นิพนธ์ต้นฉบับ

Reduction of postoperative pain after cesarian section with additional local anesthesia.

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In a randomized, double-blind, prospective study, postoperative pain was assessed in 30 pregnant patients undergoing elective primary cesarian section under general anesthesia with endotracheal intubation. Volunteers were equally divided into three groups: (1) control, (2) with additional local anesthesia employed preincisionally (0.25% bupivacaine infiltrated along the line of proposed incision), and (3) with local anesthesia infiltrated after skin closure. The severity of constant incisional pain and movement-associated wound pain was assessed with a visual analogue self-rating method at 24 h., 48 h.and 10 days after surgery. Also, the pain-free period was evaluated considering time to first analgesic (TTF). The statistical methods used here were the one-way analysis of variance (one-way ANOVA) and Scheffe's test. The addition of local anesthesia prolonged the pain-free period from 5.5 h. to 10-12 h. when compared to the control group. With pain, either constant incisional or movement-associated, the pain score differences between the control group and the local anesthesia groups (both preincision and post closure) were obvious at 24 h. and 48 h. (but not 10 days) after surgery. The mechanisms of postoperative pain reduction were probably the effects of peripheral neural blockade which prevent nociceptive impulses from entering the central nervous system causing the sustained hyperexcitable state (responsible for the maintenance of postoperative pain). Although both parameters (TTF and pain score) were statistically the same between the two experimental groups, for clinical applications the addition of local anesthesia (0.25% bupivacaine 40 ml) along the line of the skin incision after closure of the skin in patients undergoing elective cesarian section under general anesthesia was advised as being preferable.

Key words : *Pain, Postoperative, Local anesthesia.*

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สุวัตร์ งามภูพันธ์. การลดอาการปวดแผลหลังการผ่าตัดคลอดบุตรทางหน้าท้องด้วยการเสริมยาชาเฉพาะที่ กลุ่มงานสูติ-นรีเวชกรรม โรงพยาบาลอ่างทอง. จุฬาลงกรณ์เวชสาร 2537 พฤศจิกายน; 38(11): 689-697

ผู้รายงานได้รวบรวมผู้ตั้งครรภ์ 30 ราย ที่วางแผนจะทำการผ่าท้องคลอดบุตรครั้งแรกแบบ Elective ด้วยวิธีวางยาสลบและใส่ท่อช่วยหายใจทางหลอดลม โดยศึกษาถึงอาการปวดแผลหลังผ่าตัดคลอดบุตรด้วยวิธีแบ่งกลุ่มผู้ป่วยเป็น 3 กลุ่ม เท่าๆ กัน คือ กลุ่มควบคุม, กลุ่มที่เสริมยาชาเฉพาะที่ (0.25% bupivacaine ฉีดในแนวแผลผ่าตัด) ก่อนที่จะลงมีดผ่าตัด และกลุ่มที่เสริมยาชาเฉพาะที่ ฉีดที่แผลหลังจากเย็บปิดแผลผ่าตัดแล้ว การประเมินความเจ็บปวดหลังผ่าตัดให้ค่าคะแนนความเจ็บปวด ทั้ง 2 แบบ คือ ความปวดแผลขณะขยับตัวเคลื่อนไหว โดยวิธีให้ผู้ป่วยประเมินตัวเอง แบบ Visual analogue scale ที่ 24 ชม., 48 ชม. และ 10 วันหลังผ่าตัด นอกจากนี้ยังประเมินเวลาที่ผู้ป่วยได้รับยาฉีดแก้ปวดครั้งแรก (TTF) ด้วย การวิเคราะห์ทางสถิติใช้วิธี One way ANOVA และ Scheffe's test ผลการศึกษาพบว่าในกลุ่มควบคุมค่า TTF ประมาณ 5.5 ชม. เทียบกับกลุ่มที่เสริมยาชาก่อนลงมีด และหลังเย็บปิดแผลที่มีค่าประมาณ 12 และ 10 ชม. ตามลำดับ ค่าคะแนนความเจ็บปวดทั้ง 2 แบบ ในกลุ่มที่ได้รับยาชาเฉพาะที่ทั้ง 2 กลุ่ม มีค่าน้อยกว่ากลุ่มควบคุม อย่างมีนัยสำคัญทางสถิติ ทั้งในช่วง 24 ชม., 48 ชม. หลังผ่าตัด (ในช่วง 10 วันไม่แตกต่างกัน) กลไกของการลดอาการปวดแผลหลังผ่าตัดเข้าใจว่าเกิดจากยาชาเฉพาะที่ไปขัดขวางการส่งสัญญาณของเส้นประสาทจาก Nociceptive impulse ที่จะไปกระตุ้นระบบประสาทส่วนกลางเป็นผลให้ไม่เกิดภาวะ Sustained hyperexcitable state (ซึ่งเป็นสาเหตุสำคัญที่ทำให้เกิดอาการปวดแผลหลังผ่าตัด) ในรายงานนี้พบว่า ตัวชี้วัด 2 ตัด คือ TTF และค่าคะแนนความเจ็บปวดของกลุ่มที่เสริมยาชาเฉพาะที่ ก่อนลงมีดผ่าตัดและหลังจากเย็บปิดแผลมีค่าไม่แตกต่างกัน แต่ผู้รายงานได้แนะนำวิธีการเสริมยาชาเฉพาะที่หลังจากเย็บปิดแผลเสร็จ เพื่อนำไปใช้ปฏิบัติโดยทั่วไป

