

## Quality Improvement Report

# Assessing introduction of spinal anaesthesia for obstetric procedures

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### Abstract

**To assess the impact of introducing spinal anaesthesia for obstetric operative procedures on use of general anaesthesia and quality of regional anaesthesia in a unit with an established epidural service a retrospective analysis of routinely collected data on method of anaesthesia, efficacy, and complications was carried out. Data were collected from 1988 to 1991 on 1670 obstetric patients requiring an operative procedure. The introduction of spinal anaesthesia in 1989 significantly reduced the proportion of operative procedures performed under general anaesthesia, from 60% (234/390) in 1988 to 30% (124/414) in 1991. The decrease was most pronounced for manual removal of the placenta (88%, 48/55 v 9%, 3/34) and emergency caesarean section (67%, 129/193 v 38%, 87/229). Epidural anaesthesia decreased in use most significantly for elective caesarean section (65%, 77/118 v 3%, 3/113;  $\chi^2 = 139$ ,  $p < 0.0001$ ). The incidence of severe pain and need for conversion to general anaesthesia was significantly less with spinal anaesthesia than with epidural anaesthesia (0%, 0/207 v 3%, 5/156;  $p < 0.05$ ). Hypotension was not a problem, and the incidence of headache after spinal anaesthetic decreased over the period studied. Introducing spinal anaesthesia therefore reduced the need for general anaesthesia and improved the quality of regional anaesthesia.**

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### Introduction

Most maternal deaths directly attributable to anaesthesia are caused by problems arising from tracheal intubation for general anaesthesia.<sup>1</sup> Since 1980 an epidural service has been available in the obstetric unit of this hospital. In 1989 spinal anaesthesia was introduced to provide additional opportunity for regional anaesthesia.

Spinal anaesthesia is technically easier, has a faster onset and more profound sensory block compared with epidural anaesthesia, and has the potential to improve the quality of regional anaesthesia and to reduce the need for general anaesthesia. It is, however, associated with a high incidence of post-anaesthetic headache.

The use of fine bore needles has been shown to minimise this problem.<sup>2</sup>

In the unit information about each obstetric procedure with details of the anaesthetic used, its efficacy, and post-anaesthetic complications has been collected routinely onto a computerised database since 1985. This paper reports the effects of introducing spinal anaesthesia on the pattern of anaesthetic practice in the unit.

### Methods

#### SPINAL ANAESTHESIA

We drew up a protocol for the use of spinal anaesthesia in obstetrics from previous experience gained from the use of spinal anaesthesia in a general operating theatre. Initially 25 gauge Quincke needles were used, but 26 gauge needles were substituted in January 1990. Needles as fine as 29 gauge were considered technically too difficult to use for routine procedures.<sup>2</sup> In the final four months of 1991 needles with conical tips were introduced (24G Sprotte and 27G Whitacre).<sup>3</sup>

A 3 ml dose of 0.5% hyperbaric bupivacaine was administered into the lumbar cerebrospinal fluid with the patient sitting up. At least 1 litre of crystalloid or 500 ml of colloid was given as a preload before placing the patient in a wedged supine position, and prophylactic ephedrine (15 mg) was added to the subsequent bag of infusion fluid.

#### HYPOTENSION

Hypotension is of the commonest early side effects of spinal anaesthesia. In this study hypotension was defined as a systolic blood pressure  $< 90$  mm Hg.

#### POST ANAESTHETIC HEADACHES

A later but potentially incapacitating side effect of spinal anaesthesia is headache. Moderate or severe postural headaches were defined as those restricting normal activity. Patients with headaches which did not respond to conservative measures of bed-rest, fluids, and analgesia over 24-48 hours were advised to have an epidural blood patch.

#### DATA COLLECTION

For each operative procedure for obstetric patients data were entered on to a standard proforma preoperatively (box 1) and during

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postnatal follow up at 24 hours (box 2) by an anaesthetist. Information about postural headaches was sought directly from the patients and also from midwives. The data were entered from the proformas into an IBM compatible personal computer and analysed with a combined database/spreadsheet package (Open Access). Statistical comparisons were made with the Northwick Park statistics package, using the  $\chi^2$  test for non-parametric data, except in the case of small numbers when Fisher's exact test was used.

