# Comparison of General and Regional Anesthesia for Cesarean Section: Success Rate, Blood Loss and Satisfaction from a Randomized Trial

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**Abstract**

**Objective:** A prospective randomized trial was organized to compare the effectiveness of general and regional anesthesia for cesarean section (C/S).

**Method:** Three hundred and forty-one patients were randomized into the general anesthesia group (GA), epidural anesthesia group (EA) and spinal anesthesia group (SA). The effectiveness of interest was success rate, blood loss and patient satisfaction.

**Result:** We found that the success rates of EA and SA were lower than GA. Success in EA should be improved by using an epidural catheter to add more local anesthetic drug instead of a single shot; and the surgeon should allow more time for the block to work adequately. Success in SA should be improved by using bupivacaine instead of lidocaine. GA resulted in significantly more blood loss, lower postoperative hematocrit, and higher proportion of patients who had postoperative hematocrit <30 per cent than EA and SA. The patients' satisfaction scores were not different among the 3 techniques. This meant that, given adequate explanation and perioperative care, Thai women were satisfied with regional anesthesia.

**Conclusion:** Regional anesthesia is a better choice of anesthesia for C/S than general anesthesia. However, the availability of different techniques and ability to change the technique when needed were very useful and important. If GA is chosen, all safety procedures must be followed. Oxygen supplement and endotracheal intubation facilities must be available in all techniques. Guidelines of anesthesia for C/S at a national level should be agreed upon, including the type of personnel, monitoring equipment and postoperative care.

**Key word :** Anesthesia, General, Regional, Cesarean Section

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Cesarean section (C/S) is one of the most common surgical procedures. With the safety of two patients, the mother and the newborn, in the anesthesiologist's hands, the choice of anesthesia is very important. General anesthesia offers unconsciousness during the operation that seems to be an important requirement in the Asian population. A study in Thailand reported maternal death in cesarean section at 45 in 100,000 and that 80-90 per cent of cases were done under general anesthesia[1]. A study from U.S.A. reported 55 per cent of C/S under regional anesthesia (21% epidural block and 34% spinal block) and 41 per cent under general anesthesia[2]. A Scandinavian study reported that spinal anesthesia was the main technique for elective C/S[3]. In Britain, the use of general anesthesia had decreased from 83 per cent in 1981 to 23 per cent in 1994[4]. The global trend seems to favor regional anesthesia. The technology should be proved as to whether it is suitable and preferred by the population before it is adopted.

The objectives of this study were to compare the effectiveness of general anesthesia and 2 regional techniques (epidural and spinal) for C/S in the following aspects:

1. Success rate.
2. Complication of mothers in terms of blood loss and other side effects.
3. Satisfaction of the mothers.

## MATERIAL AND METHOD

This was a prospective randomized clinical trial. The study was approved by the Human's Right in Research Review Board of the hospital. The patients were term, normal pregnancy women scheduled to have elective or emergency C/S during office hours at Siriraj Hospital, Mahidol University. Exclusion criteria were patients with abruptio placenta, bleeding placenta previa, fetal distress, diabetes mellitus, moderate to severe hypertension of pregnancy, severe cardiac or respiratory disease, pregnancy with more than one fetus and coagulopathy. We explained all procedures, the advantages and disadvantages to the patients before we obtained their informed consent. Patients were randomized by using a random number table into 3 groups. Each anesthetic technique was provided as the standard procedure in our hospital at the time of the study.

**1. General anesthesia group (GA).** The patient received 0.3 molar sodium citrate 30 ml, preoxygenation with 100 per cent oxygen for 3 minutes, then crash induction with thiopental 5 mg/kg, succinyl choline 2 mg/kg, cricoid pressure and intubation with a cuffed number 7 endotracheal tube. Nitrous oxide 50 per cent in oxygen and halothane 0.5 per cent were given and pancuronium 0.1 mg/kg was used to control the ventilation. After the baby was born, halothane was turned off, fentanyl 1 microgram/kg or morphine 0.1 mg/kg was given and nitrous oxide was changed to 66 per cent. At the end of the operation the patient received atropine and prostigmine for reversal and awake extubution.

