PERIODICUM BIOLOGORUM
VOL. 111, No 2, 251–255, 2009

UDC 57:61
CODEN PDBIAD
ISSN 0031-5362

Clinical experience

Effects of general anaesthesia versus spinal anaesthesia for caesarean section on postoperative analgesic consumption and postoperative pain

LADA KALAGAC FABRIS
ADRIANA MARETIĆ

Department of Anaesthesiology and ICU
General Hospital Pula
Aldo Negri 4
52100 Pula, Croatia

Correspondence:
Lada Kalagac Fabris
Department of Anaesthesiology and ICU
General Hospital Pula
Aldo Negri 4
52100 Pula, Croatia
E-mail: lada.kalagac@pu.htnet.hr

Key words: caesarean delivery; general anesthesia; spinal anesthesia; postoperative analgesia; side effects

Abstract

Background and Purpose: *Regional anaesthesia is commonly used for elective caesarean section.The aim of this study was to investigate whether there is a positive effect of either general or spinal anesthesia on postoperative analgesic requirements and pain relief.*

Methods: *The level of postoperative analgesia has been compared in 64 women (ASA I or II) scheduled for elective caesarean section. General anaesthesia was performed with propofol, suxamethonium chloride,oxygen, nitrus oxide, and maintenance with 0,5% isoflurane and fentanyl. To achieve a sensory block height to the level of the sixth thoracic dermatome, spinal anaesthesia was performed with hyperbaric 0,5% levobupivacaine and 25 μg fentanyl. For all the patients postoperative analgesia was available on request without any limitation on time by administering the same dose of 75 mg i.m. diclofenac. If the patient had inadequate analgesia it was supplemented with 100 mg s.c. tramadol. Postoperative pain was recorded using visual analogue pain score as well as analgesic requirements over the first 24h after surgery.*

Results: *The time to first request for analgesia was significantly longer in the spinal anesthesia group ($p<0.05$). At almost all postoperative time points,visual analogue scale scores at rest and during mobilization were lower with spinal anaesthesia ($p<0.05$). More patients with general anesthesia received supplemental analgesic medication.*

Conclusion: *In parturients undergoing elective caesarean section,spinal anesthesia should be preferred because it is accompanied with less postoperative pain, less use of additional analgesics and less side effects.*

Received March 24, 2009.

INTRODUCTION

Caesarean section is the most common surgical procedure performed in obstetric anaesthesia. Caesarean section rates currently reach 27.5% in the United States,vary between 15 and 29% in Germany and in our General Hospital in Pula vary from 14% to 18% of all (labours) (births) *(1, 2)*.

General anaesthesia for caesarean section (CS) has been shown to be associated with higher maternal morbidity and mortality than regional anaesthesia. The frequency of use of general anaesthesia for CS is dependent on many factors including the country, the percentage of

patients in whom general anaesthesia is contraindicated, the skills of the anesthesiologist and the percentage of women who receive labour epidurals. A study in the UK revealed that the rate of regional anaesthesia for elective CS rose from 69.4% in 1992 to 94.9% in 2002, when spinal anaesthesia was used for 86.6% of cases *(3)*. Various factors, all related to improved maternal and foetal safety are responsible for this increase. Although both spinal and general anaesthesia have been shown to provide effective anaesthesia during surgery *(5)*, many parturients continue to experience inadequate postoperative analgesia *(6)*. In experimental studies, it has been shown that the quality of intraoperative anaesthesia can affect postoperative analgesia.The different sites of action of opiates, especially in combination with local anaesthetics, may result in a difference in the quality of blockade and suppression of temporal summation, which is considered to be the first step in central sensitistion *(7)* It has been shown that spinal anaesthesia is superior to other anaesthesia techniques in this respect.

In the General Hospital Pula from1998 to 2008 at anaesthesiologists changed their approach to the CS following the recommendation of the European Board of Anaesthesiologists, and thus the rate of spinal anaesthesia rose from 4% to 50% in the last year.

We would like to improve the results and the trend of preference for spinal anaesthesia for CS not only due to the perceived advantages of simplicity of the technique, but also because of the benefits for the mother in the postoperative period.

Good pain relieve will improve mobility and can reduce the risk of thromboembolic disease, which is increased during pregnancy. Pain can also impair the mother's ability to optimally care for her infant in the immediate postpartum period and may adversely affect early interaction between mother and infant. It is necessary for pain relief to be safe and effective, that it does not interfere with the mother's ability to move around and care for her infant, and that it does not result in adverse neonatal effects in breast-feeding women.

