Clinical significance

The clinical significance of early screening for pre-eclampsia lies in the possibility to:
- initiate close obstetrical monitoring,
- start low-dose aspirin treatment early on in the pregnancy.

Although there is no international consensus, a recent study shows that aspirin reduces the risks of pre-eclampsia, premature birth, and IUGR by more than 50% if the treatment is initiated before 16 weeks of pregnancy (Bujold et al. 2010). Furthermore, according to a meta-analysis in 2012, 89% of cases of early PE could have been avoided or delayed (by a less severe form) if treatment with aspirin is initiated before 16 weeks of pregnancy i.e. 18 WA (Roberge et al. 2012). These results highlight the clinical significance of early screening for PE.

In practice

Test request
- Estimation of the risk of pre-eclampsia in the first trimester of pregnancy. The risk can only be calculated during a single-foetus pregnancy.
- Sample
  - Between 11 WA and 0 days and 13 WA and 6 days
  - Serum: In a separate plain tube collect a sample for pre-eclampsia. After removing the coagulated mass, quickly centrifuge the sample to separate the serum.
- Storage and transport
  - Refrigerated (+2°C to +8°C)
- Document(s) to be enclosed with the test request
  - Specific request form for pre-eclampsia, which can be downloaded at www.biomnis.com > Test menu > Test guide (group code: PECLA).

Arterial blood pressure measurement

Ideally, simultaneously measure the blood pressure on both arms. If this is not possible, the calculation can be made using the arterial blood pressure from one arm (don’t measure the blood pressure on one arm and then the other).

The period between the ultrasound scan, the taking of blood pressure and sample collection must not exceed 10 days.

Price

PAPP-A quantification is routine in the T21 risk calculation for the 1st trimester and the pre-eclampsia risk calculations. The PPA-P assay must be performed alongside a PGF assay and the reagents used must be adapted to the PE risk calculation software. Please contact the Biomnis International Division for further information.

To find out more about this subject

Find all the necessary details at:
- www.biomnis.com > Test Menu > Test guide or use the Biomnis mobile application Biomnis group code: PECLA.

Pre-eclampsia prediction screening during the first trimester

Contact details
- Corinne Sault
  Head pathologist for prenatal biochemistry

References


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The scan date for the 1st trimester with the crown-rump length measurement (CRL) are essential for the pre-eclampsia risk assessment.

The other clinical details, if supplied, enable the risk assessment to be improved.

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References

Pre-eclampsia

Pre-eclampsia (PE) is a complication that can occur during pregnancy. It is a major, worldwide cause of maternal and foetal morbidity and mortality. In France, the incidence is estimated at 1-3% of nulliparous pregnancies and 0.5 - 1.5% of multiparous pregnancies.

Définition

PE is defined by:

- gestational arterial hypertension (systolic blood pressure ≥ 140 mm Hg, diastolic blood pressure ≥ 90 mm Hg),
- associated with proteinuria > 0.3 g/24 hrs and/or an oedematous syndrome.
- Hyperuricemia > 300 μmol/L,
- raised AST levels,
- thrombocytopenia > 150 x 10^9/L,
- intrauterine growth retardation (IUGR)

PE is considered severe when:

- the systolic blood pressure is ≥ 160 mm Hg and the diastolic blood pressure is ≥ 110 mm Hg,
- and/or the pregnancy extends > 3.5 g/24 hrs
- combined with or without clinical symptoms (liver-like abdominal pain, nausea, vomiting, headaches etc.),
- or with changes in laboratory results (creatininemia > 100 μmol/L, AST > 3 times the normal level, thrombopenia < 100 x 10^9/L).
- level, thrombopenia < 100 x 10^9/L.

The diagnosis of HELLP syndrome (Haemolysis, Elevated Liver enzymes and Low Platelets) is made when confronted with haemolysis, combined with hepatic cytolysis and thrombocytopenia < 100 x 10^9/L.

Pre-eclampsia pathophysiology

The origin of PE is attributed to a default in placentaion, and then maternal endothelial dysfunction. In a ‘normal’ pregnancy, the maternal spiral uterine arteries dilate following a trophoblast invasion of the uterine walls. In PE, this restructuring does not happen correctly. Placental hypoxia is the first cause of PE. The maternal organism compensates for this abnormal placental vascularisation by arterial hypertension and a reduction in the perfusion of the organs, which leads to a risk of failure.

Pre-eclampsia develops at the beginning of the 1st trimester of pregnancy.