## Results

### ANAESTHESIA FOR OPERATIVE INTERVENTION

In 1988, the year before spinal anaesthesia was

No:	
Maturity:	
Parity:	
Weight:	
Time: 0900-1800	1800-2400 2400-0900
Length of labour:	Cervical dilatation:
<2 h	Before assisted
2-8 h	rupture of
>8 h	membranes
	<5 cm
	5-9 cm
Indication:	Prior analgesia:
Elective caesarean	None
Emergency caesarean	Nitrous oxide
Retained placenta	Pethidine
Other	Combination
Operator grade:	
Consultant	
Registrar	
Senior house officer	
Complications (early):	Supplementary
Hypotension (<90	analgesia:
mm Hg systolic)	None
Bloody tap	Nitrous oxide
Unilateral missed	Opiate
segment	General anaesthesia
Height of block:	Apgar score at 1 and
	5 min:

Box 1 Information collected during anaesthesia

1 Degree of pain felt during:
Siting of spinal anaesthetic
Painless
Some discomfort
Painful
Operative procedure
Entirely comfortable
Fairly comfortable
Uncomfortable
Painful
Conversion to general anaesthesia
2 Would you consider a spinal anaesthetic in future?
Definitely
Probably
Only if advised
Definitely not
3 Problems:
Backache
Urinary difficulties
Weakness or numbness
Headache
Blood patch
Other

Box 2 Follow up questionnaire

introduced, 234/390 (60%) of operative procedures were carried out under general anaesthesia; the rest were performed under epidural anaesthesia (table 1). By 1991, 207/414 (50%) of operative procedures were performed under spinal anaesthesia, 83/414 (20%) under epidural anaesthesia, and only 124/414 (30%) under general anaesthesia ( $\chi^2 = 73$ ,  $p < 0.0001$ , all regional *v* general anaesthesia).

### ANAESTHESIA FOR CAESAREAN SECTION

In 1988, 41/118 (35%) of elective caesarean sections and 129/193 (67%) of emergency caesarean sections were performed under general anaesthesia whereas in 1991 the rates had fallen to 23/113 (20%) and 87/229 (38%) respectively (table 2). Most (87/113, 77%) elective sections and 69/229 (30%) of emergency sections were performed with spinal anaesthesia.

### ANAESTHESIA FOR MANUAL REMOVAL OF PLACENTA

In 1988, 48/55 (88%) of manual removals of the placenta were performed under general anaesthesia (table 3). By 1991 this had fallen to 3/34 (9%) with 28/34 (82%) being performed with spinal anaesthesia and 3/34 (9%) with epidural anaesthesia ( $\chi^2 = 53$ ,  $p < 0.0001$  all regional *v* general anaesthesia).

### SIDE EFFECTS OF SPINAL ANAESTHESIA

Before 1989 the mean annual incidence of hypotension after epidural anaesthesia was 5%. After spinal anaesthesia was introduced the percentage of patients with hypotension did not increase significantly. The incidence of hypotension with regional block in 1989, 1990, and 1991 was 4.5%, 4%, and 5.5% respectively.

The incidence of mild headache and of severe headache after spinal anaesthesia fell from 1987 to 1991 (table 4). The incidence of other side effects was similar to that after epidural anaesthesia. In 1991, 25/207 (12%) reported backache and 3/207 (1.3%) urinary difficulty, but none reported residual numbness or weakness at 24 hours after spinal anaesthesia. In the same year the corresponding figures after epidural anaesthesia were 11/83 (13%), 2/83 (2%), and 1/83 (1%).

### EFFICACY OF SPINAL ANAESTHESIA

In 1991, 192/290 (66%) of patients reported being entirely comfortable and 67/290 (23%) fairly comfortable during their operative procedure. However, 14/290 (5%) of patients reported being uncomfortable, and 17/290 (6%) needed to convert to general anaesthesia.

In 1988, when spinal anaesthesia was unavailable, significantly more patients with epidural anaesthetic blocks needed general anaesthesia compared with patients with spinal anaesthesia in 1991 (17/156, 11% *v* 1/207, <1%;  $p < 0.0001$  Fisher's exact test). Most of the patients requiring conversion to general anaesthesia had an epidural catheter in

Table 1 Operative obstetric procedures and anaesthetic techniques used, 1988-91

	Year			
	1988	1989	1990	1991
No of deliveries	3284	3284	3397	3290
No (%) of operative procedures	390(11.9)	440(13.4)	426(12.5)	414(12.6)
No (%) with general anaesthesia	234(60)	224(51)	162(38)	124(30)
No (%) with epidural anaesthesia	156(40)	119(27)	98(23)	83(20)
No (%) with spinal anaesthesia	0	97(22)	166(39)	207(50)

Table 2 Anaesthetic technique used for emergency and elective caesarean section

	Year			
	1988	1989	1990	1991
<i>Emergency caesarean section</i>				
No of patients	193	241	243	229
No (%) receiving:				
General anaesthesia	129(67)	152(63)	121(50)	87(38)
Epidural anaesthesia	64(33)	51(21)	78(32)	73(32)
Spinal anaesthesia	0	38(16)	44(18)	69(30)
<i>Elective caesarean section</i>				
No of patients	118	136	114	113
No (%) receiving:				
General anaesthesia	41(35)	38(28)	15(13)	23(20)
Epidural anaesthesia	77(65)	58(43)	13(11)	3(3)
Spinal anaesthesia	0	40(29)	86(75)	87(77)