Considering the concept of pre-emptive analgesia, we were interested in the effects of spinal anaesthesia for CS on postoperative pain. The concept of pre-emptive analgesia is based on experimental findings that effective analgesia initiated before the onset of surgery could prevent effects that amplify postoperative pain. Different sites of action of local anaesthetics and opiates with differences in blocking central sensitisation may contribute to a pre-emptive effect *(4)*.

We hypothesised that spinal anaesthesia, providing superior intraoperative pain relief, would result in less postoperative pain and analgesic requirements than would general anaesthesia. Therefore, we conducted a prospective randomised study in women scheduled for elective caesarean section to assess the influence of spinal or general anaesthesia on postoperative analgesic requirements.

METHODS

After approval by the Ethics Committee and written informed consent, we included 64 full term parturients (ASA I or II) with uncomplicated pregnancies. The patients were prospectively randomised into two groups. One group received general anaesthesia (29 patients) and the other received spinal anaesthesia (35 patients). One hour before general anaesthesia infusion of H2 blockers-ranitidine and metoclopramide were administered to the patients. Prior to the neuraxial block, all the patients received an intravenous infusion of 500ml of Ringer lactat. The use of intravenous vasoconstrictive medication in case of hypotension or bradicardia after completion of the neuraxial block was left to the discretion of the attending anaesthesiologist. Before surgery, patients were briefed on visual analogue scales (VASs), when requesting the analgesia, and when they can expect to recover from anaesthesia.

General anaesthesia was induced using propofol 2–2,5 mg kg^{-1}, suxamethonium chloride 1,5 mg kg^{-1}, and ventilation of the lungs controlled with 60% nitrous oxide in oxygen. After delivery the maintenance of anaesthesia was ensured with 0,5% isoflurane or 2,5 mg midazolam i.v., 1–2 μg kg^{-1} fentanyl, and neuromuscular block was obtained with rocuronium 0.5 mg kg^{-1}. Mechanical ventilation (tidal volume) was adjusted so that the individual end-tidal (etCO2) values remained constant throughout the anaesthesia. After the anaesthesia, residual neuromuscular block was reversed with neostigmine/atropine combination and the patients were extubated.

The spinal anaesthesia was performed with pencil-point needles of 25/27G, at L2/3 or L3/4 level, with the patients placed in a sitting position. Hyperbaric 0,5% levobupivacaine (0,5 mg per 10 cm height) and 25 μg fentanyl were injected intrathecally without barbotage over a period of approximately 30sec. The onset time of the blockade was defined as the time between injection of the local anaesthetic and opiate and the sensory blockade reaching the sixth thoracic dermatome using pin-prick test.

Caesarean section was performed by the Misgav-Ladach technique and was started immediately after Th8 sensory block was achieved or the patients was intubated.

After the operation, patients were transferred to the recovery room, where they stayed for 2h and then returned to their rooms.

For postoperative analgesia and to assess the degree of induced pain by surgery, the same identical analgesia protocol was used for all the women. During the recovery period the first application of analgesia dose of 75 mg i.m. diclofenac, was strictly on patient request. After which it was started with the protocol of 75 mg diclofenac (i.m./p.o. as the patients preferred) every 8 hours. If patients had inadequate analgesia it was supplemented with 100 mg s.c. tramadol without any limitation on

time, but there was a restriction in total dose as recommended by the manufacturer.

Postoperatively, all women were interviewed by an independent observer (who was unaware of the anaesthesia technique) at 2,6,12 and 24 h. Visual analogue pain score (0 cm,no pain; 10 cm, worst imaginable pain) at rest, coughing and mobilisation were obtained. Total analgesic drug consumption was recorded. Sedation was assessed on a four-point scale: 0, fully alert; 1, drowsy; 2, asleep but roused easily on speaking to the patient; 3, profoundly sedated, roused by physical stimulation.

After spinal anaesthesia, motor blockade was assessed using the modified Bromage motor score (0 = no paralysis, 1 = unable to raise extended leg, 2 = unable to flex knee, 3 = unable to flex ankle). Other parameters recorded were side effects such as nausea, vomiting, pruritus, backache and headache.

At this time point, patients were questioned about their overall satisfaction with the anaesthetic technique used.

Statistics

Statistical analyses were performed using the SPSS 9.0 software (SPSS, Chicago, IL, USA), and were assessed using the Mann-Whitney rank sum, chi-squared or Student's *t*-test as appropriate. A *P* values less than 0.05 was considered to be statistically significant.

RESULTS

There were no significant differences in the baseline demographic variables, time to delivery, duration of surgery, mean non invasive arterial BP (NIBP) or cardiovascular variables between the two groups. Patient characteristics are shown in Table 1.

