

GP Review Article**General Anaesthesia for Caesarean Section****PART II. THE INFLUENCE OF A TECHNIQUE INCORPORATING
LATERAL TILT IN 50 ELECTIVE CASES**

J. W. DOWNING, A. J. COLEMAN, M. C. MAHOMEDY, D. E. JEAL,
Y. H. MAHOMEDY

SUMMARY

Fifty mothers presenting for elective Caesarean section were anaesthetised using a technique previously recommended for obstetric anaesthesia. Clinically, most infants were in good condition after birth.

Blood gas studies done on the mothers before induction and at delivery showed a mild respiratory alkalosis with a compensatory metabolic acidosis. Mean umbilical arterial blood gas/acid-base status revealed a mild acidemia, both respiratory and metabolic in origin, which was well within accepted normal limits. Fetal oxygenation also appeared satisfactory (mean umbilical vein pO_2 33,9 torr and umbilical artery pO_2 18,9 torr).

Two mothers (4%) were conscious during surgery, but felt no pain. Vomiting after anaesthesia occurred in 16% of cases. Evidence of postoperative chest infection was found in 5 mothers (10%). Thus, the anaesthetic technique advocated does not appear to adversely influence the mother or her infant.

S. Afr. Med. J., 48, 1735 (1974).

The numerous anaesthetic techniques advocated for Caesarean section¹⁻¹¹ highlight the special problems presented to the anaesthetist by the pregnant patient. Certain aspects of obstetric anaesthesia, including aortocaval compression by the gravid uterus, the pulmonary acid-aspiration syndrome, drug-induced neonatal depression, and maternal awareness during surgery, have been emphasised in a recent review.¹² We have described the anaesthetic sequence used at King Edward VIII Hospital in Durban as a routine, where over 2 500 Caesarean sections are performed under general anaesthesia annually.¹² This report

includes details of 50 elective cases, to illustrate the influence of our method on mother and infant.

METHODS

The fifty patients were of low socio-economic status, but were free of serious systemic disease or evidence of placental insufficiency. Gestational age was between 36 and 42 weeks. The mothers were not in labour and their membranes were intact. Multiple pregnancies were excluded, and all infants delivered were mature by birthweight.¹³

The pre-operative management of the patients, including the use of a rubber wedge, or 10° table tilt to alleviate aortocaval occlusion, has been described. The induction of anaesthesia by injection of a fresh thiopentone/suxamethonium mixture, and the rationale behind this induction sequence, have also been presented.¹²

Mechanical ventilation of the lungs with nitrous oxide and oxygen, provision of muscle relaxation and the maintenance of anaesthesia with 0,5% halothane vapour and 50 mg intravenous pethidine after delivery, were identical to those previously reported.¹²

Maternal arterial blood was sampled before induction of anaesthesia, and again just before delivery. A segment of umbilical cord was isolated between two clamps before the infant breathed, and blood was drawn from the umbilical vessels for subsequent blood gas analysis. A Radiometer BMS 3 Mk 2 micro-analyser was used to measure the pH, pCO_2 and pO_2 levels of the samples. Base deficit was determined, using a Severinghaus slide rule (Radiometer blood gas calculator BGCI). Corrections were made for the degree of haemoglobin desaturation.¹⁴

After birth, the infants were awarded an Apgar score modified to exclude points for colour: Apgar minus colour (A - C).^{15,16} The subsequent care of the newborn infants, and the management of the mothers during recovery from anaesthesia, including reversal of residual muscle relaxation, pharyngeal suction and extubation with a simulated cough, have been discussed.¹²

On the day after surgery, the mothers were interviewed and the incidence of awareness during surgery, and vomiting after operation, elicited. Symptoms indicative of chest infection (productive cough, or pyrexia not in keeping with the extent of surgery) were noted, and the chest was examined clinically.

Department of Anaesthetics, University of Natal Medical School, Durban

J. W. DOWNING, M.B. B.CH., F.F.A., *Principal Anaesthetist/Senior Lecturer*

A. J. COLEMAN, M.B. B.S., F.F.A., *Professor and Head*

M. C. MAHOMEDY, L.L.M., D.A., F.F.A., *Senior Anaesthetist*

D. E. JEAL, M.A., B.M. B.CH., F.F.A., D.OBST. R.C.O.G., *Principal Anaesthetist*

Y. H. MAHOMEDY, M.B. CH.B., D.A., F.F.A., *Senior Anaesthetist*

RESULTS

The average weight of the fifty mothers was 74.0 kg, and the mean induction dose of thiopentone used 261.1 mg (range 225 - 350 mg). The induction to delivery intervals ranged from 4.5 to 20.5 minutes (mean 9.8 minutes).

The mean modified Apgar score (A-C) at two minutes was 7.6. Two infants were mildly depressed (A-C $\frac{5-6}{8}$) and 2 severely compromised (A-C $<\frac{5}{8}$), two minutes after birth. One baby required intubation and a period of controlled ventilation with oxygen.

The blood gas/acid-base status of the mothers before induction of anaesthesia and just prior to delivery is shown in Table I. The mothers had mild respiratory alkalosis with a compensatory metabolic acidosis before induction and at delivery.

