

The transcranial Doppler of maternal cerebral arteries and the prediction of pre-eclampsia

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Background

- Pre-eclampsia is a major cause of maternal and perinatal death
- Preeclamptic women frequently present cerebral involvement, which can be attributed to pathological vascular alterations, mainly affecting the parietal and occipital lobe

Background

- Any pregnant woman experiences several physiological adaptations, including changes in the cerebral hemodynamics
- Ethical and Technical constraints:
 - The major part of the information about these cerebral changes has been obtained from cross-sectional studies or studies with small animals

Background

- It is important to note that, of all organ systems affected by PE, the brain can only be assessed by signs and symptoms
- No simple laboratory blood or urine investigation can provide any mechanism of assessing cerebral function

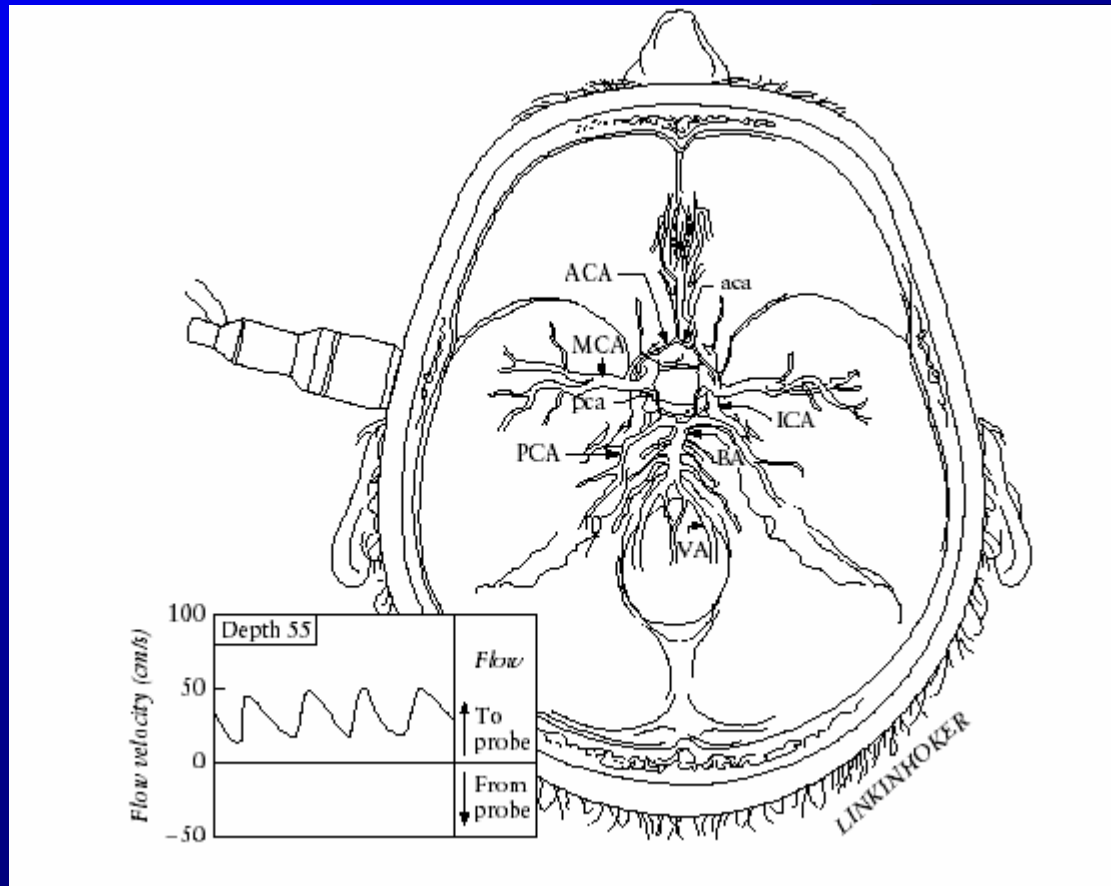
Background

- There are other non-invasive techniques:
 - Computed tomography (CT) scan
 - Magnetic resonance imaging (MRI)
- But they are not feasible in most of the settings

Background

- The introduction of the transcranial Doppler in the clinical practice is considered by some researchers as a possibility to assess the cerebral state during pregnancy

The transcranial Doppler is a non-invasive method, able to measure parameters of the cerebral hemodynamics



Background

- Previous studies evaluated parameters derived from the Doppler waveform in different vascular beds to study their ability to predict the occurrence of PE

The Question

- Can transcranial Doppler predict PE?