Cesarian section or other operative obstetrics often leaves a mother a great deal of pain postoperatively and the pain of the incision may be exaggerated by the discomfort of a urinary catheter and sore breasts. The need for an analgesia must be weighed against the needs of the mother and baby to be alert for early bonding and successful breast feeding. Systemic analgesics are often very sedative, so regional technics are good alternatives for patients with a retained epidural catheter.[1] There is a renewed interest in the use of local anesthetics for the reduction of postoperative pain.[2-6] In the initial studies, the investigators implanted a catheter in the surgical wound and injected local anesthesia at regular intervals after surgery to obtain long-lasting postoperative analgesia.[3,4] Bourn MH[4] and Sinclair RR[5] administered local anesthesia in the wound before its closure (bupivacaine instillation or application of lidocaine aerosol), and this was found to decrease the pain score and opioid requirements. A valuable study is that of Tverskoy's.[6] He stated that in patients who underwent inguinal hernia surgery, a prolonged pain-free period and pain score reduction were clearly observed in those whose skin incisions were, beforehand infilrated with 0.25% bupivacaine.

The aims of the present study were to determine (1) whether preemptive local anesthesia used during cesarian section decreases pain severity and prolongs the pain-free period and (2) which form of local anesthesia administration was more suitable (in terms of effectiveness, doctor's ease and patient's condition) for application in general practice.

Methods

Our designed study was a randomized, double-blind prospective study. Thirty term pregnant patients scheduled for elective primary cesarian section under general anesthesia with endotracheal intubation at Angthong Hospital were enrolled with their consent. They and their babies were all in good health without any medical or surgical contraindications or local anesthetic allergies. Three equal groups of patients were arranged : A control, B preincision (local anesthesia infiltrated) and C post-closure group. All received no preanesthetic medication and all were general anesthesized by the same procedure with about 7 mg. total morphine given during the operative courses. The Cesarian sections were carried out by the same surgeon using a modified Pfannenstiel skin incision and skin closure by use of delayed absorbable, 3-0, straight needle, subcuticular stitches. In group A no intervention was conducted. In group B, after intubation, subcutaneous and intramuscular infiltration of the abdominal wall with 0.25% bupivacaine (40 ml) along the line of the proposed transverse incision (around 10 cm) was made 3 minutes before surgery. In group C the same amount of local anesthesia infilration was made at the surgical wound after complete skin closure was performed.

Postoperatively, all three groups were treated in exactly the same way. When a patient complained of pain, morphine (10 mg IM) was given, and the time from the end of the surgery to the first request for an analgesic was recorded (time to first analgesic-TTF). After the first injection, each patient recieved 10 mg of morphine every 6 h. for the first day after surgery. Afterwords, the usual post cesarinan care pattern was employed.

The intensity of postoperative pain was self-assessed by the patients blinded to the possible association between their group and the degree of postoperative pain, the same as for the investigator. The assessment was made three times for each patient at 24 h, 48 h. and 10 days after the surgery (at a follow-up visit). The assessment of pain was performed with a visual analogue self-rating method.[7] The visual analogue scale consisted of a 100 mm. horizontal line without gradation, connecting points marked as "no pain at all" and "as severe as it could be." The patients were told to indicate how they felt at the moment by placing a mark perpendicular to the line. The distance (in millimeters) of the perpendicular mark from the left end of the line was considered as the pain score, Two types of pain were assessed: constant incisional pain and movement-associated incisonal pain (after the patient got out of bed, on the request of the investigator)

The data were summarized as mean ± SD. for each group. A one-way analysis of variance (one-way ANOVA) was used to assess the differences in mean pain scores and in mean TTF among the three groups. Multiple comparisons among pairs of means were conducted using Scheffe's test.[8] Differences were declared statistically significant in $P<0.05$.

