EXPERIENCES WITH LUMBAR EXTRADURAL ANALGESIA FOR CAESAREAN SECTION

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SUMMARY
The results of 324 Caesarean sections conducted under lumbar extradural block are discussed. In addition to pre-loading with fluid i.v. and the avoidance of aorto-caval compression, more recent modifications have been to administer bupivacaine in incremental doses, to be less concerned with the size of the total dose, and to provide the mother with supplementary oxygen until delivery. As a result of these modifications, the frequency of maternal discomfort and hypotension has been reduced, and the need for supplementary analgesia or a vasopressor has become a rarity. Administration of diazepam after delivery is still occasionally advisable. The technique has many advantages for both mother and infant and with a good obstetric service, few disadvantages. Prolongation of the interval between incision of the myometrium and delivery appears to be less detrimental to the infant than is the case when general anaesthesia is used.

Growing interest in the provision of lumbar extradural analgesia for labour and vaginal delivery has led to the use of the technique as an alternative to general anaesthesia for Caesarean section. An account is presented of experience of the technique in one busy maternity hospital.

SUBJECTS AND METHODS
Occasional patients were operated on for Caesarean section under lumbar extradural block from 1968, but it was not until the mid 1970s that sections were conducted in this manner on a regular basis. By that time, experience in other areas of obstetric anaesthesia had shown the necessity of ensuring that patients were not exposed to aorto-caval compression and that adequate circulating volume was maintained. From the outset of the series discussed, patients undergoing elective section were pre-loaded with Hartmann’s solution 1–2 litre while those awaiting emergency section were given additional i.v. fluid as required. Patients in both groups were tilted laterally, the direction of tilt determined by the mother’s arterial pressure (James et al., 1977).

Previously, all or the major portion of the dose of bupivacaine 0.5% without adrenaline was administered as a single injection via the extradural cannula with the mother lying in the lateral position, first on one side then, 5–10 min later, on the other. The total dose was usually only sufficient to provide sensory loss to the level of T6–T7. Most mothers breathed room air throughout the period of the operation and ergometrine with or without oxytocin was administered after delivery. Dissatisfaction with this method of management led to the adoption of a new technique which has been used since the end of 1977.

For elective section, bupivacaine 0.5% without adrenaline is injected in incremental doses after adequate fluid administration. The first dose (usually 10 ml) is given whilst the patient reclines against a head-rest. The second dose (usually 5 or 10 ml) is given not less than 10 min later, with the patient lying in the lateral position. Not less than 10 min after the second dose the patient is turned on to her other side and, if necessary, additional doses are administered. Only when loss of skin sensation to T6 has been achieved is the patient taken into the operating theatre. Far less regard than previously is paid to attempts to ensure a small total dose. Additional features of the modified technique have been that the mother is provided with supplementary oxygen until the infant has been delivered, and that ergometrine is not given unless considered by the obstetrician to be essential. If oxytocin therapy is required, it is administered i.v. either as a dilute bolus (5–10 units) or by infusion.

Rarely, an extradural block already in progress for labour was considered to have spread far enough cephalad to allow the operation to be started without a supplement, but more frequently an incremental dose of bupivacaine—usually 10 ml, sometimes 20 ml—was required. Most of the patients who
underwent emergency section under extradural block had an extradural cannula in place before the decision to operate was made. In a few instances, the condition of both mother and fetus was such that there was sufficient time to initiate a block specifically for emergency section.

RESULTS

There have been 142 elective Caesarean sections and 182 emergency sections from 1973 to the autumn of 1979. For patients undergoing elective section, the total dose of bupivacaine has ranged from 15 ml to 55 ml, administered as one to six injections. As stated above, the technique evolved gradually, so the fact that the mean dose of bupivacaine in the entire series is 26.3 ml is of little significance. During the period 1978–79, 70 cases of elective section were conducted using the present technique, and the mean dose was 27.2 ml.

