CONTINUOUS LUMBAR EPIDURAL ANALGESIA FOR LABOUR AND DELIVERY

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SYNOPSIS

An analysis on 226 high risk primigravida who received continuous epidural for relief of labour pain is presented. The anaesthetic management is described and the problems encountered discussed.

INTRODUCTION

Epidural analgesia has been widely acclaimed as the most efficient method of relief of pain in labour for childbirth and has the outstanding advantages that the parturient's sensorium is not affected and there is no depression of the newborn's respiration. (Bromage 1961; Hellman 1965; Bonica 1972; Crawford 1972 a; Scott 1977). In recent years many major centres have set up epidural services to meet the growing demand for adequate analgesia for labour (Moir & Willock 1968; Romihe, Clark & Brown 1970; Crawford 1972 **b**, c; Holdcroft, Bevan & Morgan 1974; Moore, Murnaghan & Lewis 1974; Brown & Vass 1977). A study on the use of epidural analgesia in primigravida in labour was carried out at Kandang Kerbau Hospital.

MATERIALS AND METHODS

Selection of patients

With a delivery rate of 25,000 per annum it is not possible to provide epidural coverage for all patients in labour. Primigravida in the abnormal labour ward who required analgesia were selected for the study. The procedure was fully explained to the patients and consent obtained. Those patients scheduled for induction of labour had epidural catheter inserted before labour became established while patients with spontaneous labour were not given epidural analgesia until labour pain became distressing.

Anaesthetic Technique

An intravenous infusion of 5% dextrose in water was set up. Epidural puncture was then performed with the patient in the sitting position using a 16-gauge Tuohy or straight short-bevelled needle through the second or third lumbar interspace via the midline approach. Entry into the space was verified by the loss of resistance technique with an air-filled syringe. After giving a test dose of 2 ml of 0.5% plain bupivacaine, a nylon Skinner catheter was threaded through the needle in a cephalad direction so that about 4 to 5 cm lay in the epidural space. The needle was then withdrawn and the catheter securely taped over the shoulder.

For first stage labour, an initial dose of 7 ml bupivacaine was administered when uterine contractions became troublesome. Subsequent top-up doses consisted of 5 ml of the local anaesthetic when painful contractions returned. The injections were given with the parturient on the side with a 10 degree head-down tilt. On completion of injection, she was turned to the opposite side to facilitate bilateral spread and was exhorted to avoid the supine position. When delivery was imminent, 7 ml of the local anaesthetic was given with the patient sitting up. The epidural procedure was consistently carried out by the same anaesthetist while supplementary injections were given either by him or the anaesthetist on call.

Assessment

Prior to initiation of epidural, the extent of supine hypotensive syndrome was evaluated by measuring patient's blood pressure in the lateral and then in the supine position.

The maternal blood pressure and pulse rate and the foetal heart rate were recorded every five minutes for the first twenty minutes after each injection and at thirty minute interval thereafter. In some patients, the foetal heart rate was monitored continuously by external cardiophone. The extent of sensory and motor blockade were determined and progress of labour assessed by four hourly vaginal examination. The epidural catheter was removed on completion of perineal repair after delivery.

The patient was interviewed the next day, the degree of analgesia experienced during labour and delivery was ascertained and the occurrence of complications such as headache, backache and bladder disturbance were assessed. Her view on having epidural for subsequent labour was also ascertained.

RESULTS

The epidural procedure was attempted in 230 patients. Table I shows the age, body weight and height distribution and Table II the ethnic composition of the patients. The incidence and types of associated medical or obstetrical conditions of these patients on admission are shown in Table III. Two patients (both doctors) specifically requested for epidural analgesia; all the other patients were ignorant about this mode of pain relief. There was no instance of supine hypotensive syndrome prior to epidural blockade.

TABLE I: Age, weight and Height of Patients

	Range	Mean
Age (Yrs)	15-17	25
Weight (Kg)	42-94	60
Height (Cm)	140.5-166	155.4

TABLE II: Ethnic distribution of patients

Ethnic Groups	Number of Patients
Chinese	197
Malay	23
Indian/Pakistani	10

TABLE III: Incidence of Medical and Obstetrical Complications prior to Epidural Blockade

Complications	Number of Patients
Toxaemia of Pregnancy	97
Static Weight	41
Postmaturity (by date)	43
Breech Presentation	15
Elderly Primipara	10
Previous Abortion or Molar Pregnancy	8
Trial of Labour	7
Anaemia	3
Twin Pregnancy	2
Hematuria	1
Thyrotoxicosis (controlled)	1
Cardiac (Pulmonary Stenosis)	1
Intrauterine Death	1
Premature Labour	1
Uterine Fibroid with Pregnancy	1

* Some patients had more than one complication.