The symptoms occur in the 3rd trimester of pregnancy:

- before 34 weeks of amenorrhoea: Early pre-eclampsia,
- after 34 weeks of amenorrhoea: Late pre-eclampsia.

Cases of early PE are more problematic because they require premature induction to delivery.

The pathogenesis of pre-eclampsia

- Demographic factors
- Environmental factors (maternal diabetes, type of pregnancy etc.)
- Immunological factors

A placental vascularisation anomaly

Abnormal cytotrophoblast invasion of the spiral uterine artery (Placental ischaemia)

Exacerbation of the pre-inflammatory state and oxidative stress

- Release of pro-inflammatory factors and anti-inflammatory factors (VEGF, sFlt-1 and PlGF and TGF-β1)
- Concentrations of circulating asymmetric dimethylarginine (ADMA)

Dysfunction of the vascular endothelium with multisystem involvement

- with hypertension

Ketony (placental ischaemia)
Liver (HELP syndrome)
Brain (Eclampsia)
Placenta (Apoptosis of the syncytiotrophoblast)

By H Boulanger and M Flamant (2007).

Pre-eclampsia risk factors*

- Nulliparity
- Previous history of pre-eclampsia
- Pre-existing arterial hypertension
- Maternal age: < 20 years or > 35 years
- Obesity: BMI greater than 30 kg/m²
- Multiple pregnancy
- Auto immune diseases: diabetes, SLE, RP, etc.
- Family history of pre-eclampsia.

* This list is not exhaustive.

Short-term complications

- Premature delivery
- Intrauterine growth retardation (IUGR)
- Neonatal morbidity and mortality
- Maternal mortality: 2nd cause in France

Long-term complications

Women who suffer from pre-eclampsia that leads to premature delivery are 8 times more likely to die from a cardiovascular disease than women who did not suffer from pre-eclampsia and who deliver at full term.

The calculation of the risk of pre-eclampsia in the first trimester of pregnancy is performed using:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>PE with delivery before 37 weeks</th>
<th>PE with delivery during 37 and 38 weeks</th>
<th>PE with delivery after 38 weeks</th>
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</thead>
<tbody>
<tr>
<td>Patient information</td>
<td>76.5%</td>
<td>79.6%</td>
<td>84.1%</td>
</tr>
<tr>
<td>Maternal age</td>
<td>59.5%</td>
<td>65.9%</td>
<td>68.3%</td>
</tr>
<tr>
<td>Nulliparity</td>
<td>57.9%</td>
<td>62.6%</td>
<td>66.1%</td>
</tr>
<tr>
<td>Previous history of pre-eclampsia</td>
<td>49.6%</td>
<td>54.7%</td>
<td>58.2%</td>
</tr>
<tr>
<td>Pre-existing arterial hypertension</td>
<td>46.2%</td>
<td>51.3%</td>
<td>54.8%</td>
</tr>
<tr>
<td>Maternal age: &lt; 20 years or &gt; 35 years</td>
<td>34.3%</td>
<td>39.4%</td>
<td>43.0%</td>
</tr>
<tr>
<td>Obesity: BMI greater than 30 kg/m²</td>
<td>31.5%</td>
<td>36.6%</td>
<td>39.1%</td>
</tr>
<tr>
<td>Multiple pregnancy</td>
<td>28.2%</td>
<td>33.3%</td>
<td>36.8%</td>
</tr>
<tr>
<td>Auto immune diseases: diabetes, SLE, RP, etc.</td>
<td>25.0%</td>
<td>29.9%</td>
<td>33.5%</td>
</tr>
<tr>
<td>Family history of pre-eclampsia</td>
<td>21.7%</td>
<td>26.5%</td>
<td>29.1%</td>
</tr>
</tbody>
</table>

Biophysical measurements:

- Arterial blood pressure
- Doppler scan of uterine arteries

Clinical information:

- The patient: BML, geographical origin, smoker, etc.
- The patient’s background: parity, previous history of PE, previous history of arterial hypertension

The calculation software Predictor® (Perkin Elmer) used by Biomnis uses a calculation method developed by Professor Cuckle (University of Leeds) with data provided by Professor Nicolaides (King’s College Hospital).

The risk calculation is given using a decisional threshold of 1/20.

Risk calculation performance:

During the first trimester of pregnancy (11-13.6 weeks of amenorrhoea), the combination of the PAPP-A and PlGF results along with the clinical history and the uterine Doppler scan detect up to 93% of cases of early pre-eclampsia (with approximately 5% of false positives).

The PE detection rate relative to the combination of biological and biophysical markers used in the risk calculation [according to Akolekar, 2012].