**2. Epidural anesthesia group (EA).** The patient was preloaded with 1 liter of Ringer lactate solution before the block was done with a Touhey needle at lumbar 3-4 level; 18-20 ml of 2 per cent lidocaine and adrenaline 1:200,000 were given. Oxygen 6 liters per minute was administered *via* a face mask until the baby was born.

**3. Spinal anesthesia group (SA).** Similar solution and oxygen were given as in EA. The block was done with a 25G spinal needle at lumbar 3-4 level with 1.2 ml of 5 per cent lidocaine.

All patients had a small pillow under the right buttock to prevent supine hypotensive syndrome. An anesthesia machine and endotracheal intubation equipment were available for all regional cases. Blood pressure, electrocardiograph and hemoglobin oxygen saturation were monitored. After delivery, 2 units of syntocinon were given bolus and 8 units added to the intravenous drip. The attending anesthesiologist decided to give other treatment as clinically indicated, e.g., vasopressor, sedatives, intravenous fluid, blood, etc. The randomized technique was considered unsuccessful and could be changed at the anesthesiologist's consideration, when it provided inadequate anesthesia or at the patient's request.

Blood loss was evaluated by a trained assistant who weighed the swabs (1 g of blood was counted as 1 ml), measured blood volume in the suction bottle, and estimated blood in the operative field. Total blood loss was the addition of the three. This assistant came in from another room and was instructed not to take notice of the anesthetic technique that the patient was receiving. Intravenous crystalloid, intraoperative and postoperative blood transfusion were recorded. Twenty-four hours after the operation, another assistant who was blinded to the technique of anesthesia took the patient's hematocrit (Hct). The difference between pre- and postoperative Hct and the proportion of patients in each

group who had postoperative Hct < 30 per cent were recorded.

The following intraoperative complications were recorded: hypotension, hypertension, nausea, vomiting, aspiration, unconsciousness during EA and SA. Hypotension was defined as systolic blood pressure (SBP) decreased >20 per cent of control value or SBP ≤90 mmHg. Hypertension was defined as SBP increased >20 per cent of control value or SBP ≥180 mmHg. Unconsciousness during regional block meant the patient was given sedatives until she was unable to respond to verbal command at any time during EA or SA and this complication was not applicable to GA.

At 24 hours postoperation, the patients were asked to evaluate their satisfaction towards the anesthetic technique on a visual analogue scale (VAS); zero meant not satisfied at all and ten meant totally satisfied. Their total pain scores, pain during anesthetic procedure and pain during operation were also assessed on a VAS, zero meant no pain at all and ten meant the most severe imaginable pain. GA patients were asked whether they had awareness during anesthesia.

Other variables that could affect outcomes were recorded: age, weight, preoperative Hct, operation time, education level, number of previous pregnancies and labor, number of previous C/S, nature of the operation (elective or emergency), operative procedure (C/S alone or with tubal ligation) and whether the patient was in active labor, sex of the newborn, satisfaction of parents in the newborn's sex and anesthetic technique for previous C/S.

### Analysis

Continuous variables with normal distribution were compared among the 3 groups with analysis of variance. Proportions were compared by chi-square test. $P<0.05$ was considered to be statistically significantly different. Most patients (88.6%) received the randomized technique and their data were analyzed accordingly. Anesthetic technique had to be changed in 39 patients (see below). We compared the complications among patients according to the randomized groups and according to the actual anesthetic techniques they received (deleting patients who received more than one technique), and found that the results were not different. Patients' satisfaction was compared according to the groups to which they were initially randomized.

## RESULTS

Three hundred and forty-one patients were included. The demographic variables are shown in Table 1. Age, weight, preoperative Hct and operation times were not significantly different. The education level, number of previous pregnancies and labor, number of previous cesarean sections, nature of the operation, operative procedure and the number of patients in active labor were not significantly different among the 3 groups.

