

Comparison of General Anaesthesia and Spinal Anaesthesia For Caesarean Section in Antigua and Barbuda

TC Martin^{1,2,3}, P Bell^{1,2}, O Ogunbiyi¹

ABSTRACT

Regional anaesthesia has become the anaesthetic of choice for Caesarean section (CS) in developed countries, with use extended to smaller, less developed countries in the past decade. This study is a comparison of maternal and neonatal outcomes comparing general anaesthesia (GA) and the early experience with spinal anaesthesia (SA) for CS in Antigua and Barbuda. Data obtained included maternal age, gravidity, parity, indication for operation, emergent versus routine operation and type of anaesthesia used. Outcome data comprised estimated blood loss, transfusion requirement, length of stay, postoperative wound infection for mothers. Data obtained for babies included birthweight, one and five minute Apgar scores, neonatal special care unit admission or perinatal death. The sample population included 103 CS patients who underwent GA and 45 who underwent SA. There was no difference in age (mean 29.3 vs 29.4 years), gravidity (mean 3.25 vs 3.27), parity (mean 1.74 vs 1.56) or emergency vs routine CS (44.4% vs 49.5%). Mothers who underwent GA had significantly greater estimated blood loss (mean 787 vs 632 mL, $p < 0.02$) and rate of transfusion (13.6% vs 2.2%, $p < 0.05$).

There was a trend toward longer hospital stay (mean 6.86 vs 6.42 days, $p = 0.16$) but a lower rate of postoperative wound infection (8.7% vs 20%, $p < 0.10$) for mothers who underwent GA. There were no maternal deaths. Babies demonstrated no difference in birthweight (mean 3238 vs 3258 g) but those born to mothers who underwent GA had significantly lower one minute (mean 6.84 vs 8.17, $p < 0.0001$) and five minute (mean 8.13 vs 8.91, $p < 0.001$) Apgar scores, with a trend toward more frequent neonatal special care unit admission (26.2% vs 17.7%, $p < 0.20$) and perinatal death (3.9 vs 0%, $p < 0.30$). GA and SA appear equally safe, but SA was associated with significantly better outcome for both mothers and babies.

Comparación de la Anestesia General y la Anestesia Espinal en la Sección Cesárea en Antigua y Barbuda

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RESUMEN

La anestesia regional se ha convertido en el anestésico de preferencia para la sección cesárea (CS) en los países desarrollados, extendiéndose su uso a los países más pequeños y menos desarrollados en la última década. Este estudio es una comparación de resultados maternos y neonatales que comparan la anestesia general (AG) y las primeras experiencias con la anestesia espinal (AE) para la SC en Antigua y Barbuda. Los datos obtenidos incluyeron: edad de la madre, gravidez, paridad, indicación de operación, operación de rutina versus operación de emergencia, y tipo de anestesia usada. Los datos de los resultados comprendieron: estimado de la pérdida de sangre, requisitos para la transfusión, duración de la estancia, e infección de la herida postoperatoria para las madres. Los datos obtenidos para los bebés incluyeron: peso al nacer, puntuaciones de Apgar al primer minuto y a los cinco minutos, ingreso a la unidad neonatal de cuidados especiales o muerte perinatal. La población de la muestra incluyó a 103 pacientes de SC que fueron sometidos a AG y 45 que fueron sometidos a AE. No hubo ninguna diferencia en edad (29.3 vs 29.4 años promedio), gravidez (3.25 vs 3.27 promedio), paridad (1.74 vs 1.56 promedio) o cesárea de emergencia frente a cesárea de rutina (44.4%

