ALTHESIN AS AN INDUCTION AGENT FOR CAESAREAN SECTION

A. HOLDCROFT, M. MORGAN, H. GORDON, J. G. WHITWAM AND Y. WHITE

SUMMARY

Thirty patients for elective lower segment Caesarean section were randomly divided into two groups. One group received 50 μlitre/kg of Althesin for induction of anaesthesia and the other, 100 μlitre/kg. The two maternal groups were similar. There was no significant difference in the clinical or biochemical status of the infants except that infants in the low dose group had a significantly higher Po₂ in the umbilical venous and arterial blood.

All anaesthetic induction agents cross the placenta, so that some effect on the foetus is inevitable and there is a compromise between maternal and foetal interests. In an earlier study (Holdcroft et al., 1974), it was shown that even a modest increase in the dose of methohexitone increased significantly the incidence of neonatal depression, and that the dose of barbiturate was a critical factor in determining the condition of the child at delivery.

It was shown by Hall, Whitwam and Morgan (1973), in patients undergoing gynaecological surgery, that there was no difference in the degree of respiratory depression 3 min after induction with 50 or 100 μlitre/kg of Althesin. They suggested that the use of Althesin for induction of anaesthesia for Caesarean section might reduce the incidence of maternal awareness without increasing the risk of foetal depression. Therefore we have compared these two doses of Althesin, in the hope that the dose of Althesin would not be so critically related to the state of the baby at birth.

METHODS

Selection of patients

Thirty clinically ideal patients (Crawford, 1962) were studied at the time of elective Caesarean section. The indications for operation were disproportion (7 patients), previous Caesarean section (17 patients) and persistent malpresentation (6 patients).

The patients were allocated at random into two groups to receive either a high (100 μlitre/kg) or a low (50 μlitre/kg) dose of Althesin for induction of anaesthesia.

Anaesthetic technique

Pre-anaesthetic medication consisted of atropine sulphate 0.6 mg i.m. 1 hr before operation and 15 ml magnesium trisilicate given orally 15 min before operation.

Before induction an i.v. infusion of Hartmann’s solution was set up and the arterial pressure was recorded with the patient in the supine position. After pre-oxygenation for 4 min the selected induction dose of Althesin was injected i.v. Cricoid pressure was applied as consciousness was lost and suxamethonium 1 mg/kg was injected i.v. The trachea was intubated with a cuffed endotracheal tube and the patients were ventilated with approximately 67% nitrous oxide in oxygen using a Manley ventilator set at a minute volume of 7.5 litre for patients weighing less than 80 kg and 9 litre for the remainder. Tubocurarine 30–40 mg was given following the return of muscle tone. Following delivery papaveretum (maximum 20 mg) was given i.v.

Maternal and foetal assessment

In those patients who gave informed consent a blood sample was obtained from the radial artery at the time of the uterine incision. At delivery, a section of the umbilical cord was isolated between clamps and umbilical venous and arterial samples were taken. Within 15 min they were analysed for pH, Po₂ and Pco₂ using an IL 313 blood-gas analyser.

The condition of the child at birth was recorded by an anaesthetist, and a paediatrician then carried out any resuscitation which was necessary and assessed the Apgar score at 1 and 5 min. During the puerperium, the mothers were questioned about awareness during any part of the procedure and the occurrence of dreams.
RESULTS
There were 15 patients in each group. The groups were comparable with regard to maternal age, weight, gestation and infant weights (table I), and there was no significant difference between the induction-delivery times in the two groups, as assessed by the Student t-test. The maternal blood-gases are shown in table II. There was no significant difference between these values. However, there were only seven patients in each group. Table II also shows the assessment of the infant. In the low dose group, one infant had an Apgar minus colour (A—C) score of less than 6 at 1 min. This was an infant who aspirated liquor at delivery and had an (A—C) score of 8 at 5 min. In the high dose group, four infants had an (A—C) of less than 6, but there was no

### Table I. The maternal smoking habits, age, weight, gestation, infant weight and induction to delivery intervals of the high dose group, where the mothers received 100 μlitre/kg of Althesin, and the low dose group (50 μlitre/kg)

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Patient number 15 was excluded because of blood group incompatibility with the foetus.
significant difference between the \((A-C)\) scores of the two groups at 1 min after delivery (Wilcoxon rank test and Chi-squared test).

There was neither a significant difference in the \(\text{pH}\) and the \(P_{\text{CO}_2}\) in the umbilical venous blood of the two groups, nor in the umbilical arterial blood. There was a significantly greater oxygen tension in the venous and arterial samples in those who had received the low dose of Althesin.

No awareness occurred in either group, but three women in the high dose group reported vivid dreams.

**DISCUSSION**

In this series of comparable patients it would appear that both dose levels of Althesin are satisfactory for the induction of anaesthesia for Caesarean section. The clinical condition of the infants was similar in

### Table II. The \(\text{pH}, P_{\text{O}_2}\) and \(P_{\text{CO}_2}\) of the maternal artery samples, the acid–base status of the infants and the Apgar, Apgar minus colour scores and the resuscitation details of infants whose mothers received high (100 \(\mu\)litre/kg) and low (50 \(\mu\)litre/kg) doses of Althesin

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<td>159 25</td>
<td>7.34 18 40</td>
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<td>26 36</td>
<td>-5</td>
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<tr>
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<td>0.04 7 7</td>
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<td>(P)</td>
<td>n.s.</td>
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the two groups as assessed by the Apgar (A–C) scores, the need for endotracheal intubation or the time to attain regular respiration. There was no maternal awareness in either group.