Results

Preliminary data were collected and shown in Table 1. The three groups of patients were comparable with regards to age and weight. Even though groups B and C received local anesthetic infilration that took a few minutes, the data showed no significant increase in the duration of surgery (27.1±2.5 min and 27.3±3.4 min) compared to group A (26.2±8.5)(Table 2).

Table 1. Initial data.

				Group A		Pain score					
No.	Sample	Age	WT	Duration of surgery(MIN)	Time to first analgesia(NIN)	Rest			Activitty		
						24 H	48 H	10 D	24 H	48 H	10 D
1	1	38	59	20	410	62	41	0	81	50	4
2	2	26	77	30	235	30	25	0	73	32	0
3	3	31	64	28	275	42	20	0	79	48	0
4	7	22	61	25	435	22	16	0	54	30	0
5	9	23	73	30	285	41	37	0	81	42	0
6	14	22	59	28	556	35	30	0	70	40	1
7	17	21	67	30	68	64	32	0	84	39	0
8	20	26	63	23	>24H	24	16	0	65	39	3
9	21	20	50	25	190	50 2	8	0	72	35	3
10	22	23	52	23	570	33	15	0	53	36	0

				Group B		Pain score					
No.	Sample	Age	WT	Duration of surgery(MIN)	Time to first analgesia(NIN)	Rest			Activitty		
						24 H	48 H	10 D	24 H	48 H	10 D
Group B Pain score											
1	6	34	76	25	>24H	22	16	0	50	53	0
2	10	19	68	25	>24H	18	11	0	39	24	0
3	11	25	64	24	>24H	35	20	0	64	28	0
4	13	21	58	25	>24H	19	13	0	30	12	0
5	19	25	59	27	>24H	20	12	0	42	16	0
6	23	19	58	27	720	22	14	0	35	17	0
7	25	25	55	30	830	28	10	0	42	30	0
8	27	35	62	30	693	20	11	0	40	14	5
9	28	34	67	31	590	40	22	0	51	32	0
10	29	24	60	27	869	36	8	0	49	33	0

				Group C		Pain score					
No.	Sample	Age	WT	Duration of surgery(MIN)	Time to first analgesia(NIN)	Rest			Activitty		
						24 H	48 H	10 D	24 H	48 H	10 D
Group C Pain score											
1	4	30	60	30	>24H	12	8	0	65	18	0
2	5	24	50	30	718	41	20	0	70	32	0
3	8	19	60	26	492	16	6	0	34	12	1
4	12	23	63	27	686	43	18	0	62	26	0
5	15	27	73	23	658	33	15	0	61	26	0
6	16	28	62	31	865	42	21	0	60	20	2
7	18	32	75	24	530	30	14	0	43	18	0
8	24	39	59	30	580	13	9	0	42	18	0
9	26	24	68	30	505	26	13	0	48	30	5
10	30	32	43	22	>24H	32	15	0	52	20	0

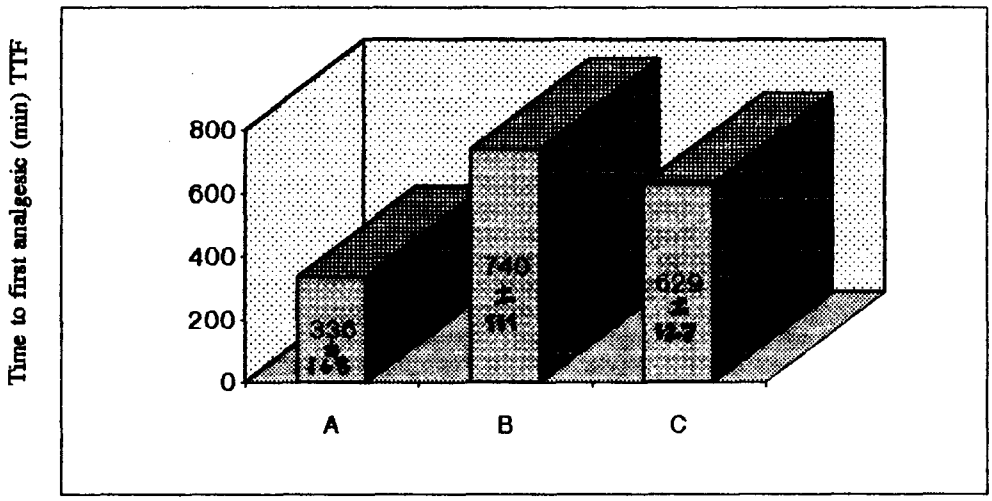
One way ANOVA P>0.05

Table 2. Characteristics of Patients.

