

A new way for the paraplacental supply of substances to the fetus

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Insufficient intrauterine supply to the fetus is now as before an unsolved problem in the field of obstetrics, particularly in severe cases. Years ago by means of basic research we were able to show that essential substances administered into the amniotic cavity, for instance amino-acids, lead to a longer lasting concentration increase in amniotic fluid (4). Injected amino-acids are definitely accepted by the fetus (1). The reception follows most probably by means of drinking and resorption in the intestinal tract and also by diffusion through the umbilical cord, which we were able to prove by means of umbilical cord experiments (5).

Total body autoradiograms showed the highest amino-acid concentrations in liver tissue (2). There does not appear to be a significant outflow of amino-acids to the mother (1). The routine trans-abdominal application through amniocentesis does not however occur without risks, as we were able to observe in single cases - risks such as infection and onset of labor. Also the transvaginal micropuncture of the membranes on the lower egg-pole (5) which we described a few years ago has not proved itself in the long-term due to amniotic fluid leakage which sometimes follows.

Whilst searching for another method we did find a new way, which does involve a certain danger of inducing labor, but which nevertheless can be of importance in future. It involves the administration of substances to the lower egg-pole - this means through the cervix to the intact membranes at the forewaters. First tests were made with amino-acids alternately with and without glucose.

Method for the first two tests

In two cases - in association with the preparation for a full-term labor induction before rupturing of the membranes, an extra amnial catheter was introduced approximately 15-20 cms between membranes and the internal wall of the uterus. The position of the placenta had been localised through several previous ultrasonic examinations, so that the catheter could be inserted in a placenta-free area. Then the membranes were punctured, whereby a second catheter (12 Char. duodenal probe according to Levin) was inserted at least 30 cms into the uterine cavity for measuring the intrauterine pressure. Through this catheter we then obtained amniotic fluid samples to determine the initial values. Afterwards an infusion of glucose solution (10%) at an infusion speed of 30-50 ml/h was given through the extra amnial catheter. Through the intrauterine catheter amniotic fluid samples were obtained at intervals of about 15 minutes. Later in addition we began an amino-acid (Aminosterile L) infusion. In this way we were able to observe the behaviour of the amino-acid and the glucose-levels in the amniotic fluid independent of each other. The results are seen in figures 1 and 2. It is obvious from the definite increase in amino-acids and also in glucose during the course of the extra-amnial infusion, that the substances passed very probably through the membranes. Nevertheless there is doubt as to whether the amino-acids and glucose did not gain access to the amniotic fluid retrograde through the broken membranes. We therefore made a further test which excluded this possibility.

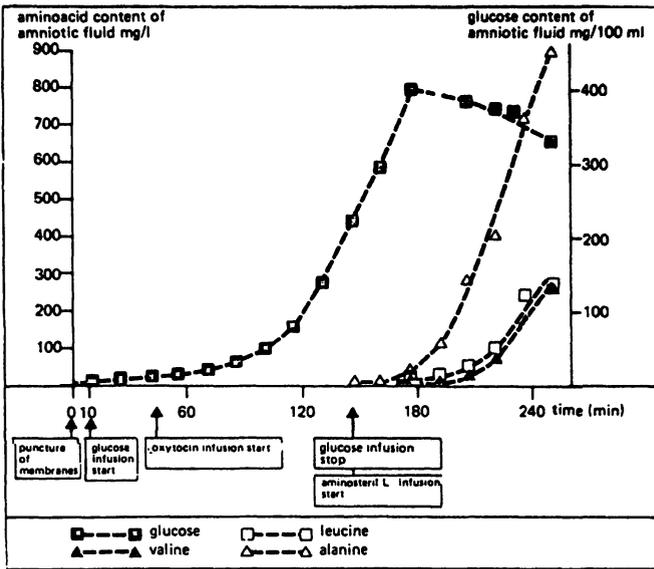


Fig. 1

Fig. 2

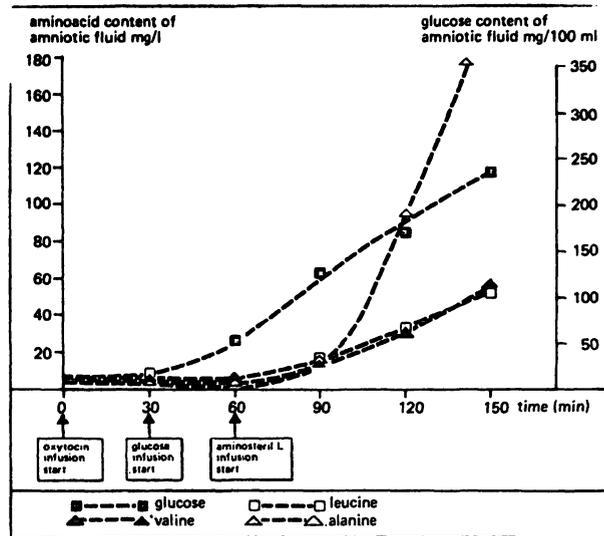


Fig. 3

Method for the second test group

In 3 patients with proven retarded fetuses a transabdominal amniocentesis was performed after explaining the procedure to the patient. The purpose of the first amniocentesis was to establish the lung maturity of the fetus and the initial values for the amino-acid and glucose levels in the amniotic fluid. Then a mixture of amino-acids and glucose (Aminosteril L with 5% glucose) was administered at a speed of 7 drops per minute by means of a specially prepared diaphragm with one catheter for infusion on the lower egg-pole and one catheter for exfusion (Fig. 3). This device was specially constructed in cooperation with J. Rothe from our unit.

In the first case the second amniocentesis followed 3 hours after beginning the infusion, in the second case 9 hours later, and in the third case 27 hours later. The results can be seen in Figure 4.

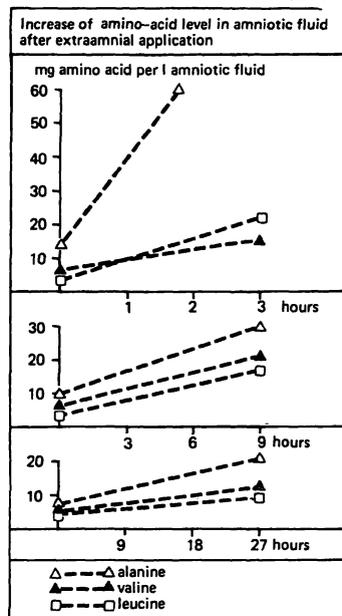


Fig. 4

Conclusion

If it were possible by this method to achieve under successful inhibition of premature uterine contractions, a supply of essential substances via the intact membranes of the lower egg-pole over a longer period of time, a relatively simple compensatory paraplacental nutrition of the malnourished fetus could be realized. Naturally an application by this way is valid for all substances that can pass through the intact membranes.

References

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In all cases there is an increase, in the first two cases proven to be well above the amino-acid level in amniotic fluid reported in the literature (3). As a side effect in all our 3 cases even in the first few hours after the start of the egg-pole infusion contractions began. In one case we added to the infusion acetylsalicylic acid solution (Aspisol®). The application rate was 40 mg/h. In this way we succeeded in inhibiting the premature contractions within a short time. The acetylsalicylic acid appears to have worked as a prostaglandin antagonist.