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Title : THE EFFECTS OF PAINFUL UTERINE CONTRACTIONS, POSITION, AND EPIDURAL ANESTHESIA ON MATERNAL TRANSCUTANEOUS OXYGEN TENSION (tcPO<sub>2</sub>)

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**Introduction.** We studied the effects of painful uterine contractions, position, and epidural anesthesia on maternal transcutaneous oxygen tension (tcPO<sub>2</sub>)

**Methods.** After informed consent was obtained, 14 unmedicated women in active labor, six women in active labor with epidural anesthesia, and four healthy non-pregnant volunteers were evaluated with continuous monitoring of transcutaneous oxygen (tcPO<sub>2</sub>). Subjects breathing room air were monitored while in the supine, sitting, and left lateral positions. The patients in labor also had continuous monitoring of fetal heart rate and uterine contractions. All parturients were healthy, and no fetal distress was evident.

**Results.** During labor, the unmedicated parturients demonstrated marked changes in tcPO<sub>2</sub> levels ( $\Delta$ tcPO<sub>2</sub>) while in all three positions. These sine-wave tcPO<sub>2</sub> oscillations were caused by hyperventilation during, and hypoventilation between, painful uterine contractions. While subjects were in the supine position, approximately one minute after a contraction, mean tcPO<sub>2</sub> rose to a peak of 90 (+ 2.0) torr and then fell 18 per cent to 74 (+ 4) torr before the onset of the next contraction. The interval between uterine contractions correlated significantly with the decrease in tcPO<sub>2</sub>. The maximum decrease in tcPO<sub>2</sub> for any patient was 44 torr. Fetal heart rate did not change during the oscillations in tcPO<sub>2</sub>. The sitting position was associated with

slightly higher values for tcPO<sub>2</sub>, possibly because of improved local perfusion rather than higher PaO<sub>2</sub>. Both the sitting and the lateral positions were associated with more marked oscillations in tcPO<sub>2</sub>. In some patients, the maximum fall in tcPO<sub>2</sub> was 68-74 torr. The lateral position was associated with the greatest decreases in tcPO<sub>2</sub>. The same tcPO<sub>2</sub> pattern could be elicited in healthy nonpregnant volunteers by hyperventilation. The time interval to reach minimum tcPO<sub>2</sub> levels after 2 min of hyperventilation was longer than in pregnant patients in active labor.

The patients with epidural anesthesia had a constant tcPO<sub>2</sub> pattern with no changes occurring with contractions. This is due presumably to the even breathing pattern during painless labor.

**Discussion.** During labor, regardless of the position of the mother, maternal oxygenation can vary markedly because of hyperventilation during, and hypoventilation between, uterine contractions. These alterations are absent during epidural anesthesia. The  $\Delta$ tcPO<sub>2</sub> may threaten fetal oxygenation, since the minimum tcPO<sub>2</sub> occurs between contractions when placental perfusion is maximal, and just before the onset of the next contraction, when uterine blood flow is minimal.

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