Anaesthesia

Attempts at gaining entry into the epidural space failed in four patients. Three of them had dural puncture and the procedure was abandoned. In the remaining patient the epidural space could not be located. These four patients were excluded from the analysis.

Epidural blockade was most commonly initiated when the cervical dilatation was 2 to 3 cm in diameter. Twenty patients received epidural at the time of surgical induction while one patient had her first injection at full cervical dilatation. Sensory blockade of dermatone. T_{10} and above was achieved in 78% of patients and there was only minimal impairment of lower limb movements. Time interval from initiation of block to delivery ranged from 32 minutes to 26 hours 48 minutes with a mean of 5 hours 58 minutes. The number of injections required varied from 1 to 9 with a mean of 2.6. The total amount of bupivacaine administered ranged from 35 mg to 315 mg with a mean of 83 mg and the average duration of action of bupivacaine (interval between the first two doses) was 2 hours 22 minutes.

Efficiency of epidural blockade was based on patient's retrospective assessment of analgesia (Table IV). One hundred and eighty six patients (82.3%) had complete pain relief during labour and delivery. Thirty-two patients (14.2%) considered the epidural blockade helpful, as uterine contractions became less troublesome and pain during delivery became tolerable. Of the eight patients (3.5%) who did not benefit from the procedure, four of them had pain relief with the initial dose but not with subsequent doses. This could possibly be due to displacement of the epidural catheter during the course of labour. In two other patients, blood was persistently flowing through the epidural catheter and following each injection there was paraesthesia in the lower limbs but no relief of pain. The remaining two patients had no sensory changes at all, despite apparent success in catheter insertion.

Systemic hypotension was the most frequent complication encountered. Fourteen patients had a fall in systolic pressure exceeding 20 mmHg after injection and required treatment with rapid intravenous fluid infusion and ephedrine. Venous bleeding into the catheter was observed in eight patients and except for the two patients with ineffective blockade, no other untoward effect developed as a consequence. There were four instances of dural puncture — in three patients the epidural procedure was abandoned as mentioned earlier, while in the remaining patient entry to the epidural space was achieved at another vertebral interspace and epidural blockade successfully carried out. One patient developed post-spinal headache which was alleviated by bed-rest, hydration and analgesics. Urinary retention from loss of bladder sensation necessitating catheterisation was a common occurrence during labour but was not a problem in the post-delivery period. No patient complained of backache but on direct questioning many admitted that there was slight soreness at the epidural injection site. Neurological damage was not encountered in this series.

TABLE IV: Patients' assessment of analgesia

	Number of Patients (Ppercentages in Parenthesis)
Complete	186 (82.3)
Helpful	32 (14.2)
No Benefit	8 (3.5)

Labour

Induction of labour was carried out in 113 patients (50%) — 77 by means of oxytocin and 36 by the use of prostaglandin E_2. Labour came on spontaneously in the other 113 patients, but 78 of them were given oxytocin for augmentation of uterine contractions.

Table V displays the mode of delivery of these patients. The incidence of forceps delivery was 51.8%. Indications for forceps were: — prolonged second stage (55.6%), prophylaxis (34.2%), and foetal distress (10.2%). Emergency Caesarean section was carried out in 27 patients, 12 for foetal distress, 13 for no progress in labour and 2 for cephalo-pelvic disproportion.

TABLE V: Mode of delivery*

Method	Number (Percentages in Parenthesis)
Spontaneous	74 (32.5)
Breech	10 (4.4)
Forceps	117 (51.3)
Low	42
Mid	60
Rotation	15
Caesarean Section	27 (11.8)
Total	228

* The total number exceeds 226 as there were two patients with twin pregnancy.

Newborn

The one minute Apgar scores of the newborn are shown in Table VI. There were two stillbirths. In one, foetal heart sound was absent on admission, while the other was a case of breech delivery with undiagnosed cord prolapse. Analysis of infants with low Apgar scores revealed no evidence to implicate epidural analgesia.

TABLE VI: Infant apgar at one minute

Apgar	Number of Babies* (Percentages in (Parentesis)
10-7	177 (77.6)
6-4	37 (16.2)
3-0	14 (6.2)

* The number of babies exceed 226 as there were two patients with twin pregnancy.

DISCUSSION

Our study shows that continuous lumbar epidural is an effective method for relief of labour pain. The attainment of complete analgesia in 82.3% of our patients is beyond the reach of conventional techniques. 50% nitrous oxide in oxygen (Entonox) or 0.5% trichlorethylene in air can produce complete pain relief in only 11-12% of patients while with 0.35% methoxyflurane in air the percentage may reach 30 (Rosen 1971). Low dosage of systemic analgesic such as pethidine, morphine or pentazocine is seldom effective while high dosage is associated with nausea, vomiting, confusion and failure of the patient to cooperate in the birth process and with marked respiratory depression in the newborn (Holdcroft & Morgan 1974).