Refining...

- Can transcranial Doppler of maternal cerebral arteries predict the occurrence of PE?

Systematic Review

- To assess whether second–trimester changes in transcranial Doppler parameters of normotensive pregnant women are associated with the subsequent development of pre-eclampsia

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

- **Types of studies**

- All case-control and cohort studies providing measures of the transcranial Doppler parameters

- **Types of participants**

- Any normotensive pregnant woman at the 2nd trimester of pregnancy

- **Types of outcome measures**

- For all women: pre-eclampsia / eclampsia

SEARCH STRATEGY FOR IDENTIFICATION OF STUDIES

- Period: between 1994 and 2004
- Key Words: Transcranial Doppler, Preeclampsia, pre-eclampsia, eclampsia, prediction (multiple combination of them)
- Language: any
- Database Searched: Medline, Popline and SciELO
- In addition: reference lists of retrieved articles were checked

INCLUDED STUDIES

- Moutquin (1999):
 - Cohort of 395 normotensive women (20 developed PE)
- Riskin-Mashiah (2002):
 - Nested case-control study
 - 10 preeclamptic and 20 normotensive pregnant women
 - Matching for gestational age, maternal age and parity
- Williams (2004):
 - Nested case-control study
 - 20 preeclamptic and 40 normotensive pregnant women
 - Matching for maternal age

RESULTS

- Moutquin (1999):
 - The blood flow velocity was similar in the second and third trimester in both groups
- Riskin-Mashiah (2002):
 - The pulsatility and resistance indices were lower in the second trimester in women who later would develop pre-eclampsia
- Williams (2004):
 - The blood flow velocity and the pulsatility index did not differ in the second or third trimester between the case and the control groups

Changes in maternal middle cerebral artery among women who later developed PE

STUDY	n	BFV NTW	PI NTW	RI NTW	BFV PEW	PI PEW	RI PEW
Moutkin (1999)	375 / 20	60.3 ± 10.4	-	-	63.7 ± 8.0		
					↔		
Riskin-Mashia (2002)	20 / 10	-	0.83 ± 0.03	0.54 ± 0.01	-	0.73 ± 0.03*	0.50 ± 0.01*
						↓	↓
Williams (2003)	40 / 20	66.46 ± 1.2	1.05 ± 1.9	-	69.25 ± 14.7	1.92 ± 0.21	
					↔	↔	

BFV: Blood Flow Velocity / PI: Pulsatility Index / RI: Resistance Index / NTW: Normotensive Women / PEW: Preeclamptic Women

The meta-analysis of these studies was considered not feasible

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Considerations

- Methodological problems:
 - Case-control studies: the controls capacity for representing the population that generated the cases is uncertain, considering its reduced number
 - Possible measurement bias:
 - The number of examiners performing the Doppler
 - No assessment of the inter and intra-examiner variability
 - Possible Confounder:
 - The smoking status of the women in any study was not clarified

REVIEWER'S CONCLUSIONS

■ Implications for practice

- Until further evidence is available, the transcranial Doppler may not be performed to predict or promote the earlier detection of pre-eclampsia

■ Implications for research

- Further research is needed to define the ability of transcranial Doppler in the prediction of pre-eclampsia
- Future studies should include larger samples and address the inter and intra-examiner variability

Summary

- Pre-eclampsia is a major problem in the field of reproductive health
- Developing strategies to allow its early detection, ideally before its clinical manifestation, must remain a goal for researchers dealing with this topic
- However, considering the available data, the ability of transcranial Doppler in the prediction of pre-eclampsia is still uncertain
- Further research is needed to define the ability of transcranial Doppler in the prediction of pre-eclampsia