

## Doppler assessment of the fetoplacental circulation and fetal growth; preliminary results

P.J.H.M.Reuwer, H.W.Bruinse. University Hospital Utrecht, The Netherlands

Flow resistance of the placental villous circulation was studied, using the Pulsatility Index ( $PI = \frac{\text{syst.} - \text{diast.}}{\text{mean velocity}}$ ) of Doppler flow signals from umbilical arteries. A previous study confirmed the intra- and inter-observer reproducibility of the method and demonstrated the feasibility of the signal processing technique used [1].

The aim of the study was to establish gestational age-related PI reference values in normal pregnancy and to investigate whether differences could be found in intra-uterine growth retardations (IUGR).

### Patients:

1. 23 normal pregnancies, examined every two weeks from the 16th postmenstrual week onward. No antenatally presumed or treated complications and healthy term infants with appropriate weights ( $> P10$ ) and no perinatal morbidity.
2. 16 compromised pregnancies associated with severe IUGR (birthweight  $< P2.3$ ), first Doppler examination after clinical diagnosis IUGR.
3. 6 patients examined longitudinally as group 1, giving birth to small for date infants ( $< P10$ ).

### Results:

- In normal pregnancy (group 1) the PI decreased with advancing pregnancy (fig. 1), indicating a progressive decline of placental vascular resistance.
- All patients with evident IUGR (group 2) had significantly increased PI values ( $>> 3SD$ ) except one patient (PI 1.0 at 31 weeks) giving birth to a severely malformed infant (triploidy), with a normal placenta.
- 5 of the 6 patients of group 3 had serially increased PI values ( $> 2SD$ ). PI values were increased several weeks before suboptimal fetal growth was clinically presumed. Two examples are shown in fig. 2 and 3; in these cases suboptimal fetal growth was not presumed antenatally on the basis of serial routine examinations (fundal palpation and sonographic fetometry), whereas PI values were increased as early as 28 postmenstrual weeks. Several old infarctions were found in one placenta (fig. 2) and the other one (fig. 3) showed asymmetrical maturation failure.

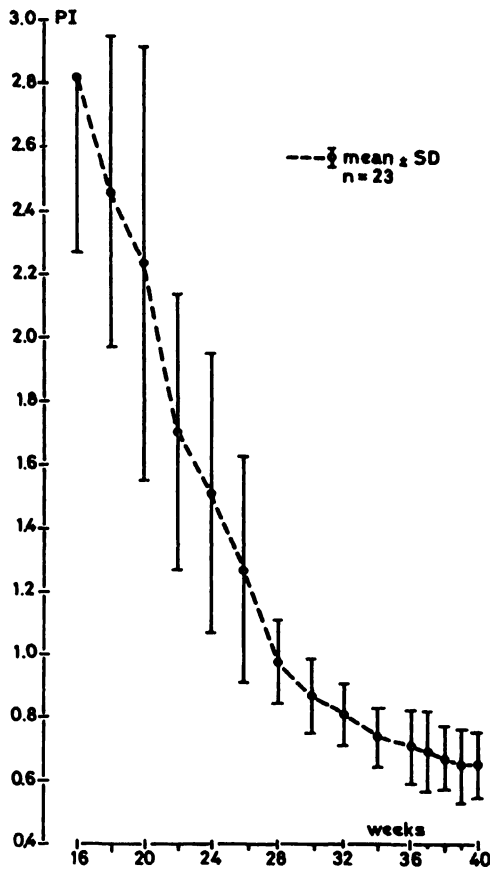


fig. 1

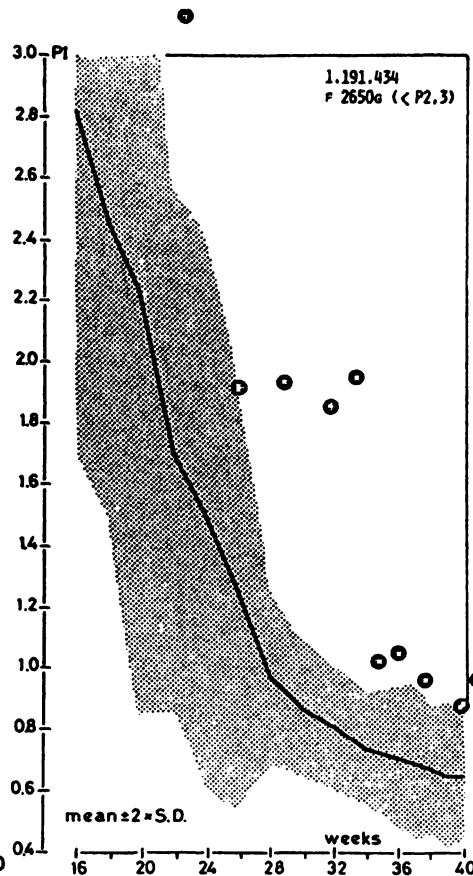


fig. 2

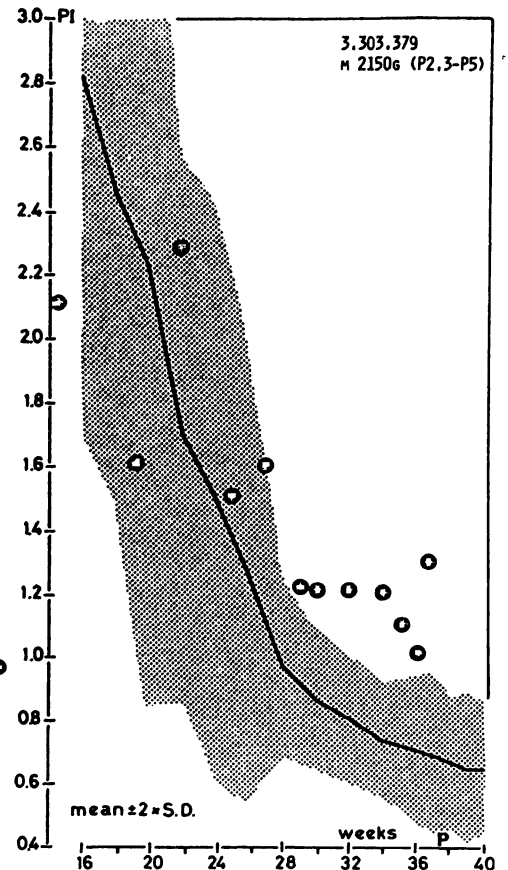


fig. 3

Comment: these preliminary data suggest that the PI holds promise as a simple, clinically useful method for early diagnosis of compromised fetoplacental circulation. This technique may enhance our understanding on the subject of IUGR by distinguishing placental vascular from non-vascular pathogenesis. The PI might be used to evaluate therapeutic regimes for improving placental circulation.

Further studies: an extensive study to establish the predictive value of the PI as a screening method for IUGR has been started. Besides birthweight more accurate criteria for optimal fetal growth such as Ponderal Indices and skinfolds are used. The protocol will be discussed. In addition, a computer circulation model has been developed to study the numerical correlations of placental vascular resistance and other hemodynamic parameters with PI changes. Suggestions regarding the computer simulation study and additional animal experiments are gently appreciated.

Reference:

1. P.J.H.M.Reuwer, W.C.Nuyen, H.J.M.Beijer, R.M.Heethaar, H.W.Bruinse, Ph.Stoutenbeek, A.A.Haspels.: Characteristics of flow velocities in the umbilical arteries, assessed by Doppler ultrasound. *Europ.J.Obst.Gyn.Reprod.Biol.* (1984) Accepted for publication.