The ill-effects of inadequate relief of labour pain have recently been established. Climie et al (1973) conducted a 'consumer satisfaction enquiry' in Australia and found that the commonest complaint of mothers was inadequate pain relief and that this was sufficient to deter 20% of them from having any more children. Straining and hyperventilation during childbirth increase maternal oxygen consumption (Sangoul, Fox and Houle 1975), cause a rise in the concentration of free fatty acids in maternal blood (Maltau, Andersen & Skrede 1975) and thereby produce maternal metabolic acidosis (Thalme, Raabe & Belfrage 1974). As a consequence, the foetus becomes increasingly acidotic (Thalme, Belfrage & Raabe 1974). There is evidence that the effective use of epidural contributes towards the well-being of both mother and child (Pearson % Davies 1973 a, b, 1974 a, b, Crawford 1977).

An important consideration in the evaluation of epidural for obstetrics is the incidence of complications:—

1) *Dural puncture*

Our incidence of 1.7% is similar to that reported by Holdcroft and Morgan (1976) and better than the 2.5% reported by Dawkins (1969) and the 7.6% and 3.2% by Crawford (1972 b, c). Inadvertent perforation of the dura is an inherent risk of epidural blockade but its rate is closely related to the experience of the operator (Crawford 1972 c).

2) *Infection*

The intermittent injection of local anaesthetic through an indwelling catheter in the epidural space over a prolonged period poses the serious hazard of infection. Stringent aseptic measures were employed to prevent its occurrence in our patients. With the recent availability of Millipore bacterial filter (Swinnex) in the hospital, the 'top up' procedure is simplified as this dispenses with the need for elaborate sterile precautions (Moir 1971).

3) *Systemic hypotension*

This is prone to occur in the pregnant woman under conduction anaesthesia. The inferior vena cava is liable to be compressed by the pregnant uterus in the supine position and there is loss of compensatory vasoconstriction with sympathetic blockade. The condition can be reversed by uterine displacement and liberal fluid infusion.

4) *Prolonged second stage*

The factors responsible are obtundation of the bearing-down reflexes, relaxation of the perineum and weakness of voluntary expulsive muscles. With loss of the bearing-down reflexes, transition from first to second stage will not be accompanied by hyperventilation or vocal response, hence the need for more frequent vaginal or rectal examinations to assess progress of labour. Prolongation of second stage imposes a threat on the foetus and it is mandatory that the foetal heart rate be closely monitored. Notwithstanding the presence of adequate sensory blockade and muscular relaxation, the obstetrician must refrain from undertaking difficult vaginal delivery, lest serious injury is inflicted on the child and mother (O'Driscoll 1975). Simple outlet forceps delivery is increasingly employed to shorten the second stage.

We do not hesitate to initiate epidural block in painful early labour. In the United States most obstetricians hold the view that epidural depresses uterine contractions and slows labour and they are reluctant to start the procedure until late first stage when the cervical os is half dilated. Crawford (1972c), however, has shown

that epidural does not significantly prolong first stage labour; furthermore the transient inhibition of myometrial activity sometimes observed after injection can be readily prevented by oxytocin infusion. In keeping with our objective to provide the minimum effective dose, we prefer the traditional practice of segmental blockade and giving 'top up' on demand rather than Crawford's (1975) regime of complete blockade from dermatone T_{10} downward and 'top up' at regular interval. Bupivacaine is our drug of choice for continuous epidural in first stage labour (Bromage 1969). The plain solution is preferred because the addition of adrenaline does not significantly lengthen the analgesia and may produce undesirable effects on the mother and child (Reynolds & Taylor 1971). The prolonged action of bupivacaine has the practical advantage that the frequency of 'top up' is reduced and the problem of tachyphylaxis seldom arises. The minimal degree of motor blockade allows patient to move freely in bed and participate in the birth process. With its high protein-binding capacity, placental transfer of bupivacaine is very low thereby conferring protection on the foetus. On the other hand for use as a test dose and for second stage labour, a drug with brief duration of action such as chloroprocaine is preferred.

Our policy of having all 'top up' injections administered by anaesthetists did not work out satisfactorily and needs to be revised. Only one anaesthetist is in attendance at night and during weekend in the hospital. On many occasions urgent demand for pain relief could not be dealt with promptly as the anaesthetist was busy in the operating theatre. With proper guidelines laid down, this function could be safely and effectively carried out by trained nursing personnel (Crawford 1972b, C; Brown & Vass 1977).

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