

## THE INFLUENCE OF MATERNAL O<sub>2</sub> ADMINISTRATION ON FETAL HEART RATE (FHR) AND LONGTERM VARIABILITY AMPLITUDE (LVA)

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O<sub>2</sub> breathing in healthy adults causes a small decrease in heart rate (HR) (2). In healthy fullterm infants O<sub>2</sub> breathing also leads to a small decrease in HR (1). When the mother is breathing pure O<sub>2</sub>, a decrease of FHR and LVA in the fetus can be observed (4). These observations have been confirmed previously (5). Using an algorithm for computer determination (CD) of FHR level and LVA (3), it was the aim of this paper to study the behaviour of FHR and LVA before and during maternal O<sub>2</sub> breathing with computer assistance.

### MATERIAL AND METHODS

In 14 cases the mothers were breathing O<sub>2</sub> via a face mask for about 10 min., having been instructed not to hyperventilate and were kept in the lateral position. Recordings were made of FHR and uterine activity as well as fetal tcPo<sub>2</sub>. FHR and LVA were estimated visually and by using an algorithm, which makes a histogram of all FHR values. From this distribution the 10th and 90th percentile is estimated and it's distance multiplied with a constant factor of 1.2. The result represents the actual LVA (3). When comparing the CD FHR and LVA with the visually estimated one, a very good agreement was found ( $2\alpha < 0.001$ ).

### RESULTS

In 11 of the 14 cases the tcPo<sub>2</sub> increased and FHR and LVA decreased when the mother was breathing pure O<sub>2</sub>. When plotting LVA against fetal tcPo<sub>2</sub> before and during the period of O<sub>2</sub> breathing it became obvious that LVA decreased with an increase in fetal tcPo<sub>2</sub> (Fig. 1). There was a significant increase in fetal tcPo<sub>2</sub> by  $\bar{x} = 5$  mmHg ( $2\alpha < 0.001$ ), a significant decrease in FHR by  $\bar{x} = 4$  bpm ( $2\alpha < 0.05$ ) and a significant decrease in LVA by  $\bar{x} = 6,7$  bpm ( $2\alpha < 0.001$ ).

In the other three cases the FHR remained constant whilst the LVA slightly increased during fetal tcPo<sub>2</sub> increase. The fetal tcPo<sub>2</sub> level prior to maternal O<sub>2</sub> breathing was not significantly different in both groups. There was however a significant difference between the initial basal FHR level in the two groups before the onset of maternal O<sub>2</sub> breathing. The mean basal FHR in the group of FHR and LVA decrease was 138 bpm compared with 126 bpm in those cases showing only an increase in LVA ( $2\alpha < 0.01$ ). To draw any conclusions from the difference, the number of cases in the second group is too small. It might be possible that the change in activity-status was masked in some way.

### DISCUSSION

O<sub>2</sub> breathing in normal subjects causes a small decrease in HR, which is abolished by atropine and therefore probably vagal in origin, and results in a comparable rate-dependent decrease in cardiac out-

