ANAESTHESIA FOR CAESAREAN SECTION

A medical audit of junior anaesthetic staff practice

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SUMMARY

This survey compared the safety of 261 healthy mothers of whom 170 received extradural and 91 general anaesthesia for Caesarean section. Anaesthetics were conducted in routine hospital practice by six anaesthetic registrars. Failed intubation occurred in one patient, awareness was reported by 12 patients following general anaesthesia and two patients had abnormal reactions to drugs. In contrast, the numerous complications that arose with extradural anaesthesia were less serious and easier to manage. Hypotension occurred in 11 patients, inadequacy of analgesia in 25 patients and a period of unawareness in 16 patients following sedation after delivery. Extradural block for Caesarean section is thus seen as safer than general anaesthesia when performed by the same group of anaesthetic trainees on healthy mothers.

Extradural blockade for Caesarean section has been publicized as safer (Davis, 1982) and more acceptable (Brownridge and Jefferson, 1979) to the mother than general anaesthesia. However, anaesthetic trainees are less familiar with this more difficult technique and it is feared that encouraging the use of this, albeit safer, anaesthetic may result initially in an increase in anaesthetic-associated maternal mortality (Rosen, 1981; Corrall, 1982). Thus it is of interest to monitor the complications of extradural and general anaesthesia for Caesarean section conducted in routine clinical practice by junior hospital staff.

PATIENTS AND METHODS

Two hundred and sixty-one healthy patients delivered by Caesarean section of a single fetus later than 34 weeks of gestation were studied. One hundred and fifteen (44%) had elective Caesarean sections and 146 (56%) underwent emergency operations.

Six registrars who had at least 2 years of anaesthetic experience took part in the survey. Four of these registrars had passed the First Part of the FFA diploma and two the Second Part. Their experience with extradural Caesarean section was varied, some being initially uncertain of the technique. Three of the registrars were at the hospital on a 3-month rotational basis; the other three were on 6-month appointments.

Patients having elective Caesarean section chose either form of anaesthesia; 72 (62%) selected extradural and 43 (37%) general anaesthesia. Ninety-eight (67%) of the emergency Caesarean sections were performed under extradural block with the mother's agreement and providing there were no contraindications. Forty-eight (33%) emergency Caesarean sections were conducted under general anaesthesia included in this group were 10 women who had extradural blockade for labour and general anaesthesia for Caesarean section. In two of these the block itself was inadequate, another three had fetal distress of such severity that insufficient time remained for extending the block, and five mothers refused to undergo Caesarean section while awake.

Minor differences in anaesthetic technique occurred between the registrars. All Caesarean sections carried out under extradural analgesia were managed with 0.5% bupivacaine 20–30 ml without adrenaline; occasionally 1% or 2% lignocaine 5–10 ml was added to improve the blockade. After delivery, metoclopramide was routinely given by two of the registrars to patients having extradural Caesarean section. Diazepam or fentanyl was given when deemed necessary. General anaesthesia followed the established sequence of pre-oxygenation, administration of the induction agent i.v., cricoid pressure, suxamethonium and tracheal intubation; intermit-
tent positive pressure ventilation, with 50% oxygen and nitrous oxide, and in 83% of patients 0.5% halothane was added. A non-depolarizing neuromuscular blocking drug was given and after the delivery of the infant opiates were administered, and ventilation with 70% nitrous oxide in oxygen commenced.

All patients were placed with a left lateral tilt during the operation and given an infusion of crystalloids (approximately 1000 ml). In both anaesthetic groups 30% also received a colloidal infusion, half of which was dextran 70, the rest haemaccel. All patients were given oxytocic agents postpartum; in 96% syntocinon was used and in the remainder syntometrine. Postpartum analgesics, sedatives or antiemetics were given to 96% of the general anaesthetic patients and to 22% of the extradural patients. Seven patients receiving general anaesthesia required blood during operation against two (P < 0.05) in the extradural group.