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vs 49.5%). Las madres que fueron sometidas a AG tuvieron estimados de pérdida de sangre (787 vs 632 mL promedio, $p < 0.02$) y tasa de transfusión (13.6% vs 2.2%, $p < 0.05$) significativamente mayores. Hubo tendencia a una estadía hospitalaria más larga (6.86 vs 6.42 días promedio, $p = 0.16$) pero una tasa más baja de infección post-operatoria (8.7% vs 20%, $p < 0.10$) para las madres que fueron sometidas a AG. No hubo muertes maternas. Los bebés no mostraron diferencia de peso al nacer (3238 vs 3258 g promedio) pero los nacidos de madres sometidas a AG, tuvieron puntuaciones de Apgar al primer minuto (6.84 vs 8.17 promedio, $p < 0.0001$) y a los cinco minutos (8.13 vs 8.91 promedio, $p < 0.001$) significativamente más bajas, con tendencia a una mayor frecuencia de ingreso a unidades neonatal de cuidados especiales (26.2% vs 17.7%, $p < 0.20$) y muertes perinatales (3.9 vs 0%, $p < 0.30$). La AG y la AE parecen igualmente seguras, pero la AE estuvo asociada con resultados significativamente mejores tanto para las madres como para los bebés.

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INTRODUCTION

Caesarean section (CS) rates have increased dramatically in developed and developing countries alike in the past 30 years (1–3). Although infant and maternal death rates have been decreasing in Antigua and Barbuda following an increase in CS (3), the procedure is not without risk to mother (4) and child (5). In developed countries, regional anaesthesia, most often spinal anaesthesia (SA) rather than general anaesthesia (GA) has become the anaesthetic technique of choice for women undergoing CS (6–8).

Spinal anaesthesia has emerged as a safe alternative, even for emergency CS, in developed countries (9, 10). In parts of the United Kingdom, use of regional anaesthesia has reached nearly 95% as of 2002 (11). The percentage of CS done under SA at the University Hospital of the West Indies increased from 20% in 1996 to 80% in 2001 (12). In 2002, 90% of CS were performed under SA (13). The choice of regional anaesthesia (SA) in Canada was more likely in larger, metropolitan, regional and higher volume hospitals (14).

As newer techniques are introduced in developed countries and in tertiary medical facilities in the Caribbean region, they need to be carefully assessed when adopted in smaller, developing countries. In this study, an attempt was made to compare the safety and outcome of the initial experience with SA compared with GA for CS at the Holberton Hospital in Antigua. Holberton Hospital is the only government hospital in Antigua and is the location of 92% of the deliveries in this country, serving a population of about 70 000 people, 90% Afro-Caribbean, with per capita income \$US6000, 70% of which is earned from tourism.

METHODS

Records from the Holberton Hospital in Antigua for women who underwent CS from January 2000 to June 2003 were retrospectively reviewed. Data obtained included maternal age, gravidity, parity, reason for Caesarean section, emergency or routine procedure and type of anaesthetic used. Outcome data included estimated blood loss, transfusion requirement, length of stay and postoperative wound infection for the mothers. For babies, birth weight, one and five

minute Apgar scores, neonatal special care unit admission and perinatal deaths were recorded. Data from those mothers who underwent SA were compared with those who underwent GA using chi square and two-sample *t*-test (15).

Spinal anaesthesia consisted of intrathecally administered hyperbaric solution of 0.5% bupivacaine, 6 to 12 mg (0.75 to 1.5 mL respectively) at lumbar vertebral interspace 2/3 or 3/4. A standard rapid sequence induction of GA was achieved with propofol or thiopentone. Atracurium besylate was used as a muscle relaxant to facilitate endotracheal intubation and maintain muscle relaxation. Nitrous oxide (50%) and halothane (1.5%) and oxygen were given for anaesthesia maintenance using standard techniques.

RESULTS

There were 4328 deliveries during the study period, with 489 (11%) by CS. Of the deliveries by CS, 64 (13%) were done under SA and 425 (87%) under GA. Four cases were begun as SA and converted to GA (1%). Medical records were available and complete for 45/64 cases (70%) of patients who underwent SA for CS. These cases were included in the analysis. A sample of those who underwent GA, roughly twice as many cases as those done under SA, was randomly selected as a comparison group. This sample of 103/425 (24%) of those mothers who underwent GA was included in the study. No selection bias for inclusion of either group is known or suspected.

