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ORIGINAL RESEARCH

Comparison of two strategies of post-caesarean pain relief - Local Bupivacaine Infiltration versus Intravenous Paracetamol Infusion

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ABSTRACT

Post-caesarean pain being moderate to severe in nature necessitates the requirement of optimal analgesia for early autonomy and mobility of mother to care the newborn. Pain relief can be provided either locally or systemically.

66 post-spinal caesarean parturients were randomized to 2 groups (B&P). At the time of wound closure, Group B received Local Infiltration with 20ml of Bupivacaine (0.25%) and Group P received IV infusion Paracetamol (1G stat) and continued 8th hourly.

In the first 8 hours after surgery, VAS <4 was 24 in Group B (14 in Group P)(p=0.04). Mean duration of analgesia in Group B was 364.39 ± 213.12mins (230.61 ± 43.91mins in Group P) (p <0.001). The first request for rescue analgesia in Group B was between 5-8 hrs in 29 patients (26 patients within 4hrs in Group P). Local infiltration with Bupivacaine (0.25%) is a highly cost-effective technique with rapid and longer post-operative analgesia, fewer rescue analgesic requirement and better quality of analgesia than intravenous Paracetamol (1G 8th hourly).

Key words: Infiltration, bupivacaine, intravenous, paracetamol, post-caesarean analgesia

INTRODUCTION

Pain is ranked highest among undesirable outcomes associated with Caesarean section[1].Severe acute pain after Caesarean Section is a risk factor for development of chronic pain and postpartum depression[2].The provision of effective post-operative analgesia is of key importance to facilitate early ambulation, breast-feeding, maternal-infant bonding and prevention of post-operative morbidity.

Post-caesarean pain is often traditionally managed with Opioids and NSAIDS. They are associated with high incidence of adverse pharmacological effects such as nausea, vomiting, pruritus, sedation and respiratory depression. Thus, alternative drugs or strategies are needed.

Paracetamol is considered first line of treatment for pain as per WHO guidelines for pain management. It has very few drug interactions[3].It acts at both central and peripheral points of pain pathway, by direct inhibition of N-Methyl-D-aspartate receptors and inhibition of cyclooxygenase-2 (COX2) pathway. Hence, Paracetamol infusions are being widely used for post-operative analgesia as a non-opioid analgesic alternative.

Wound infiltration with local anesthetics is one of the simplest and potentially useful methods for pain relief. Bupivacaine wound infiltration has been used with varying success in management of post-caesarean pain. Pain from the surgery partly arises from inflammatory response to surgical incision as much as nociceptive inputs. Hence, reducing this inflammation and nociception may contribute to analgesia[4, 5].Localanesthetics influence levels of Interleukin 10 and Substance P and also have bacteriostatic and bactericidal properties[6].Local Infiltration is minimally invasive, inexpensive and devoid of systemic side effects of drugs, unlike opioids and NSAIDS.

Present study is undertaken to evaluate the relative effectiveness of two strategiesnamely local Bupivacaine wound infiltration as compared to

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intravenous Paracetamol infusion in the relief of post-operative pain after Caesarean section.

METHODOLOGY

A prospective randomized study was done to evaluate the relative effectiveness of two strategies namely Bupivacaine wound infiltration as compared to intravenous Paracetamol infusion in the relief of post-operative pain after Caesarean section in the Department of Anaesthesiology, Pain and Critical care.

INCLUSION CRITERIA

- Patients willing to sign consent form.
- American Society of Anesthesiologists (ASA) physical status I or II.
- Parturients between the age group of 18-35 Years.
- Elective and emergency Caesarean Sections under spinal anesthesia.
- Caesarean delivery with Pfannenstiel incision.

EXCLUSION CRITERIA

- ASA III and IV.
- Bleeding disorders/patient on anticoagulant therapy.
- Allergy to study drugs.
- Severe cardiopulmonary, renal or liver disease.
- Preeclampsia, eclampsia.
- Morbidly obese.
- Patient Refusal.

Following ethics committee approval, informed written consent was obtained from the parturients deemed suitable for the study. Detailed pre-anesthetic check-up was done. The mothers fulfilling the declared criteria were selected. They were randomly allocated to one of the two groups (Group B and Group P) by computer generated random number table. Group B (N=33) was scheduled to receive Local Infiltration with Inj. Bupivacaine 0.25% Group P(N=33) was scheduled to receive Inj.Paracetamol 1G IV.

The procedure of regional anesthesia was explained to the patient in their vernacular language. Preparation included an overnight fast of 8 hours in the case of elective surgery. Patients were premedicated with Injection Pantoprazole 40mg IV and Injection Metoclopramide 10mg IV 1 hour prior to surgery. Nil by mouth status was confirmed prior to surgery. All patients were counselled and educated preoperatively about reporting of the intensity of post-operative pain using the Visual analogue scale (VAS), which is graded 0-10 on a horizontal line: 0 being no pain, 10 being worst imaginable pain.

RESULTS

The number of patients with VAS <4 was 24 in Group B compared to 14 in Group P in the first 8 hours after surgery. The number of patients with VAS >=4 went up in Group B (19) compared to Group P (18) in the 8-24hour period.