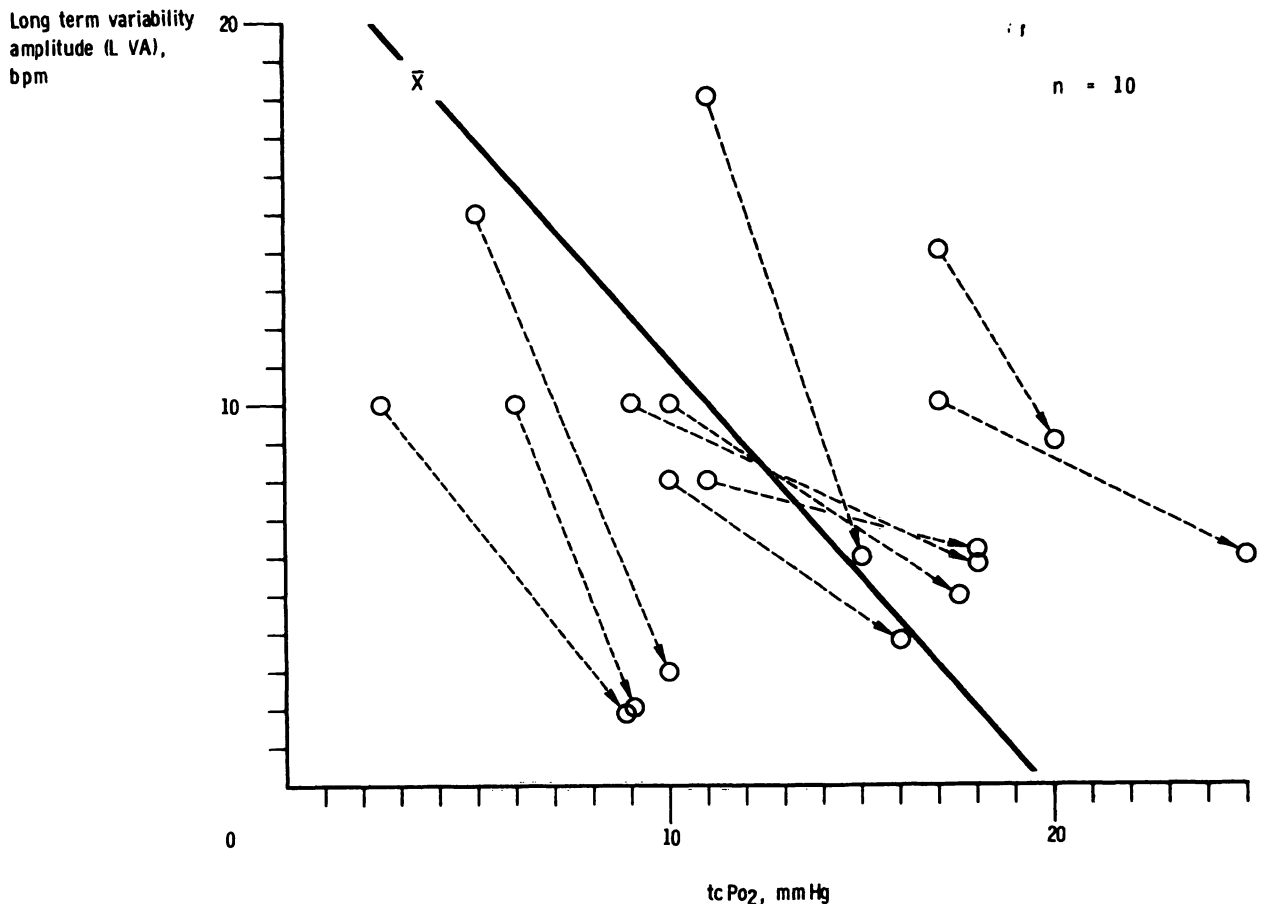


Fig. 1 shows the LVA plotted against the fetal tcPo<sub>2</sub> before and during maternal O<sub>2</sub> breathing. An increase in fetal tcPo<sub>2</sub> is followed by a LVA-decrease.

put (2). In healthy fullterm newborns O<sub>2</sub> breathing results in a small decrease in HR which persists while the baby is breathing O<sub>2</sub> (1). Since ventilation decreases at the same time, this may not be a pure chemoreceptor response. In the fetus our observation of a decrease in FHR and LVA with an increase of tcPo<sub>2</sub> can be taken as evidence of chemoreceptor activity.

#### CONCLUSIONS

- 1.) Maternal O<sub>2</sub> breathing leads to a fetal tcPo<sub>2</sub> increase.
- 2.) During maternal O<sub>2</sub> breathing FHR and LVA decreases in 11 of 14 cases.
- 3.) This effect of O<sub>2</sub> on FHR and LVA is suggestive of chemoreceptor activity in the fetus.
- 4.) The algorithm for CD of FHR-LVA (3) allows this parameter to be readily and quantitatively assessed and shows a very good agreement with the visual analysis.

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