The registrar performing the anaesthetic recorded the patient's age, race, social class and parity, and the reason for Caesarean section. Anaesthetic technique and complications, times of induction, skin incision, uterine incision, delivery and end of operation were noted. The baby was assessed by the paediatric staff and the Apgar score, need of resuscitation and time to sustained respiration were recorded. Another member of the anaesthetic staff questioned the mother on the second day after operation on her view of the anaesthetic (answer "satisfactory", "tolerable" or "unsatisfactory"), awareness ("none", "pleasant", "unpleasant") and the presence of pain during operation, her reason for selecting the particular anaesthetic (table II) and whether she would have the alternative anaesthetic for a possible future Caesarean section.

The data were analysed using SAS software on the University of London Andahl 470/V8 computer running MVS. $\chi^2$-test, analysis of variance and $t$ tests were applied where appropriate.

RESULTS

The mean age (± SD) of the patients was 28 ± 7.1 yr. Social classes I and II accounted for 91 (35%) and 213 (81%) were Caucasian. Half the group were primiparae.

One hundred and seventy patients (65%) had extradural anaesthesia only. There was no significant difference in the populations receiving either anaesthetic technique.

Fathers were permitted to attend any Caesarean section birth and did so in 134 (79%) of extradural patients and 14 (15%) of general anaesthetic patients. The majority of these particular women were having general anaesthesia for emergency Caesarean section and the father had been present throughout labour.

In elective extradural Caesarean section the mean induction to delivery interval was 51 min (range 22–85 min). In emergency extradural Caesarean section where the extradural catheter was already in situ the mean induction to delivery interval was 27 min (10–45 min), and when the catheter was inserted or reinserted for the Caesarean section the mean was 58 min (39–87 min). These wide ranges reflect the lack of urgency of the operation, technical difficulties and the time required to assemble the operating team after the onset of the blockade. In contrast, elective Caesarean section under general anaesthetic had a mean induction to delivery time of 10 min (4–23 min) and for emergency Caesarean section under general anaesthesia 7 min (2–29 min).

The mean incision to delivery time was 8 min in the extradural group (2–25 min) and 7 min in the general anaesthesia group (1–23 min). The mean uterine incision to delivery time was 70 s in emergency Caesarean section for either anaesthetic. This was 90 s in elective Caesarean section and 96 s in breech presentation with either technique. The mean time from incision to the end of operation was the shortest (41 min) in emergency extradural Caesarean section and the longest in elective Caesarean section with general anaesthesia (49 min).

Table I details some of the complications of the anaesthetics provided. The most serious complication was a failure to intubate the trachea in a patient

<table>
<thead>
<tr>
<th>Complication</th>
<th>Extradural (n = 170)</th>
<th>General (n = 91)</th>
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<tbody>
<tr>
<td>Failure to intubate</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hypotension</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Extradural block assessed as inadequate by anaesthetist</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Pain during operation</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>Period of unawareness reported by patient during awake Caesarean section</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Period of awareness reported by patient during Caesarean section under GA</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Abnormal reaction to drugs</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Nausea or vomiting, or both</td>
<td>38</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

Table I. Complications of anaesthesia
under general anaesthesia. The established "failed intubation drill" for urgent deliveries was followed. Attempted intubation was abandoned on the initial dose of suxamethonium, the consultant anaesthetist was summoned, cricoid pressure was maintained and after gentle inflation the anaesthesia continued with spontaneous respiration using nitrous oxide, oxygen and halothane via a face-mask. The patient was tilted to the left and the table flat. There were no serious sequelae to mother or child. There were three other problems with intubation. In two patients the trachea had to be reintubated following bursting of the cuff, and in one patient intubation of the trachea was accomplished with considerable difficulty.

Twelve patients reported awareness under general anaesthesia and of these, four suffered pain. None of these patients received halothane. It was not always obvious to the anaesthetist that the patient was awake during general anaesthesia and only five patients were assessed as possibly having a period of awareness. Two patients had abnormal reactions to drugs during general anaesthesia, one asthmatic developing severe bronchospasm after induction, another requiring papaveretum 60 mg to secure adequate anaesthesia after the delivery.