TABLE I. MEAN MATERNAL BLOOD GAS STATUS BEFORE INDUCTION OF ANAESTHESIA AND PRIOR TO DELIVERY OF THE FETUS (\pm SD)

	Before induction	Before delivery
pH	7.411 (\pm 0.048)	7.383 (\pm 0.047)
Range	7.303 - 7.510	7.292 - 7.461
pCO ₂ torr	28.1 (\pm 3.9)	31.7 (\pm 4.4)
Range	17 - 39	24 - 46
pO ₂ torr	468.5 (\pm 74.0)	151.3 (\pm 34.0)
Range	230 - 600	83 - 215
Base deficit in mEq/L	5.6 (\pm 2.6)	5.3 (\pm 2.5)
Range	1.0 - 10.8	0.8 - 11.3

TABLE II. MEAN UMBILICAL VENOUS (Uv) AND ARTERIAL (Ua) BLOOD GAS STATUS (\pm SD)

	Uv	Ua
pH	7.313 (\pm 0.045)	7.260 (\pm 0.039)
Range	7.220 - 7.401	7.172 - 7.345
pCO ₂ torr	42.5 (\pm 5.5)	51.7 (\pm 7.4)
Range	33 - 65	40 - 73
pO ₂ torr	33.9 (\pm 6.8)	18.9 (\pm 4.7)
Range	19 - 47	6 - 32
Base deficit in mEq/L	5.9 (\pm 2.8)	7.9 (\pm 2.8)
Range	0.4 - 10.9	0.5 - 12.6

Umbilical cord blood pH, pCO₂, pO₂ and base deficit values appear in Table II. A moderate degree of metabolic acidemia was found in the umbilical venous samples. A combined respiratory and metabolic acidemia was seen in the umbilical arterial blood. Mean pO₂ of umbilical cord blood was 33.9 (Uv) and 18.9 (Ua) torr.

The average maternal to fetal base deficit gradients were, (Ma - Uv) 0.6 (\pm 1.7) and (Ma - Ua) 2.6 (\pm 2.4) mEq/litre.

DISCUSSION

We have previously reviewed the special problems confronting the obstetric anaesthetist.¹² The importance of lateral tilt, a relatively short induction to delivery (I-D) interval, and a brief uterine incision to delivery (U-D)

time, have been emphasised. The hazard of pulmonary acid aspiration, and maternal awareness during surgery, were discussed; and our anaesthetic technique designed to avoid these difficulties was presented. In addition, the limitation of drug dosage, thus decreasing the incidence of drug-induced neonatal depression, was advocated.

In this study induction to delivery intervals were limited to less than 12 minutes where possible. Thiopentone dosage did not exceed 4 mg/kg body weight.

The clinical status (A-C scores) of most infants two minutes after birth was satisfactory. Mean blood gas/acid-base results were within accepted normal limits for both mother and infant.^{9,17}

Base deficit gradients between mother and fetus indicated good fetoplacental exchange and a relative lack of fetal biochemical asphyxia.¹⁸

No significant relationship could be demonstrated between the induction to delivery (I-D) intervals and the maternal to fetal base deficit gradients. Maternal and fetal blood gas/acid-base status was also unrelated to time (I-D) interval.

Two patients volunteered evidence of awareness during surgery; each recalled hearing a baby cry. Neither mother, however, admitted feeling pain or discomfort. Eight mothers (16%) vomited after operation. Evidence of chest infection was noted in 5 mothers (10%) on the day after Caesarean section.

No correlation could be demonstrated between maternal to fetal base deficit gradients and the induction to delivery intervals. Maternal and fetal blood gas/acid-base levels were also unrelated to time. Thus the biochemical status of the mothers and their infants did not appear to deteriorate with time, which could be attributed to the use of lateral table tilt.^{8,18}

Factual recall was not a problem in this series, and in the two cases reported, awareness was painless and not unpleasant. Postoperative vomiting occurred in 16% of cases, and evidence of chest infection was obtained in 10% of patients, an incidence similar to that reported in other studies.^{9,15}

We conclude that the anaesthetic technique used as a routine in our unit and in the 50 elective Caesarean sections presented here, does not appear to adversely influence the mother or her infant.

REFERENCES

- Finster, M. and Poppers, P. J. (1968): *Anesthesiology*, **29**, 190.
- Stenger, V. G., Blechner, J. N. and Prystowsky, H. (1969): *Amer. J. Obstet. Gynec.*, **103**, 901.
- Kosaka, Y., Takahashi, T. and Mark, L. C. (1969): *Anesthesiology*, **31**, 489.
- Moir, D. D. (1970): *Brit. J. Anaesth.*, **42**, 136.
- Fox, G. S. and Houle, G. L. (1971): *Canad. Anaesth. Soc. J.*, **18**, 60.
- Kalappa, R., Ueland, K., Hansen, J. M., Eng, M. and Parer, J. T. (1971): *Amer. J. Obstet. Gynec.*, **109**, 411.
- Crawford, J. S. (1971): *Brit. J. Anaesth.*, **43**, 179.
- Crawford, J. S., Burton, M. and Davies, P. (1972): *Ibid.*, **44**, 477.
- Downing, J. W., Coleman, A. J. and Meer, F. M. (1972): *Ibid.*, **44**, 1069.
- Peltz, B. and Sinclair, D. M. (1973): *Anaesthesia*, **28**, 37.
- Crawford, J. S., Burton, M. and Davies, P. (1973): *Brit. J. Anaesth.*, **45**, 726.
- Downing, J. W., Coleman, A. J., Mahomedy, M. C., Jeal, D. E. and Mahomedy, Y. (1974): *S. Afr. Med. J.* (in press).
- Crawford, J. S. (1972): *Principles and Practice of Obstetric Anaesthesia*, 3rd ed., p. 62. Oxford: Blackwell Scientific Publications.
- Siggaard-Anderson, O. (1963): *Scand. J. Clin. Lab. Invest.*, **15**, 211.
- Crawford, J. S. (1962): *Brit. J. Anaesth.*, **34**, 179.
- Idem* (1973): *Ibid.*, **45**, 148.
- Idem* (1972): *Op. cit.*,¹³ p. 52.
- Downing, J. W., Coleman, A. J., Mahomedy, M. C., Jeal, D. E. and Mahomedy, Y. H. (1974): *Anaesthesia* (in press).