Table 3 Anaesthetic technique used for manual removal of placenta

	Year			
	1988	1989	1990	1991
No of patients	55	35	33	34
No (%) receiving:				
General anaesthesia	48(88)	19(54)	7(21)	3(9)
Epidural anaesthesia	7(13)	5(14)	3(9)	3(9)
Spinal anaesthesia	0	11(31)	23(70)	28(82)

Table 4 Incidence of headache after spinal anaesthesia

	Year		
	1989	1990	1991
No of patients	97	166	207
No (%) of patients with:			
Mild headache	9(9)	7(4)	7(3)
Severe headache requiring blood patch	6(6)	7(4)	3(1)

situ which was being topped up for an operative procedure. The reasons for conversion to general anaesthesia included inadequate sensory block with the maximum permitted dose of local anaesthetic (50%), fetal distress (25%), and maternal distress (25%). Similarly, the incidence of severe pain was significantly more in 1988 in patients with epidural anaesthetic blocks than in those with spinal anaesthesia in 1991 (3%, 5/156 v 0% 0/207,  $p < 0.05$  Fisher's exact test). Thus the incidence of unsatisfactory anaesthesia was reduced with the introduction of spinal anaesthesia.

### Discussion

The introduction of spinal anaesthesia for obstetric procedures in a unit with an established epidural service reduced the number performed under general anaesthesia by half, mostly for manual removal of the placenta and emergency caesarean section. The risks of general anaesthesia are greatest for these unplanned procedures, since the patients may not have been starved or

adequately prepared. Before the introduction of spinal anaesthesia epidural anaesthesia was available for elective caesarean section and for women with particular medical conditions (for example, hypertension, respiratory disease, diabetes mellitus). Those women at an increased risk of needing an operative delivery were encouraged to have an epidural for analgesia in labour. Emergency caesarean sections were carried out under epidural anaesthesia when there was sufficient time for "topping up" and the total dose of bupivacaine would not exceed 2 mg/kg/4 h. The speed of onset and relatively low dose of bupivacaine required to establish spinal anaesthesia for caesarean section are advantages in this situation. A short operative procedure such as manual removal of the placenta is more likely to be undertaken with regional anaesthesia if it can be established quickly.

Deaths due to anaesthesia were reported as declining in the *Reports on Confidential Enquiries into Maternal Deaths* for 1985-7.<sup>1</sup> The assessors thought that increased use of appropriately supervised regional anaesthesia contributed to the reduction. If the reduction in general anaesthesia reported in this unit was replicated nationally a decrease in maternal mortality might be expected.

The incidence of hypotension did not increase with the introduction of spinal anaesthesia, although doses of local anaesthetic used were up to 3 mls of 0.5% heavy bupivacaine and sensory blockade for caesarean section was directed at the upper limit of the 4th thoracic dermatome. The contributory factors were the position of the patient, the use of a preload of fluid, and the use of ephedrine.

The incidence of headache after spinal anaesthesia has decreased steadily. Certainly, with increased experience and increasing skill and patience the incidence of multiple dural puncture has probably fallen. The reduction in needle size is important, and the proportion of patients needing an epidural blood patch to treat a headache after spinal anaesthesia (1.3%) is comparable with the best published figures for 26 gauge Quincke needles.<sup>4</sup>

Spinal anaesthesia has several other disadvantages. Firstly, it is a "one shot" technique, with no opportunity for subsequent "topping up" with local anaesthetic or opiate. Opiates are routinely given through epidural catheters after delivery of the baby but we have not as yet any experience with spinal opiates.<sup>5,6</sup> We have tried to enhance post-operative analgesia after spinal anaesthesia in several other ways, including the use of wound infiltration, ilioinguinal blocks, non-steroidal anti-inflammatory analgesia, and patient controlled opiate analgesia. Secondly, some of the trainee surgeons are relatively slow (taking 1.5-2 h for a caesarean section), and spinal catheters or combined spinal with epidural catheters are available in this situation.<sup>7</sup> Finally, the speed of onset of spinal anaesthesia means that it is unsuitable for hypovolaemic patients or those with fixed cardiac output.

This audit allowed us to review the impact of introducing spinal anaesthesia. We showed that it has improved the service offered to obstetric patients for operative procedures. Patients are now more likely to have regional anaesthesia and thereby avoid the risks of general anaesthesia. Operative procedures performed under spinal anaesthesia are less likely to be painful than those performed under epidural anaesthesia and over the three years of the audit the incidence of post-anaesthetic headache has improved.

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