Although the onset of sensory block was significantly faster in parturients with spinal anaesthesia, time to delivery and total duration of surgery did not vary between the groups.

During surgery, in the spinal anaesthesia group not one patient needed additional intravenous analgesia.

Following intrathechal injection, MAP decreased from baseline within 2 min., but even the induction with propofol resulted in a decrease of MAP from baseline. As measured by the area under the curve, however, there was no significant difference in MAP and HR between the GA and SA groups over the total anaesthesia time (*P* = 0,77). All women remained haemodynamically stable throughout the precedures.

The spinal group did not need any supplemental analgesics during surgery, and the time to first analgesic request was significantly longer. Median time to first patient request for analgesics for the spinal group was 159 min., compared to 119 min. of the general anaesthesia group.

For the whole period of 24h postoperatively, the VAS score at rest was significantly higher in the general anaesthesia group (range 3.6–8.0) than in the spinal anaesthesia group (range 2.5–6.0). Furthermore, the mean of VAS score during mobilisation and coughing for the 24h observation time was significantly higher in the general anaesthesia group (VAS 7.4) than in the spinal anaesthesia group (VAS 6.0); ($P < 0.002$). At all other time points, women with general anaesthesia had higher pain scores ($P < 0.05$), so they were less able to move around and to take care of their infants.

In general anaesthesia group the mean diclofenac consumption in the first 24h was 225 ± 30 (mg), and in the spinal group it was 175 ± 28 (mg).

Consumption of rescue drugs (tramadol 100 mg s.c.) during the first 24 h postoperative time was higher in the general anaesthesia group. In the spinal group 51% of

TABLE 1

Patient characteristics.

	Spinal anaesthesia (*n*=35)	General anaesthesia (*n*=29)
Age (years)	30 ± 5	31 ± 5
Height (cm)	166 ± 6	166 ± 6
Weight (kg)	78 ± 16	82 ± 15
Gestational age (weeks)	38 ± 2	38 ± 2
Onset of motor block (min)	6,5 ± 1,5	
Time to delivery (min)	6,5 ± 2	5,0 ± 1,5
Duration of surgery (min)	40 ± 10	40 ± 13

(results are expressed as mean ± SD or median)

TABLE 2

Analgesic data and side effects.

	Spinal anaesthesia (*n*=35)	General anaesthesia (*n*=29)
First analgesic request (min) *	159 ± 39	119 ± 44
Diclofenac consumption in 24h (mg)*	175 ± 28	225 ± 30
Duration of motor block (min)	105 ± 12	–
No need for rescue analgesia (No.pts.)	51 % (18)	38 % (12)
VAS score at rest (mean)**	3.8	5.9
Pruritus / Nausea	15 / 2	2 / 7
Sedation > 1 (No.of patients)	–	4
PPHD (No.of patients)	1	–

* $P < 0.05$
** $P < 0.02$

patients did not need any rescue analgesia during the first 24h, in comparison to 38% of patients in the general anaesthesia group.

The rate of sedation, nausea and vomiting was comparably low in both groups throughout the first operative day. There were no instances of nausea and vomiting requiring treatment. Nevertheless, in the general anaesthesia group, more patients experienced nausea in the early recovery time than in the spinal anaesthesia group. This difference was not statistically significant. Although more women (42%) with spinal anaesthesia had pruritus, none of them requested treatment for it.

DISCUSSION

The present study was designed to compare the quality of postoperative analgesia between different techniques of anaesthesia in elective caesarean section.

In this prospective, randomised study, we found that spinal anaesthesia provided longer postoperative analgesia and lower analgesic consumption compared to general anaesthesia.

The first objective point of this study was reached; we observed that the time to first request for postoperative analgesia was longer in the spinal group. It has been demonstrated in other studies that intrathecal fentanyl delayed the first request for analgesia by approximately 10–30 min compared to the control groups *(8)*. Although none of the performed spinal blocks had to be supplemented by intravenous analgesics during surgery, the difference achieved might therefore be explained by better pre-emptive analgesic effect of spinal anaesthesia.

We also observed that postoperative analgesic consumption was significantly lower in the spinal group during the first 24h. Fentanyl is frequently preferred as the opioid added to local anaesthetic for spinal anaesthesia. The addition of fentanyl to the local anaesthetic increases the spread of anaesthesia, slows its regression, enhances and prolongs intraoperative and postoperative analgesia *(9)*. Side effects of intrathecally administered opioids include maternal respiratory depression, nausea, vomiting, pruritus, sedation. In fact it was suggested that opioid doses could be reduced so it might minimise the side effects. In contrast to morphine, intrathecal use of lipid soluble drugs, such as fentanyl and sufentanyl, does not appear to predispose to nausea and vomiting after caesarean delivery but both drugs can cause pruritus in dose-related manner *(10)*.