Of the 341 patients, 302 had C/S under the anesthetic technique to which they were initially randomized. Success rates and the reason of the change in techniques are shown in Table 2.

Table 3 shows that blood loss measured in suction bottles and total blood loss were highest in GA and least in SA. Postoperative Hct was significantly lower in GA than the other two techniques. SA had the highest mean postoperative Hct. The proportion of patients who had postoperative Hct lower than 30 per cent were significantly higher in GA than SA.

Cardiovascular changes and other complications are shown in Table 4. Episodes of hypotension occurred significantly more often in EA and SA; but hypertension occurred more often in GA. The incidences of nausea and vomiting were highest in SA, and lowest in GA. No aspiration of gastric content or awareness during GA occurred in this

**Table 1. Demographic variables (mean ± SD) of the three groups.**

| | General (n = 103) | Epidural (n = 120) | Spinal (n = 118) |
|---|---|---|---|
| Age (year) | 29.2 ± 5.2 | 29.2 ± 5.9 | 29.5 ± 5.2 |
| Weight (kg) | 65.7 ± 9.5 | 65.4 ± 8.8 | 66.4 ± 12.0 |
| Height (cm) | 153.8 ± 5.6 | 153.8 ± 11.1 | 154.7 ± 6.0 |
| Preoperative Hct (%) | 38.3 ± 3.3 | 38.4 ± 3.4 | 38.3 ± 3.8 |
| Operation time (min) | 66.8 ± 18.3 | 69.1 ± 19.3 | 63.1 ± 19.3 |

**Table 2. Success rates of the 3 techniques of anesthesia and the reasons of the changes from randomization.**

| Technique | Success | | Reasons of changes | |
|---|---|---|---|---|
| General | Randomized | 103 | To epidural anesthesia: | |
| | Succeeded | 99 | History of asthma | 3 |
| | Success rate | 96.1% | Obstetrician's request | 1 |
| Epidural | Randomized | 120 | To general anesthesia: | |
| | Succeeded | 108 | Patients' request | 3 |
| | Success rate | 90.0% | Could not identify space | 1 |
| | | | No anesthesia achieved | 2 |
| | | | Partial analgesia | 4 |
| | | | Partial analgesia, after delivery | 1 |
| | | | Operation outlasted block | 1 |
| Spinal | Randomized | 118 | To epidural anesthesia: | |
| | Succeeded | 95 | Could not obtain cerebrospinal fluid | 5 |
| | Success rate | 80.5% | To general anesthesia: | |
| | | | Neurofibromatosis | 1 |
| | | | Mitral valve prolapse | 1 |
| | | | Could not obtain cerebrospinal fluid | 7 |
| | | | Partial analgesia | 5 |
| | | | Block was too high | 1 |
| | | | Operation outlasted block | 3 |

**Table 3. Comparison of blood loss among the 3 groups.**

| | General (n = 114) | Epidural (n = 117) | Spinal (n = 95) | P | |
|---|---|---|---|---|---|
| Blood in suction (ml) | 378.3 ± 302.7 | 323.8 ± 274.6 | 257.2 ± 192.8 | 0.01 | GA>SA |
| Total blood loss (ml) | 873.6 ± 403.1 | 748.2 ± 363.5 | 648.0 ± 312.0 | 0.0001 | GA>EA,SA |
| Postoperative Hct (%) | 33.0 ± 4.8 | 34.9 ± 4.3 | 36.4 ± 4.6 | 0.01 | GA<EA<SA |
| Pre-postoperative Hct difference (%) | -5.1 ± 4.7 | -3.4 ± 4.8 | -2.0 ± 5.3 | 0.0007 | GA>EA,SA |
| Postop Hct < 30% (per cent of patients) | 21.2 | 11.4 | 6.6 | 0.006 | GA>SA |
| Crystalloid given intraoperatively (ml) | 1707.0 ± 664.5 | 1950.0 ± 579.2 | 2301.7 ± 539.9 | 0.01 | GA<EA<SA |
| Blood given in OR (per cent of patients) | 4.4 | 5.1 | 2.1 | 0.29 | |
| Blood given at wards (per cent of patients) | 2.7 | 4.4 | 0 | 0.45 | |

study. One-fifth of patients in the 2 regional groups were given sedatives until they did not respond to verbal command at one time during the operation.