The time from the first dose of bupivacaine to delivery by elective section in minutes, ranged from 25 to 183, mean 74.3, and that from the final dose to delivery ranged from 3 to 112, mean 36.8.

There was a failure to establish satisfactory extradural analgesia in three patients, who are not included in this report.

Three patients undergoing elective section received a general anaesthetic after delivery. One (who had received bupivacaine 30 ml in increments of 15, 10 and 5 ml) because she complained of discomfort in her legs. The second received 30 ml in two doses (20 ml and 10 ml), and reported considerable pain at the site of surgery. The third patient complained of pain on incision of the peritoneum and had received 20 ml (10 ml and 10 ml). Neither of the last two patients had received the first dose of bupivacaine whilst semi-reclining. Seven patients required additional analgesia after delivery because of suprapubic pain. The details of the dose (ml) of bupivacaine, are as follows:

<table>
<thead>
<tr>
<th>Patient</th>
<th>Increments</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15 5</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>15 5</td>
<td>20</td>
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<td>3</td>
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<td>4</td>
<td>10 6</td>
<td>16</td>
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<tr>
<td>5</td>
<td>10 5 5 5 5</td>
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<td>40</td>
</tr>
<tr>
<td>7</td>
<td>10 6 4 5</td>
<td>25</td>
</tr>
</tbody>
</table>

Each of these patients was given pethidine 50 mg i.v. and 50% nitrous oxide in oxygen was also administered to patients 1 and 2. Only patient 7 was anaesthetized during the period 1978–79; the remainder did not have a dose of bupivacaine injected whilst in the semi-reclining position. The requirements for supplementation are summarized in table I.

<table>
<thead>
<tr>
<th></th>
<th>Earlier technique</th>
<th>Present technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>General anaesthesia</td>
<td>72</td>
<td>70</td>
</tr>
<tr>
<td>Analgesia</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Three patients undergoing emergency section required general anaesthesia after delivery. In one of these the level of sensory block reached only to T10, and in retrospect it would clearly have been wiser either to delay operation until another dose had been given, or to have administered general anaesthesia from the start. Four patients required supplementary analgesia—pethidine in three patients and nitrous oxide in the fourth.

In one patient general anaesthesia had been the first choice, but endotracheal intubation proved impossible, so the mother was allowed to waken and an extended block was given via a previously inserted extradural cannula.

Eight patients undergoing elective section had been given a vasopressor (epinephrine). Each of the episodes of hypotension occurred before the introduction of the present technique, and most followed an initial injection of bupivacaine 20 ml. Two patients in the series of elective sections developed marked bradycardia and were given atropine 0.6 mg i.v. with satisfactory results.

One patient in the series of emergency sections was successfully treated with ephedrine and atropine for severe hypotension which occurred immediately after delivery. Blood loss at the time was estimated to be 600 ml, and she had received almost 2 litre of Hartmann's solution. One other patient developed severe bradycardia which responded to atropine.

One of the few complications encountered since the development of this technique has been that the mother tends to become restless after the baby has been born. Minor discomforts then achieve prominence—heaviness of the legs, backache, stiffness in the elbows and shoulders. The presence of the husband sitting at the head of the table (a practice
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which has been encouraged unless there are obvious clinical or personality reasons for not doing so) has helped to alleviate this, as also has the anaesthetist who sustains the mother’s morale by appropriate conversation. A further aid has been the provision of music from a cassette recorder.

The maternal satisfaction with this management has been impressive. The mother sees her baby when it is delivered; often she can hold it (even to the breast) within minutes of delivery, and can continue to be closely aware of it throughout the remainder of the operation and in the period immediately after operation.

Maternal nausea and retching were very uncommon features during operation after the abandonment of the use of ergometrine except under the most extreme circumstance of uterine hypotonia. Perphenazine was administered to many of the patients, but this has been a precaution rather than an essential prophylactic.