No major problems were encountered with the insertion of extradural catheters. Hypotension occurred in 11 patients (6%) and was treated with ephedrine in six. Inadequacy of anaesthesia for a part of the operation was assessed by the anaesthetist as occurring in 10 patients, although pain during operation was subsequently reported by 25 women. Too extensive a block with paraesthesia of the hands and stuffy nose occurred in four patients. Nausea with, or without, vomiting occurred in 38 patients (22%). Drowsiness was noted in eight patients. Thirty-seven patients (22%) received postpartum sedation during the operation—diazepam, metoclopramide or fentanyl. This caused 16 patients to report periods of unawareness during extradural Caesarean section.

The condition of the baby was better in the 1st minute after delivery in the extradural group, with more infants having Apgar scores of 8 or greater (76% against 57% ($P < 0.05$) in the general anaesthesia group). The time to sustained respiration of less than 1 min was recorded in more infants in the extradural group (54% against 24% ($P < 0.05$)). The numbers requiring initial intubation and ventilation at birth were greater in the general anaesthesia group (15% against 9% ($P < 0.05$)). However, by 5 min of age there was no difference in the Apgar scores and all the infants had established sustained respiration.

Sixty-nine per cent of emergency extradural Caesarean sections and 65% of general anaesthetic emergency Caesarean sections were performed between 8pm and 8am.

Five patients having emergency Caesarean section found the anaesthetic unsatisfactory. Two received extradural and three general anaesthesia. Mothers found extradural anaesthesia satisfactory (83% against 71% ($P < 0.05$) of general anaesthesia patients). Most mothers receiving extradural analgesia declared that their choice of anaesthesia in the event of a repeat Caesarean section would be the same, 96% as against 66% ($P < 0.001$).

All patients were asked why they had requested or consented to their anaesthetic technique and details are recorded in Table II. The most usual reason mothers gave for having extradural Caesarean section was their wish to participate in the birth of the baby.

**DISCUSSION**

Problems of general anaesthesia for Caesarean section are well known and continue to be unpredictable and often unavoidable. Difficulties with tracheal intubation (Moir, 1980) and awareness (Editorial, 1979) during operation are in the forefront of the anaesthetist's consciousness and yet still occur. The one patient in whom it was impossible to intubate the trachea was at serious risk, but a catastrophe was avoided by following a preset plan. The frequency of awareness was similar to other series surveyed (Moir, 1970). Four patients suffered from pain during the operation under general anaesthesia and this was more alarming than the 25 who were able to

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**Table II. Maternal reason for choice or consent to anaesthetic technique**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Extradural Blockade</th>
<th>General Anaesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wish to participate in birth</td>
<td>113</td>
<td>0</td>
</tr>
<tr>
<td>Felt no choice was given</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>Fear of seeing operation</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Fear of pain</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Same as pleasant previous</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Caesarean section anaesthetic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative to unpleasant previous</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Caesarean section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other fears</td>
<td>5</td>
<td>11</td>
</tr>
</tbody>
</table>
complain to the anaesthetist of pain while under extradural analgesia as the pain could be alleviated.

In contrast, patients receiving extradural anaesthesia had no serious problems in this survey. This is not to suggest that extradural Caesarean section is easy or safe, but merely that in these patients general anaesthesia was even less safe. Complications that arose during extradural Caesarean section, hypotension and inadequate blockade, were treatable and avoidable. However, the practice of sedating these patients after delivery must only be undertaken when essential, and then with caution if the risk of inhalation is to be avoided with certainty, and if the mother's desire to participate in the birth is not to be disappointed, or the experience eliminated from her memory. The use of self-administered 50% nitrous oxide and oxygen may be a safer and more satisfactory analgesic in these circumstances.

All the anaesthetic registrars in this survey were competent anaesthetists with varying degrees of experience in general and extradural anaesthesia. It is well known that these fit and healthy young women are a particular anaesthetic risk and are not suitable patients for inexperienced or inadequately trained junior anaesthetists, whatever technique of anaesthesia is used. Lack of familiarity with extradural analgesia for Caesarean section spells an inadequacy of training for anaesthetic registrars as this safer technique has become an essential tool in the anaesthetist's armamentarium.