Table 5 shows that the patients' satisfaction score towards anesthesia were not significantly different although pain score was significantly lower in GA. The proportions of patients who would like to have the same technique if they needed another C/S were not significantly different. Sexes of the newborns, satisfaction of parents in the newborns' sexes and anesthetic techniques for previous cesarean section were not different among groups.

## DISCUSSION

Choice of anesthesia is one of the most important decisions an anesthesiologist has to make before the start of each C/S. The condition of the mother and the fetus, the nature of the operation, the expectation of the mother, the expertise of the surgeon and anesthesiologist come into the decision making. In countries where the patients have strong preference for one of the techniques, a randomized trial to compare the effectiveness among techniques may not be possible. Patients in Thailand may expect general anesthesia, but regional anesthesia offers

**Table 4. Per cent of patients who had cardiovascular changes and other complications in the peri-operative period.**

| | General (n = 114) | Epidural (n = 117) | Spinal (n = 95) | P | |
|---|---|---|---|---|---|
| SBP decreased | | | | | |
| Change ≥20% | 15.8 | 51.3 | 56.8 | <0.001 | GA<EA,SA |
| SBP ≤90 mmHg | 11.7 | 37.2 | 52.1 | <0.0001 | GA<EA,SA |
| SBP increased | | | | | |
| Change ≥20% | 56.1 | 20.2 | 10.5 | <0.001 | GA>EA,SA |
| SBP ≥180 mmHg | 12.7 | 1.8 | 1.1 | 0.003 | GA>EA,SA |
| Nausea | 4.3 | 28.2 | 51.6 | 0.0008 | GA<EA<SA |
| Vomiting | 7.0 | 17.7 | 34.7 | <0.001 | GA<EA<SA |
| Unconciousness | | | | | |
| during EA or SA | NA | 22.2 | 20.0 | 0.822 | |
| Awareness during GA | 0 | NA | NA | | |

SBP = systolic blood pressure. NA = not applicable.

**Table 5. Satisfaction scores and proportion of patients who would have the same technique of anesthesia.**

| | General (n = 103) | Epidural (n = 120) | Spinal (n = 118) | P | |
|---|---|---|---|---|---|
| Satisfaction score | 8.07 ± 2.22 | 8.06 ± 2.52 | 7.49 ± 2.95 | 0.16 | |
| Pain score | | | | | |
| During procedure | 1.75 ± 3.01 | 2.70 ± 2.56 | 3.19 ± 2.85 | 0.008 | GA<EA,SA |
| During operation | 0.07 ± 0.34 | 0.91 ± 2.15 | 0.76 ± 2.04 | 0.001 | GA<EA,SA |
| Total pain score | 2.69 ± 1.19 | 3.51 ± 1.6 | 3.53 ± 1.62 | 0.001 | GA<EA,SA |
| Preferred the same technique again (per cent of patients) | 70.0 | 65.0 | 64.2 | 0.079 | |

many advantages; and there has been no study to confirm the patients' acceptance of either technique. Only a randomized trial such as this one will be able to provide the answer to our objectives.

## Success rate

The expertise of the anesthesiologist is important; but if only one anesthesiologist gave all anesthetics in this study, the results could not be generalized to the real clinical situation of Thailand. We have chosen mixed personnel expertise (anesthesiologists, residents, nurse anesthetists) that occurred in a busy general hospital, but with quality control by consultant anesthesiologists and adherence to the study protocol. This was to assure the balance of validity, feasibility and generalisation of the study.