The extradural cannula was used for analgesia after operation in some patients, but a shortage of nursing staff has been a limiting factor. Furthermore, it has not always been appreciated that when the patient is no longer pregnant the volume of bupivacaine solution required to provide a sufficient block is considerably more than the usual top-up dose. A dose of less than 15-20 ml of 0.25% bupivacaine would be unlikely to eliminate abdominal pain after surgery. Whether or not an injection has been given after operation, mobility of the mother after operation has, in general, been more prompt and more energetic than that seen after sections conducted under general anaesthesia.

Detailed reference to the condition of the infants is confined to those delivered by elective section. Only the Apgar minus colour scores at 1 and 5 min \((A-C)_1\) and \((A-C)_5\) are considered since the available acid-base data are insufficient to report.

Eighteen infants had \((A-C)_1\) less than 8, but of these, 12 were the infants of mothers with probable placental dysfunction. Two of these infants (both of diabetic mothers) scored 7 at 5 min. The remaining six infants were delivered of mothers assumed to have normal placental function. There were 112 patients in this group. The six individual \((A-C)_1\) scores were: 7, 5, 4, 4, 3 and 1. The 5-min \((A-C)_5\) scores of four of this group of infants was 8, and the remaining two scored 7.

Consideration of the induction–delivery interval is unlikely to be relevant to the condition of the neonate delivered under extradural analgesia. However, the time which elapses between the first incision to the myometrium and completion of delivery (the U–D interval) should be relevant if the postulates to explain the significance of this interval to neonatal well-being when general anaesthesia is used are correct (Crawford et al., 1976). The mean duration of the U–D interval exceeded 90 s in 19 of the 112 normal patients (group A elective sections). This is almost identical to the frequency (15.4%) reported for group A elective sections conducted under general anaesthesia (Crawford et al., 1976). However, only one (5.3%) of the 19 neonates subjected to a U–D interval of more than 90 s failed to achieve maximum \((A-C)\) scores. Of the 93 infants who had been subjected to a U–D interval of less than 90 s, five (5.4%) failed to achieve a maximum score.

There were three sets of twins in the series of elective sections, and one set in the emergency series. All six infants in the series of elective sections were in good condition at delivery.

DISCUSSION

The modifications in technique introduced into our practice since 1977 were based largely upon advice from Moir (1979). These have reduced considerably the frequency of undesirable features of this procedure. The number of patients who required supplementary analgesia or general anaesthesia with the previous technique was small, but there were undoubtedly several patients who were uncomfortable during the operation, but not sufficiently so to persuade the anaesthetist to administer i.v. or inhalation analgesia. Even with the present technique, some mothers become sufficiently anxious, bored or restless after delivery to require some sedation such as diazepam 5 mg i.v.

Maternal hypotension is unusual if the technique of incremental dosage—subsequent to fluid pre-loading—is adopted, and care is taken to avoid aorto-caval compression. The administration of a vasopressor is rarely required. This may be contrasted with the frequency of hypotension in two recently reported series in which bupivacaine was administered as a single dose. In one (Fox et al., 1979), nine of the 20 patients required ephedrine; in the second (Downing, Houlton and Barclay, 1979) 10 of 32 patients developed a significant decrease in arterial pressure, although only one required a vasopressor.

Occasionally bradycardia occurs. In this series it almost invariably occurred shortly after delivery and
was probably induced by oxytocin. It was successfully treated by atropine i.v.

There is growing agreement that where there is no evidence of placental dysfunction, there is little difference in Apgar scores and acid-base results between infants delivered under extradural block and those whose mothers were given general anaesthesia (James et al., 1977; Downing, Houlton and Barclay, 1979; Fox et al., 1979). Although Downing and colleagues (1979) reported that the degree of metabolic acidosis of the neonate increased significantly with increase in the U-D interval, in the present series the U-D interval was not related to the Apgar minus colour scores. This contrasts with deliveries conducted under general anaesthesia (Crawford et al., 1976). It is possible that, when conducting a Caesarean section under extradural analgesia, the obstetrician tends to be more gentle and restrained in his manipulations, and that there is less disturbance of the placental blood supply during the period between incision into the myometrium and delivery of the infant.