One of the added difficulties with anaesthesia for Caesarean section is that emergency cases take place more commonly at night when the anaesthetic registrar must make a decision on technique, with consultant advice when necessary. Indications for general and extradural anaesthesia must be clearly defined beforehand (Marx, Eisenberg and Singh, 1981). Extradural anaesthesia takes five times as long as general anaesthesia from induction to delivery of the infant. Because of both the time to satisfactory blockade and the time taken for the obstetric team to assemble, this fact alone can cause practical difficulties with anaesthetic manpower and can represent a contraindication for this technique where the obstetric needs demand a very rapid delivery of the baby (Crawford et al., 1976), although induction to delivery times of less than 20 min were recorded in 12 patients. Given the choice of technique, the majority of mothers and fathers wish to experience the birth of their children irrespective of the manner of delivery. As extradural Caesarean section is also less hazardous for the mother there should be no reason why this should not be permitted for most patients.

Ten mothers in this series underwent the increased risks of a double anaesthetic technique. A general anaesthetic combined with what may have been a fairly extensive vasomotor blockade decreases, even further, cardiovascular compensatory mechanisms, and may be the worst possible anaesthetic situation. Seven of these 10 mothers were given this double anaesthetic by registrars as yet uncertain of the technique of extradural Caesarean section.

With adequate anaesthetic advice, only five mothers out of 98 with already existing extradural blocks refused a Caesarean section under extradural analgesia. Mothers were informed by the anaesthetist, when Caesarean section was to be undertaken, that most Caesarean sections are now performed under extradural block as it is considered safer, that it is no longer necessary for them to be asleep, that their husbands may remain with them and that they will see the baby as it is born; any pain they may experience will be treated immediately by the anaesthetist who will remain with them throughout. They may listen to music with earphones, they will not see the operation and will have as normal an experience of childbirth as is possible.

Extradural Caesarean section, although a challenging technique, especially with patients in labour, has a definite place in modern obstetric anaesthetic practice and is safer than general anaesthesia when undertaken by trained junior staff. Anaesthesia is reported as the second commonest single cause of maternal death (DHSS, 1982). It may yet become the commonest single cause of maternal death in the face of constantly improving obstetric management unless improvements in anaesthetic technique accompany greater skill of those anaesthetic registrars who are the anaesthetists on site and on first call for emergency Caesarean section.

REFERENCES

ANESTHESIA FOR CESARIAN SECTION

Un bilan médical de la pratique d'une équipe d'anesthésistes jeunes

RESUME

Cette étude compare la sécurité de 261 mères en bonne santé dont 170 ont reçu une péridurale et 91 une anesthésie générale pour césarienne. Ces anesthésies ont été pratiquées en chirurgie hospitalière régie par six anesthésistes en formation. Une patiente n'a pas pu être intubée, 13 patientes ont dit être restées conscientes au cours de l'anesthésie générale et deux patientes ont réagi de façon anormale aux agents anesthésiques. À l'inverse, les nombreuses complications survenues avec l'anesthésie péridurale étaient moins sérieuses et plus faciles à traiter. Une hypotension est survenue chez 11 patientes, 25 patientes ont souffert d'analgésie inadéquate et 16 patientes ont perdu connaissance du fait de la sédation suivant l'extraction. Ainsi, l'anesthésie péridurale pour césarienne apparaît comme une technique plus sûre que l'anesthésie générale lorsqu'elle est pratiquée par le même groupe d'étudiants en anesthésie sur des mères en bonne santé.

NARKOSE BEIM KAISERSCHNITT

Bilanz der Narkosen von in der Ausbildung stehende Anästhesisten

ZUSAMMENFASSUNG

Dieser Überblick vergleicht die Narkosesicherheit beim Kaiserschnitt bei 261 gesunden Müttern, von denen 170 Extra-