Before randomization we excluded patients with contraindication to any technique, e.g., obstetric conditions with bleeding tendency (regional blocks might aggravate hypotension) and diabetes (general anesthesia prevents the observation of the change of consciousness). Therefore, the patients in this study represented the general population of healthy women who could have C/S under any technique. The success rate of GA was the highest. It could have been even higher if we had excluded patients with history of asthma, which our attending anesthesiologists considered an important indication to avoid GA. EA also had a high success rate, but 3 patients requested GA after they had initially consented to be randomized. This indicated their fear of the operation. The lower success rates of EA and SA could be due to the difficulty to curl the backs of pregnant women and the use of a small dosage to avoid hypotension, resulting in inadequate blocks. In this clinical research, some surgeons wanted to start the operation before the block had taken full effect and the success

rate of EA could be higher if more time was allowed in some patients. Lidocaine had an advantage in its fast onset of action, but a disadvantage in a short duration of action. The success rate of SA could be higher if bupivacaine, which has a longer action, has been used or some surgeons had been faster. However, equipment for general anesthesia must always be available in case regional anesthesia fails.

**Blood loss and other side effects.**

Blood loss during C/S was difficult to evaluate because the amniotic fluid was also collected in the suction bottle, and there was blood on the operative field. A study randomized 125 C/S into three groups of GA with varying concentrations of halothane and compared them with 20 patients who received EA, but did not include a spinal group[5]. Blood loss was evaluated by hemoglobin extraction-dilution technique and the investigator concluded that the mean blood loss in EA was approximately half that of GA. However, it was not clear when halothane, which could lead to uterine relaxation, was turned off and the study was not truly randomized. Other randomized trials[6,7] evaluated blood loss by changes in Hct and hemoglobin, but all patients received GA. Gilstrap et al reviewed 293 C/S and compared the need of transfusion, the proportion of patients with postoperative Hct<30 per cent and the proportion with more than 8 per cent decrease in pre- and postoperative Hct[8]. Patients who received GA with halothane had significantly greater incidences of all three problems. They also reviewed previous studies and found "less than rigorous attempts to delineate blood loss" and concluded that a prospective randomized assessment with a large number of patients should be performed.

In this randomized trial the authors had concrete evidence that blood loss was highest in GA and least in SA. Although the measurements of blood loss were not absolutely accurate, the variation would have affected all three groups. The lower hematocrit value in GA could not result from dilution of intravascular volume because less crystalloid was given to this group. The units of blood transfusion given were not different, maybe because of the policy to give blood only when the patients were very anemic or had unstable cardiovascular system.

In our practice for GA, the abdomen was prepared, the surgeon gowned and instrument-ready before induction of anesthesia. This was frightening for patients and, together with a sympathetic response to laryngoscopy and intubation, contributed to the rise in SBP. The incidences of patients with >20 per cent SBP increase from baseline were higher than those with SBP higher than a cut-off point, e.g., half of the GA group had SBP increase >20 per cent from baseline but in fact only 12.7 per cent had SBP higher than 180 mmHg. There were no permanent untoward effects from these changes. In EA and SA, the high incidences of nausea and vomiting occurred due to hypotension and retraction of uterus and peritoneum. Since the regional blocks were "single shot" we could not add local anesthetic drugs during cases. Patients whose blocks were high (and effective) tended to have hypotension from vasodilatation. Another study reported the same incidence of hypotension after SA[9]. Regimens of vasopressors have been proposed to combat this[10]. When the blocks were not high enough the patients experienced such discomfort that some anesthesiologists gave narcotics or sedatives. This placed the patients at risk of aspiration of gastric content and abolished the advantage of regional anesthesia.

Aspiration did not occur, partly because its incidence was low, 1 in 661[11]. Failed intubation was another risk of fatality in GA. Its incidence in UK was 1 in 250[4]. In the US, the anesthesia-related maternal mortality rate decreased from 4.3 per million live births during 1979-1981 to 1.7 per million during 1988-1990. The number of deaths involving GA has remained stable, but the number of regional anesthesia-related deaths has decreased. The relative risk of death of GA/RA after 1985 was 16.7 (95% confidence interval 12.9-21.8)[12]. Even regional anesthesia has its risks, primarily the toxicity of local anesthetics and excessively high blocks. Neurological sequelae after regional block have been reported[3]. New drugs with less cardiac depression have recently been introduced, e.g., ropivacaine[13], but is not yet widely used in Thailand.