The two main features which have inhibited greater use of extradural analgesia for Caesarean section have been obstetric wariness and the time taken to prepare the patient. Some obstetricians have an initial reluctance to operating upon an awake patient. This is difficult to understand, because of all surgical specialists the obstetricians are those who most frequently employ their manipulative skills upon patients with whom they can concurrently converse. These restraints can be overcome only by gentle persuasion continuously applied, and by reference to the examples of colleagues in the same hospital. One objection advanced has been that a potentially difficult section should weigh in favour of general anaesthesia. In our experience this is applicable only if the difficulty likely to be encountered is severe haemorrhage from an anterior low-lying placenta. If the myometrium is scarred—as, for example, from one or more previous sections—the choice of extradural block is advantageous since it reduces the insult which a prolonged induction-delivery interval and U-D interval would otherwise offer to the infant, and yet affords no increased hazard to the mother. Many of the cases referred to in this report were repeat sections.

The other objection is equally misplaced. It is true that if a successful block is to be ensured a considerable time will be spent in achieving it. This should cause no difficulty in an obstetric unit the standards of which meet the requirements for an extradural service. Few obstetric units in the United Kingdom conduct an average of more than one or two elective Caesarean sections per day, and there is no need to hurry the start of these. Most sections in such units will be performed by residents who have other duties in the delivery suite with which to fill in the waiting period. In this series, the occasions when the time from beginning the extradural block to delivery of the infant was more than 1 h occurred when an emergency intervened and the operation had to be delayed. The anaesthetist also is not unduly withdrawn from other routine work in the delivery suite, provided that there is a competent midwife available to supervise the care of the mother whilst the block is being established. The degree of urgency to conduct an emergency section must be an important factor in deciding whether or not the operation should be conducted under an extradural block. The choice will obviously be influenced in favour of a block if one is already in progress for pain relief in labour.

A list of the indications and contraindications is not germane to this discussion, but as in the use of extradural analgesia for labour, the contraindications diminish with increasing experience in an obstetric unit.

REFERENCES
totale et pour donner à la mère un supplément d’oxygène jusqu’à l’accouchement. Par suite de ces modifications, la fréquence des malaises maternels et d’hypotension s’est trouvée diminuée et il est rare que l’on doive faire appel à une analgésie supplémentaire ou utiliser un agent vaso-pressif; l’administration de diazépam après l’accouchement reste occasionnellement recommandable. La technique présente de nombreux avantages pour la mère et pour l’enfant et avec un bon service d’obstétrique, il y a peu d’inconvénients. La prolongation de l’intervalle entre l’incision du myomètre et l’accouchement semble être moins préjudiciable à l’enfant que lorsqu’on utilise une anesthésie générale.

ERFAHRUNGEN MIT EXTRADURALER LUMBARANALGESIE BEI KAIERSCHNITT

ZUSAMMENFASSUNG


EXPERIMENTOS CON ANALGESIA EXTRADURAL LUMBAR EN OPERACION CESAREA

SUMARIO

Se trata de los resultados de 324 operaciones cesáreas efectuadas bajo bloqueo extradural lumbar. Fuera de la carga previa con fluido i.v. y la eliminación de la compresión aorto-caval, las recientes modificaciones tienden a administrar bupivacaina en dosis incrementales sin preocuparse tanto de la importancia de la dosis total y a suministrar a la madre oxígeno adicional hasta el parto. El resultado de dichas modificaciones fue de reducir la frecuencia de la hipotensión y del malestar de la madre y la necesidad de una analgesia complementaria o de un vasopresor se volvió una rara. La administración de diazepam después del parto es aconsejable todavía en algunas oportunidades. Esta técnica tiene muchas ventajas tanto para la madre como para el recién nacido y con un buen servicio obstétrico, muy pocas desventajas. La prolongación del intervalo entre la incisión del miometrio y el parto parece ser menos perjudicial para el recién nacido que cuando se administra una anestesia general.