Comparison

Predictor	AUC	Sn	Sp	DA
sFlt-1	0.92	100%	88%	90%
PIGF	0.51	100%	15%	32%
sFlt-1/PIGF	0.94	100%	90%	92%
PSV Ratio	0.68	86%	63%	67%
PI	0.78	64%	86%	82%

ROC Curves: sFlt-1/PIGF & PI in Suspected PE



Conclusion: OAD indices, particularly PSV ratio and PI, offer a non-invasive, cost-effective tool for detecting cerebrovascular changes in PE and predicting progression in suspected cases. Though inferior to the sFlt-1/PIGF ratio, integrating OAD into clinical protocols could enable early risk stratification, especially where biomarkers are unavailable.