**Satisfaction**

Even when there is adequate analgesia, the patient can suffer from fear, anxiety, nausea, vomiting and other minor side effects. We have asked the patients specifically for satisfaction towards the anesthetic technique and verified that factors affecting satisfaction, e.g., sex of the baby, were equally distributed in all groups. Although pain score was lower in GA, satisfaction scores were not different.

This meant that with appropriate explanation and perioperative care, regional anesthesia could satisfy Thai women. A previous, non-randomized study in 393 Thai women reported that patient satisfaction in GA was significantly higher than regional anesthesia[14]. They had 333 patients in GA and only 60 received regional anesthesia and the choice of anesthesia in the first place could have affected satisfaction.

However, success rates, satisfaction scores and future preferences from this study showed that our service, though safe and satisfactory, could still be improved. Also troublesome was the fact that many patients were sedated and exposed to the risk of aspiration. Two important factors were the limited time allowed for the block to work and the inability to add more local anesthetics in single shot blocks. The first one could be improved by the understanding of obstetricians and the second one by adding an epidural catheter to provide continuous epidural block. Other techniques available are combined spinal-epidural block (CSE)[15], and continuous spinal anesthesia (CSA)[3]. These could provide analgesia with faster onset and longer duration and provide routes for epidural and spinal opioids for postoperative pain relief[16]. These techniques cost more, need more time and expertise and are not yet the standard practice in most hospitals in Thailand. The choice of anesthesia also depends upon manpower and their experience. In Thailand, nurse anesthetists are the main work force in rural areas. They are not allowed to give regional anesthesia, so only general anesthesia is available.

Apart from benefits to mothers, the effects of anesthetic techniques on the newborns are also important. Our pediatric colleagues evaluated the newborns of our patients and reported lower Apgar scores in the newborns of GA mothers but the Newborn Adaptive Capacity Scores were not significantly different among the three techniques[17]. These confirmed that hypotension in EA and SA did not affect the newborns. Direct medical cost of anesthesia for C/S in our hospital, which is a tertiary care hospital, has been reported; GA costs significantly more than EA and SA[18]. Cost of anesthetic techniques also depends on the use of disposable or reusable equipment. Cost can not be ignored in the present financial crisis and ultimately an anesthetic technique should be evaluated by its efficiency not effectiveness[19]. From our results and these other aspects, regional anesthesia should be a priority for C/S.

## SUMMARY

The authors found that the success rates of EA and SA were lower than GA and there was room for improvement. Success in EA should be improved by using an epidural catheter to add more drugs and provide continuous block; and the surgeon should allow more time for the block to work adequately. Success in SA should be improved by using bupivacaine instead of lidocaine. Postoperative pain relief could also be given *via* these regional techniques. GA resulted in significantly more blood loss and had other potential severe complications. However, the availability of different techniques and ability to change the technique when needed were very useful and important. If GA is chosen, all safety procedures must be followed. Oxygen supplement and endotracheal intubation facilities must be available in all techniques. The patients' satisfaction was not different among the 3 techniques. This meant that, given adequate explanation and perioperative care, Thai women were satisfied with regional anesthesia. Previous studies regarding mortality, effect on newborns and cost of anesthesia also favored regional anesthesia. The authors recommend that regional anesthesia by continuous epidural block, spinal block (or a new technique, combined spinal epidural block) are better choices of anesthesia for cesarean section in Thai patients than general anesthesia. Guidelines of anesthesia for cesarean section should be agreed upon, including the type of personnel, monitoring equipment and postoperative care.