Variable	Groups of Samples			P Value
	A	B	C	
N	10	10	10	
Age (yr)	28.2 ± 5.5	26.1 ± 6.1	27.8 ± 5.7	P=0.6013
Weight (kg)	62.5 ± 8.4	62.7 ± 6.2	61.3 ± 9.7	P=0.9192
Duration of surgery (min)	26.2 ± 3.5	27.1 ± 2.5	27.3 ± 3.4	P=0.7112

A=control
B=preincision
C=post closure

The duration of analgesia (time to first analgesic-TTF) was 336±168 min in group A, 740±111 min in group B and 629±127 min in group C, with a statistically significant difference determined by one-way ANOVA. Furthermore, with Scheffe's test, significant differences were found between group B and group A, and between group C and group A. The group B and group C difference was statistically non-significant. Noticeably, there were 5 patients in group B (50%) who needed no opioid injection in the first 24 h. after surgery while in group C the number was 2 and group A it was only 1 (Figure 1).



One way ANOVA P = 0.0001

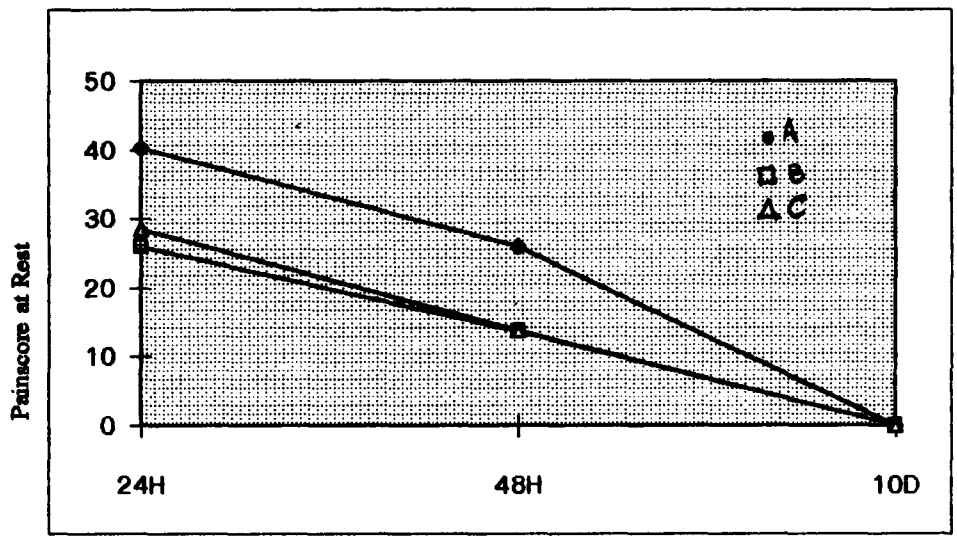
Scheff's test

Group	A	B	C
A			
B	*		
C	*		

* Denotes pairs of groups significantly different at the 0.050 level

Figure 1

Obvious positive effects of the additional local anesthesia were observed with respect to constant incisional pain and movement-associated pain. The constant pain score (Figure 2) at 24 h. and 48 h. was 40.3 and 26.0 in group A, 26.0 and 13.7 in group B and 28.5 and 13.9 in groups C. Statistically pain-score differences were found between groups B and A, and between groups C and A, but between groups B and C it was comparable.



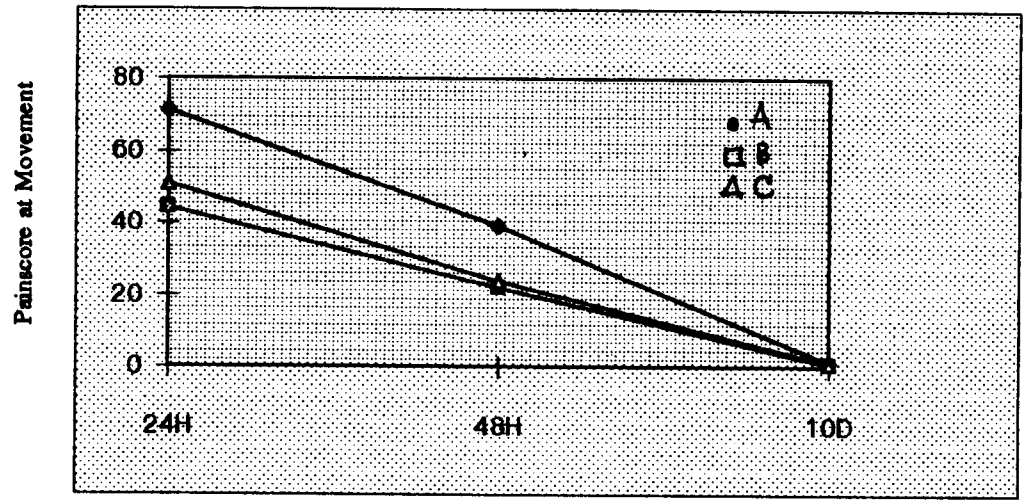
One way ANOVA	P 24 h. = 0.0277			P 48 h. = 0.0002
Scheffe's test	Group	A	B	C
	A			* 24 h.
	B	* ^		^ 48 h.
	C	* ^		