Spinal anaesthesia was given in an emergency situation in 20/45 (44%) of cases and GA in an emergency situation in 51/103 cases (50%), an insignificant difference. All patients who underwent CS were given gentamicin, metronidazole and ampicillin for 5 days after operation. Reasons for CS in both groups are listed in Table 1.

There was no significant difference in age (values represent mean \pm standard deviation), (29.4 ± 5.8 vs 29.3 ± 6.2 years), gravidity (3.27 ± 2.10 vs 3.25 ± 1.82) or parity (1.56 ± 1.74 vs 1.74 ± 1.72) between those who underwent SA compared with those who underwent GA (Table 2). Mothers who underwent SA had significantly less estimated blood loss (632 ± 216 vs 787 ± 322 mL, $p < 0.01$) and were less likely to be given a transfusion (1/45, 2% vs 14/103,

Table 1: Indications for Caesarean section in those undergoing spinal (SA) and general anaesthesia in Antigua

Reason	Spinal anaesthesia n = 45	General anaesthesia n = 103	Total n = 148
Repeat Caesarean	44%	27%	32%
Failure to progress	22%	28%	26%
Breech/transverse	18%	21%	20%
Eclampsia	0%	7%	5%
Placenta praevia/bleed	5%	5%	5%
Fetal distress	2%	5%	3%
Prior myotomy	2%	3%	3%
Large baby/diabetic mother	5%	1%	3%
HIV positive	0%	1%	1%
Prolapsed cord	0%	2%	1%
Prior stillbirth	2%	0%	1%
Vaginal abscess	0%	1%	1%

Table 2: A comparison of outcomes of mothers (and babies) undergoing spinal anaesthesia versus general anaesthesia for Caesarean section in Antigua and Barbuda

Variable	Spinal n = 45	General n = 103	p-value
Age (years)	29.4 ± 5.8*	29.3 ± 6.2	NS**
Gravidity	3.27 ± 2.10	3.25 ± 1.82	NS
Parity	1.56 ± 1.74	1.74 ± 1.72	NS
Emergent CS	44%	50%	NS
Blood loss (mL)	632 ± 216	787 ± 322	< 0.01
Transfused	2%	14%	< 0.05
LOS***	6.42 ± 1.61	6.86 ± 1.82	NS
Infection	20%	9%	NS
Birthweight (g)	3258 ± 502	3238 ± 721	NS
Apgar, 1 min	8.17 ± 1.02	6.84 ± 2.00	< 0.0001
Apgar, 5 min	8.91 ± 0.73	8.13 ± 1.74	< 0.001
Special Care Unit	17%	26%	NS
Perinatal death	0%	4%	NS

* = mean value plus standard deviation, ** = not significant, $p > 0.05$, *** = length of hospital stay; CS = Caesarean section

14%, $p < 0.05$). Mothers who underwent SA had an insignificant trend toward shorter length of stay (6.42 ± 1.61 vs 6.86 ± 1.82 days, $p = 0.16$) than those who underwent GA. Mothers who had CS under SA had a trend toward greater rate of postoperative wound infection (9/45, 20% vs 9/103, 9%, $p < 0.10$).

There was no significant difference in birthweight between babies born to mothers who underwent SA or GA (3258 ± 502 vs 3238 ± 721 g). Babies born to mothers who underwent SA had significantly better one minute (8.17 ± 1.02 vs 6.84 ± 2.00 , $p < 0.0001$) and 5 minute (8.91 ± 0.73 vs 8.13 ± 1.74 , $p < 0.001$) Apgar scores. There was an insignificant trend toward fewer neonatal special care unit admissions (8/45, 16% vs 27/103, 26%, $p < 0.20$) and perinatal deaths (0/45, 0% vs 4/103, 4%, $p < 0.30$) in babies of mothers who underwent SA compared with GA. There were no maternal deaths in either group.