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## REFERENCES


1. Werunkabutra T, Pausawasdi S. Anesthesia for cesarean section. Thai J Anesthesiol 1992; 18: 144-7.
2. Gibbs C. Anesthesia for cesarean section. American Society of Anesthesiologists Refresher Course 1989: 121.
3. Holmstrom B, Rawal N, Amro S. The use of central regional anesthesia techniques in Sweden: result of a nation-wide survey. Swedish Association of Anesthesia and Intensive Care. Acta Anaesthesiol Scand 1997; 41: 565-72.
4. Hawthorne L, Wilson R, Lyons G, Dresner M. Failed intubation revisited: 17-year experience in a teaching maternity unit. British J Anaesth 1996; 65: 680-4.
5. Moir DD. Anaesthesia for cesarean section. British J Anaesthesia 1970; 42: 136-42.
6. Crawford JS, Lewis M, Davies P. Maternal and neonatal responses related to the volatile agent used to maintain anaesthesia at cesarean section. British J Anaesthesia 1985; 57: 482-7.
7. Abboud TK, Kim SH, Henriksen EH, et al. Comparative maternal and neonatal effects of halothane and enflurane for cesarean section. Acta Anaesthesiol Scand 1985; 29: 663-8.
8. Gilstrap LC, Hauth JC, Hanskin G, Patterson AR. Effect of type of anesthesia on blood loss at cesarean section. Obstet Gynecol 1987; 69: 328-32.
9. Satproedprai A, Kongratanawan D, Saothontthong J, Urusopone P, Werawatganon T, Somboonviboon W. Preload fluid for spinal anesthesia in cesarean section. Thai J Anesthesiol 1993; 3: 106-11.
10. Webb AA, Shipton EA. Re-evaluation of i.m. ephedrine as prophylacxis against hypotension associated with spinal anaesthesia for cesarean section. Can J Anaesth 1998; 45: 367-9.
11. Olson GL, Hallen B, Hambraeus-Jonzon K. Aspiration during anesthesia: a computer-aided study of 185,358 anaesthetica. Acta Anaesthesiol Scand 1986; 30: 88-92.
12. Hawkin JL, Koonin LM, Palmer SK, Gibbs CP. Anesthesia-related deaths during obstetric delivery in the United States. Anesthesiology 1997; 862: 277-84.
13. Morton CP, Bloomfield S, Magnusson A, Jozwiak H, McClure JH. Ropivacaine 0.75% for extradural anesthesia in elective cesarean section: an open clinical and pharmacokinetic study in mother and neonate. British J Anaesth 1997; 79: 3-8.
14. Tongchaicharoensiri P, Tongcharoen P, Panich A. Comparison of patient satisfaction and complication between general and regional anesthesia for cesarean section. Ramathibodi Nurse J 1998; 4: 33-44.
15. Pisalyabutr S. Combined spinal epidural technique. Thai J Anesthesiol 1995;21:247-50
16. Tontisirin O, Ponpiboonlap P, Chankam R. Comparative study of postoperative analgesia between epidural morphine and systemic narcotics in TAH. Thai J Anaesth 1998; 24: 26-31.
17. Kolatat T, Somboonnanonda A, Lertakyamanee J, Chinachoti T, Tritrakarn T, Muangkasem J. Effects of general and regional anesthesia on the neonate (a prospective, randomized trial). J Med Assoc Thai 1999; 82: 40-5.
18. Chevawattana S, Lertakyamanee J, Somprakit P, Muntraporn N, Chartprom S. Direct medical costs of anesthesia in Siriraj Hospital. Siriraj Hospital Gaz 1998; 50: 487-97.
19. Tugwell P, Bennett K, Feeny D, Guyatt G, Brian Haynes R. A framework for the evaluation of technology: the technology assessment iterative loop. In: Health Care Technology (ed) Feeny D, Guyatt G, Tugwell P.Montreal: The Institute for Research on Public Policy.1986: 41-56.