* ^ Denotes pairs of groups Significantly different at the 0.050 level

Figure 2

The movement-associated pain score pattern was similar (Figure 3). Pain intensity at 24 h and 48 h was 71.2 and 39.1 in group A, 44.2 and 22.0 in group B, and 50.7 and 23.9 in group C respectively. The analytic results were similar : the score was significantly lower in group B and group C when compared to group A. The pain intensity between group B and group C was not statistically different. Both types of pain scores at 10 days after surgery were the same between the three study groups.

The delivery outcomes were all uneventful. There were neither wound infections nor deviated wound healing processes in the three groups of patients.



Oneway ANOVA P 24 h = < 0.0001 P 48 h = < 0.0001 P 10 D = 0.7063

Scheffe's test

Group	A	B	C
A			
B	* ^		
C	* ^		

* 24 h

^ 48 h

* ^ Denotes pairs of groups significantly different at the 0.050 level

Figure 3

Discussion

The scientific basis for post-operative pain genesis derives from previous evidence documenting sensitzation of peripheral nociceptors following tissue injury. powerful nociceptive impulses are generated not only by the surgical procedure itself, but also by the action of proteolytic and inflammatory agents (e.g. bradykinin, prostaglandins, and serotonin) released into the wound tissue. Repetitive peripheral stimulation results in a progressive increase in response of spinal dorsal horn neurons and also continued firing after the stimulus which may be quite long-lasting. Spinal cord hyperexcitability produced by massive nociceptive impulses may be sustained and thus constitute a pathophysiologic mechanism underlying postoperative pain.[5,6,9] Local anesthetics work by limiting conduction prepagation in nerve cells to prevent nociceptive impulses from entering the central nervous system during and immediately after surgery and thus suppress formation of the sustained hyperexcitable state in the CNS and this results in reduction of the postoperative pain.[4,6]

Our results indicated that the addition of local anesthetic (0.25% bupivacaine) infiltrated long the line of surgical incision in patients undergoing cesarian section under general anesthesia obviously decreased the intensity of postoperative pain either at 24 h or 48 h after surgery, regardless of whether the anesthesia was of the preincision or postclosure type. This effect was evident with both constant incisional pain and movement-associated pain. By assessing pain scores in this study, the results, quite interestingly, agreed with the report of Tverskoy et al.[6] Moreover, the addition of local anesthesia resulted in an increase in the postoperative time to the first request of analgesic from approximately 5.5 h. to 10-12 h. which is also compatible

with many other reports.[3-6] Noticeably, that 5 patients in group B (50%) tolerated pain very well and needed no injections compared with 2 in group C and 1 in group A, requires confirmation from additional studies.

From general points of view, local anesthetic infiltrated preincisionally results in postoperative pain reduction slightly better than postclosure infillration but with no statistically significant difference. When considering regular implementation, the preincision group may have some limitations. The Induction-Delivery-Interval (IDI), theoretically, should not exceed 8 minutes.[10] The additional time of surgery (in some case this may be quite long) for the time of infiltration (and three more minutes for anesthetic dispersion), for group B type operations may use up that golden time of IDI. Moreover, the use of large amounts of anesthetics (40 ml) in the surgical wound is usually not desirable because it distorts tissues and makes surgical dissection difficult.[4] Therefore, the suggested form of local anesthetic iufiltration for reduction of postoerative pain is the postclosure means.

Conclusion

Postoperative pain in patients undergoing cesarian section under general anesthesia can be markedly reduced by having local anesthesia infiltrated along the surgical incision either prior to incision or after skin closure. Additionally, it may reduce postoperative opioid requirements thus indirectly providing a positive influence to the breast feeding programme. It is postulated that neural blockade prevents nociceptive impulses from entering the central nervous system, thus suppresses formation of the sustained hyperexcitable state in the CNS. The suggested method of local anesthetic addition is surgical wound infiltration after skin closure.

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