THE RELATIONSHIP OF HUMAN UMBILICAL ARTERIAL AND VENOUS PLASMA LEVELS OF CORTICOSTEROIDS TO GESTATIONAL AGE

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The role of the foetal adrenal cortex in the initiation of parturition in the sheep is well established; however the evidence for a similar role by the human foetal adrenal is circumstantial and based upon the association of prolonged gestation with foetal adrenal hypoplasia (Anderson, Laurence & Turnbull, 1969; Roberts & Cawdery, 1970) and of premature delivery with foetal adrenal hyperplasia (Anderson, Laurence, Davies, Campbell & Turnbull, 1971). There is no information concerning changes in levels of corticosteroids in the human foetus in late pregnancy and the present study was undertaken in order to examine the relationship of umbilical cord arterial and venous plasma concentrations of corticosteroids at the time of delivery to gestational age of the foetus and type of labour.

Matched samples of umbilical cord arterial and venous blood were collected during December 1971 – January 1972. Plasma levels of corticosteroids were determined by a competitive protein-binding technique (Murphy, 1967), using methylene chloride for extraction of the plasma samples, 0-1 % human late pregnancy plasma labelled with [1,2-3H]corticosterone as the binding protein, and Florisil for the adsorption of the unbound corticosteroids. No attempt to separate individual corticosteroids by preliminary chromatography was made at this stage and the results are expressed in terms of equivalence to cortisol standards.

There was no relationship between circulating corticosteroid levels and the type of labour in term (37–40 week) vaginal deliveries; the mean levels ± s.e.m. were 200-1 ± 12-9 ng/ml (arterial) and 245-1 ± 12-8 ng/ml (venous) for 56 spontaneous deliveries and 201-0 ± 17-1 ng/ml (arterial) and 244-4 ± 14-4 ng/ml (venous) for 42 oxytocin-induced or oxytocin-augmented deliveries. However, corticosteroid levels in the foetal circulation were influenced by gestational age and both arterial and venous levels showed a surge at 35–37 weeks gestation (Fig. 1). The mean level of corticosteroids for each gestational age category was less in arterial plasma than in venous plasma.

The relevance of the observed surge in umbilical corticosteroid levels at 35–37 weeks to foetal maturation and the initiation of parturition in the human being is uncertain, but it is perhaps significant to note that this surge occurs concurrently
with a rapid increase in hepatic glycogen reserves (Shelley & Neligan, 1966) and in amniotic fluid lecithin (Gluck, Kulovich, Borer, Brenner, Anderson & Spellacy, 1971; Bhagwanani, Fahmy & Turnbull, 1972). Both of these functions are involved in foetal maturation and are influenced by corticosteroids (Liggins, 1972).

Fig. 1. The effect of gestational age on mean corticosteroid levels in umbilical arterial (O --- O) and venous (●—●) plasma in spontaneous vaginal deliveries. The number of observations is given in parentheses.

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REFERENCES