Pain after caesarean delivery may have at least two components: postoperative (somatic) pain from the wound itself and visceral pain arising from the uterus. Although somatic pain can be relieved by opioids, visceral pain may be more difficult to treat. NSAIDs are effective for relieving pain related to menstrual cramping and, as a result, there has been interest in the use of NSAIDs to treat that component of pain after caesarean delivery. Unfortunately we know that NSAIDs alone are insufficient to effectively treat post-caesarean pain, which is the reason why we use opioid (tramadol) for rescue medication *(11)*. However, inclusion of NSAIDs in a multimodal approach to pain relief after caesarean delivery has been very successful both in improving the quality of analgesia resulting from systemic or neuraxially administered opioids and reducing side effects. For istance, use of IM diclofenac 75 mg results in morphine sparing effects and a decrease in side effects related to morphine use *(10, 11)*. These benefits also apply to women having regional or general anaesthesia. The disadvantage of using NSADs is related to the potential of gastrointestinal side effects and platelet dysfunction *(12)*.

The incidence of pruritus after intrathecal opiates is a side effect that occurs with a frequency ranging between 20–80%. The observed rate of pruritus in our patients was within the reported range, and none of these patients wished to be treated for itching.

Nausea and vomiting occurred less frequently and did not differ between the groups.

Parturients have a great risk of postdural puncture headache. In our study we reported only one PPDH, the main reason probably is that we used 25 or 27 gauge pencil point needles for the spinal anaesthesia.

CONCLUSION

In conclusion, we found that both general and spinal anaesthesia are reliable and well tolerated anaesthesia techniques for elective caesarean section. However, surgical anaesthesia, postoperative pain relief and decrease use of additional medication with nonsteroidal analgesic diclofenac was superior with the spinal technique.

We did not observe any severe side-effects with either spinal or general anaesthesia. The choice of technique is frequently influenced by factors such as the skills of the anaesthesiologist or patient preference. Finally, adjuvants, such as NSAIDs, may play a significant role in enhancing the analgesic efficacy of traditional parenteral or neuraxial opioid-based technique after caesarean delivery, while at the same time decreasing the potential for side effects by reducing opioid requirements.

REFERENCES

1. GAISER R R 2003 Changes in the provision of anesthesia for the parturient undergoing cesarean sectin. *Clin Obstet Gynecol 46:* 646–656
2. STAMER U M, WEISE R *et al.*1999 Change in anesthetic practice for Caesarean section in Germany. *Curr Opin Anaesthiol 12:* 565–571
3. JENKINS J K, NAUSS L E *et al.* 2003 Anaesthesia for Caesarean section: a survey in a UK region from 1992 to 2002. *Anaesthesia 58:* 1114–8
4. DRESNER M 2004 Haemodynamic stability and regional anaesthesia for caesarean section. *Current Anaesth & Crit Care 15:* 262–269
5. ASA-TASK FORCE 1999 Practice guidelines for obstetrical anesthesia: a report by the American Society of Anesthesiologist Task Force on Obstetrical Anesthesia. *Anesthesiology 90:* 600–611
6. RAWAL N 2002 Acure pain services revisited: good from far, far from good? *Reg Anest Pain Med 27:* 117–121
7. CURATOLO M, PETERSEN-FELIX S, ARENDT-NIELSEN L *et al.* 1997 Spinal anaesthesia inhibits central temporal summation. *Br J Anaesth 78:* 88–89

8. KARAMAZ A, KAYA S *et al*. 2003 Wich administration route of fentanyl better enhances the spread of spinal anaesthesia: intravenous, intrathecal or bouth? *Acta Anaesthesiol Scand 47:* 1096–1100
9. DAHL J B,JEPPESEN I S, JORGENSEN H *et al*. 1999 Intraoperative and postoperative analgesic efficacy and adverse effects of intratechal opioids in patients undergoing cesarean section with spinal anesthesia: a qualitative and quantitative systemic review of randomized controlled trials. *Anesthesiolog 91:* 1919–1927
10. GALDEN J, STURART H, SANTOS C A 2005 Post caesarean delivery analgesia. *Anesth Analg 101:* S62–S69
11. CARDOSO M M S C, CARVALHO J C S *et al.* 1998 Small dose of intrathecal morphine combined with systemic diclofenac for postoperative pain control after caesarean delivery. *Anesth Analg 86:* 538
12. MARC C, NORRIS *(ed)* 2000 Handbook of Obstetric Anesthesia. Lippincott Willims & Wilkins, Philadelphia.