It is still the practice in this obstetric unit to perform Caesarean section operations in the supine position. In this study it must be assumed that the potential problem of aorto-caval occlusion is a common factor in both groups of patients. In an earlier study of Althesin as an induction agent for Caesarean section (Downing et al., 1974) lateral tilt was employed, but overall the infants were more acidotic than those in our series. The development of foetal acidosis, which does not appear to be a significant problem in this study, may be related to the time between induction of anaesthesia and delivery of the child. The induction-delivery interval in the Downing series was longer, and it may be that timing has more effect on the state of the baby than lateral tilt.

The only biochemical difference was the significantly higher oxygen tensions in the infants when 50 μlitre/kg Althesin had been used. This may reflect altered placental perfusion or an effect on foetal haemodynamics with the larger dose of Althesin. Rorke, Davey and Du Toit (1968) showed that the clinical condition of the infant delivered by Caesarean section was significantly correlated to the level of foetal oxygenation, with no relationship to the foetal acid–base state. This is in contrast to the work of James and others (1958) who were unable to correlate the degree of foetal oxygenation with the clinical condition of the infant at birth. It should be pointed out, however, that the induction-delivery times in Rorke's series were very long, being on average greater than 45 min.

Althesin in a dose of 60–70 μlitre/kg has been compared with thiopentone as an induction agent for Caesarean section by Downing and others (1974). Although they found no difference in the clinical condition of the infant at birth, those who had received Althesin were significantly more acidic than those given thiopentone. Downing, Coleman and Meer (1973) have also used Althesin as the sole agent for anaesthesia for Caesarean section. When an induction dose of 150 μlitre/kg was used, with incremental doses of half that amount, there was an unacceptable incidence of foetal depression. The incidence of neonatal depression was acceptable with an induction dose of 100 μlitre/kg and smaller additional doses.

Gyermek (1974) has shown that newborn rats are far more sensitive to the effects of Althesin than adult rats. Therefore he suggests that minimal doses of Althesin should be used in obstetric practice, that incremental doses should be avoided and that sufficient time should elapse from induction to delivery to allow for metabolism. Metabolism of Althesin in the human foetus has not been studied, but it might be wise to avoid the use of this drug in situations where foetal hepatic function is reduced, for example, prematurity, or Rhesus incompatibility.

In this study, however, both doses of Althesin have proved satisfactory for the induction of anaesthesia for Caesarean section. The larger number of infants in the high dose group with (A–C) scores of less than 6 suggests that infants in the high dose group were at a greater risk of foetal depression, but because of the small number of infants in this study the clinical significance of these results is debatable. The effect of doubling the dose of the induction agent contrasts markedly to what has been observed for a much smaller increase in a dose of methohexitone (Holdcroft et al., 1974). Therefore it seems that Althesin would be a safer drug than methohexitone if a relative "overdose" is given, such as may occur with the use of a standard dose for patients of varying weight. The main disadvantage of Althesin appears to be the increasing number of sensitivity reactions being reported after its use, so that, despite its desirable properties for obstetric anaesthesia, it may not become generally accepted.

REFERENCES


ALTHESIN FOR CAESAREAN SECTION

L’ALTHESINE EN TANT QU’AGENT D’INDUCTION POUR LES OPERATIONS CESARIENNES

RESUME

Trente patientes opérées à froid d’une césarienne par incision du segment inférieur ont été divisées au hasard en deux groupes. Un groupe a reçu 50 µlitre/kg d’althesine pour induction de l’anesthésie et l’autre 100 µlitre/kg. Les deux groupes maternels étaient similaires. Il n’y a pas eu de différence significative dans l’état clinique ou biochimique des enfants sauf que les enfants appartenant au groupe ayant reçu la plus faible dose avaient une tension en oxygène (Po₂) nettement plus élevée dans le sang veineux umbilical et dans le sang artériel.

ALTHESIN ALS EINLEITUNGSMITTEL FÜR KAISERSCHNITT

ZUSAMMENFASSUNG

Dreissig Patientinnen für unteren Kaiserschnitt wurden wahllos in zwei Gruppen eingeteilt. Eine Gruppe erhielt als Narkoseeinleitung 50 µlitre/kg Althesin, die andeet 100 µlitre/kg. Beide Gruppen waren ähnlich. Es gab im klinischen oder biologischen Zustand der Kinder keine wesentlichen Unterschiede, ausser dass die Kinder aus der Gruppe mit der niedrigeren Dosis eine wesentlich höhere Sauerstoffspannung (Po₂) im umbilikalen venösen und arteriellem Blut aufwiesen.

EL ALTESIN COMO AGENTE DE INDUCCION ANESTESICA PARA LA SECCION CESAREA

SUMARIO

Se dividió en dos grupos al azar a 30 pacientes para una sección cesárea del segmento inferior, según conviniera. Un grupo recibió 50 ml/kg de altesin con fines de anestesia y el otro 100 ml/kg. Los dos grupos maternales fueron similares. No hubo diferencia apreciable en el estado clínico o bioquímico de los niños excepto que los del grupo de dosis menor tenían una presión de oxígeno bastante mayor en la sangre arterial y venosa umbilical.