# การเปรียบเทียบวิธีระงับความรู้สึกแบบทั้งตัวและแบบเฉพาะส่วน สำหรับการผ่าตัดคลอดทางหน้าท้อง : อัตราความสำเร็จ, การเสียเลือด และความพึงพอใจ จากการศึกษาแบบสุ่ม

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**จุดประสงค์** : ต้องการศึกษาเปรียบเทียบแบบสุ่มเพื่อเปรียบเทียบประสิทธิภาพของการระงับความรู้สึกแบบทั้งตัวและแบบเฉพาะส่วน สำหรับการผ่าตัดคลอดทางหน้าท้อง

**วิธีการ** : สุ่มแบ่งผู้ป่วย 341 คนออกเป็น 3 กลุ่มคือ กลุ่มที่ 1 ได้รับการระงับความรู้สึกแบบทั้งตัว (general anesthesia) กลุ่มที่ 2 ได้รับการระงับความรู้สึกโดยการฉีดยาชาที่เหนือช่องไขสันหลัง (epidural anesthesia) กลุ่มที่ 3 ได้รับการระงับความรู้สึก โดยการฉีดยาชาเข้าในช่องไขสันหลัง (spinal anesthesia) ศึกษาความสำเร็จ ปริมาตรเลือดและความพึงพอใจของผู้ป่วย

**ผลการศึกษา** : กลุ่มที่ 1 มีอัตราความสำเร็จสูงกว่ากลุ่มที่ 2 และ 3 กลุ่มที่ 2 ควรมีอัตราความสำเร็จสูงขึ้นถ้าใส่สายเข้าในช่องเหนือช่องไขสันหลังด้วยเพื่อให้สามารถเติมยาชาได้แทนที่จะฉีดยาครั้งเดียวและสูติแพทย์ต้องให้เวลามากขึ้นเพื่อให้ยาออกฤทธิ์ก่อนผ่าตัด กลุ่มที่ 3 ควรมีอัตราความสำเร็จสูงขึ้นถ้าใช้ยาบิวพิวาเคนซึ่งมีฤทธิ์นานกว่าไซโลเคน เมื่อเปรียบเทียบปริมาตรเลือดและการเปลี่ยนแปลงฮีมาโตคริตพบว่า กลุ่มที่ 1 มีการเสียเลือดมากกว่ากลุ่มที่ 2 และ 3 การสอบถามคะแนนความพึงพอใจของผู้ป่วยพบว่าไม่แตกต่างกันอย่างมีนัยสำคัญแม้ว่าคะแนนความปวดในกลุ่มที่ได้รับการระงับความรู้สึกแบบทั้งตัวต่ำกว่ากลุ่มอื่น ๆ แสดงว่าการระงับความรู้สึกแบบเฉพาะส่วนที่ให้คำอธิบายและการดูแลที่ดีสามารถทำให้ผู้ป่วยไทยพอใจได้

**สรุป** : การระงับความรู้สึกแบบเฉพาะส่วนมีความเหมาะสมสำหรับการผ่าตัดคลอดทางหน้าท้องมากกว่าการระงับความรู้สึกแบบทั้งตัว อย่างไรก็ตามการมีวิธีระงับความรู้สึกให้เลือกใช้หลายวิธีเมื่อจำเป็นมีประโยชน์และสำคัญ ถ้าเลือกใช้การระงับความรู้สึกแบบทั้งตัวต้องปฏิบัติตามขั้นตอนเพื่อความปลอดภัย และไม่ว่าจะเลือกวิธีใดต้องมีออกซิเจนและอุปกรณ์เพื่อการใส่ท่อช่วยหายใจพร้อมเสมอ ควรมีการสร้างแนวทางปฏิบัติในการระงับความรู้สึกสำหรับการผ่าตัดคลอดทางหน้าท้องในระดับประเทศ รวมทั้งบุคลากรอุปกรณ์และการดูแลหลังผ่าตัด

**คำสำคัญ** : การระงับความรู้สึก, แบบทั้งตัว, แบบเฉพาะส่วน, การผ่าตัดคลอดทางหน้าท้อง

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