DISCUSSION

General anaesthesia for CS is the older approach and is considered the anaesthesia technique of choice in some conditions (6, 7, 10). These include maternal hypovolaemia, coagulopathy, infection at site of intrathecal catheter or needle insertion, increased intracranial pressure and patient refusal of regional anaesthesia (6, 7, 10, 16). It is useful when uterine relaxation is required, substantial haemorrhage is anticipated or rapid induction may be needed (10). Failed endotracheal intubation and aspiration of gastric contents are the two major causes of maternal mortality associated with GA (6, 10, 16, 17).

Spinal anaesthesia is a more recent development avoiding the major complications of GA but having several of its own (6, 7, 10). These include maternal hypotension, fetal heart rate decelerations, accidental total spinal anaesthesia, urinary retention, post-partum headache and epidural abscess or haematoma (6, 7, 10). The lack of medical personnel trained in the technique would exclude the use of SA (6, 7, 17). It has the advantages of fewer drugs used, a better childbirth experience, better postoperative pain control and possibly lower maternal mortality (17). A recent Cochrane Database review revealed no significant difference in epidural and spinal techniques for CS with both associated with maternal satisfaction and low rates of side effects (18). In a United Kingdom study, the failure rate for regional anaesthesia (epidural or spinal) was 1.3% for elective and 4.9% for emergency CS, with conversion to GA (10). In Jamaica, about 6% of SA cases were converted to other types of anaesthesia between 1996 and 2002 (13). This rate was 1% in early experience with SA in Antigua and Barbuda.

In this study, mothers who underwent SA in Antigua had significantly less estimated blood loss as reported by others (19). They also had less need for transfusion compared with those who underwent GA. This may reflect some degree of SA related venous blood pooling with mild hypotension. Theoretically, the trend in increased postoperative infection rate in mothers who underwent SA could be due to low perfusion of the wound site due to venous pooling. Prophylactic antibiotics were used in all cases, similar to the rate of 97% at the University Hospital of the West Indies, Jamaica (14). It is also reported that mothers who underwent SA for CS had less pain, gastrointestinal upset, fever and cough than mothers who underwent GA (20).

Babies appeared to fare better when mothers were given SA in Antigua, with significantly better one and five minute Apgar scores similar to the experience of others in both term and preterm infants (21–23). Although lower Apgar scores (24) and an increase in maternal acidosis (24) are more likely with GA compared with SA, the changes were minor and the slower adaptive changes after birth had resolved by 24 hours of age (25). In Antigua, there was a trend toward fewer neonatal care unit admissions and perinatal deaths with SA compared with GA. Other technical factors apart from anaesthesia may affect neonatal status. A

prolonged induction to delivery time for GA deliveries (*eg* over 10 minutes) may result in lower Apgar scores (6). A uterine incision to delivery time (*eg* over three minutes) is associated with a low Apgar score regardless of anaesthesia technique used (6). These times were not recorded in this series.

This study documents a good outcome for mothers undergoing SA as well as GA for CS. A recent study from Malawi found increased mortality in mothers and babies who underwent GA compared with SA, suggesting that SA is the preferred technique even in a developing country (26). Spinal analgesia, used increasingly for labour pain management overseas, has recently been shown not to cause increased CS rates compared with other types of pain management (27, 28). If this technique for managing labour pains becomes more readily available, use of SA for CS will become a natural extension.

Limitations of this study include its retrospective approach and small numbers of patients. It appears that SA can be safely applied and provides options for the management of operative deliveries as well as other surgical procedures even in the smaller islands of the Caribbean. Women (and men) can be provided with choices and hence alleviate some the fears associated with anaesthesia and surgery in the Caribbean and other developing countries (29).

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