Table 1: Patient Distribution as per VAS

Number of Patients	Group B				Group P				p Value	
	<8Hrs	%	> 8Hrs -24 Hrs	%	<8 Hrs	%	> 8Hrs -24 Hrs	%	<8 Hrs	>8Hrs -24Hrs
With VAS <4	24	73	14	42	14	42	15	45	0.04	0.90
With VAS >=4	9	27	19	58	19	58	18	55		
Total	33	100	33	100	33	100	33	100		

The mean duration of analgesia in group B was 364.39mins compared to group P which was 230.61mins (p <0.001). The range of duration of analgesia in Group B was 240 to 1440mins, whereas in Group P, it was 180 to 300mins.

Table 2: Duration of Analgesia (mins)

Duration of Analgesia (Min)	Group B	Group P	p-Value
Mean Duration of Analgesia (SD)	364.39 (213.12)	230.61 (43.91)	<0.001
Range (Min)	240-1440	180-300	

Mean time at which the group B received rescue dose 1, 2 and 3 was at 6.19 hr, 9.33hr and 16.38hr respectively, whereas in group P it was 3.82 hr, 6.18hr and 12.15hr respectively.

Table 3: Mean Time of Administration of Rescue Doses (hour)

Rescue Doses	Group B		Group P		Mean Difference	p-Value
	Mean	SD	Mean	SD		
Rescue-1	6.19	1.40	3.82	0.76	2.37	<0.001
Rescue-2	9.33	0.70	6.18	0.72	3.15	0.002
Rescue-3	16.38	0.47	12.15	1.38	4.23	<0.001

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In group B, none of the patients required any rescue analgesia in the first 4hours post-surgery. Whereas, 26 patients received their first rescue analgesic in the first 4 hours. In group B, 29 patients required the first rescue between 5-8 hours and 7 patients required the same in Group P. There were 3 patients who requested for first analgesic in Group B, while none in Group P, after 8 hours of surgery.

Table 4: Requirement of First Rescue Dose

First Rescue dose	Group B		Group P	
	No of Patients	Percentage of Patients	No of Patients	Percentage of Patients
4 hours	0	0.00%	26	78.79%
5 hrs to 8 hrs	29	90.63%	7	21.21%
> 8 hours	3	9.38%	0	0.00%

The mean number of rescue doses in group B was 1.45 whereas in group P it was 2.12 in first 24hrs.

Table 5: Mean Number of Rescue Doses

Parameter	Group B		Group P		Mean Difference	p-Value
	Mean	SD	Mean	SD		
Mean No. of Rescue Doses	1.45	0.66	2.12	0.70	-0.67	0.002

Figure 32: Mean Number of Rescue Doses

There were 3 patients of Group B and 11 patients in Group P who required additional analgesia with IV Tramadol and were considered as failures.

Table 6: Additional Rescue Doses

Rescue Doses	Group B	Group P
Additional Rescue Dose with Tramadol	3	11

The total cumulative rescue doses in 24 hours for each group in the whole series were 48 in group B and 70 in group P. The number of rescue doses of both Diclofenac and Tramadol was lesser in Group B (45, 3) compared to Group P (59,11).

Table 7: Cumulative Total Number of Rescue Doses

Rescue Doses	Group B			Group P		
	Diclofenac	Tramadol	Total	Diclofenac	Tramadol	Total
Cumulative Total Number of Rescue Doses (No.s)	45	3	48	59	11	70

Group B **Group P**

Figure 34: Cumulative Total Number of Rescue Doses

Thetotalanalgesicconsumption of Injection Diclofenacwas 102.27mg in GroupB.whereas, it was more in Group P (134.09 mg).

Table 8: Total Diclofenac Consumption (mg)

Parameter	Group B		Group P		p-Value
	Mean	SD	Mean	SD	
Total Diclofenac Consumption (mg)	102.27	40.53	134.09	30.66	0.003

Quality of analgesia was better with Group B compared to Group P. 20 patients in Group B were graded as excellent, 10 patients were graded as good and 3 as poor. In Group P, 6 patients were graded as excellent and 16 patients as good and 11 were graded as poor.

Table 9: Quality of Analgesia

Quality of Analgesia (grade)	Group B		Group P		p-Value
	No.	%	No	%	
Excellent (3)	20	60.61	6	18.18	0.003
Good (2)	10	30.30	16	48.48	
Poor (1)	3	9.09	11	33.33	

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Patients have opined to be more satisfied with the pain relief strategy in Group B (82%) as compared to Group P (70%).

Table 10: Patient Satisfaction Score

Score	Group B	Group P
Very Satisfied(5), Satisfied(4), Fair (3)	82%	70%
Unsatisfied(2), Very unsatisfied(1)	18%	30%

Discussion

Caesarean section constitutes a public health priority in India because it is one of the most common obstetric surgeries with its rates being increased due to increasing marital age, legal issues and socio-economic status of the community. The Fifth National Family Health Survey (2019-2021) showed that national C-section rate is 21.5%, higher than the recommended WHO threshold 10-15% in any country, the highest rates being in states of Telangana (60.7%), Andhra Pradesh and Kerala (42.4%)each. Thus, prevention of post- operative complications of Caesarean section is of prime importance.

One of the most common post-operative complications of Caesarean section is pain after surgery. Post- caesarean pain is ranked ninth among various surgeries in terms of highpain intensity scores on the first post-operative day. 80% of mothers experience moderate to severe pain in the post-operative period. Prompt and adequate pain relief must be employed as early as possible to facilitate early recovery, ambulation, communication with the newborn and initiation of breastfeeding as well as prevent chronic pain. Pain-induced hypoxia may lead to complications involving pulmonary, cardiac, gastrointestinal systems and thereby leading to prolonged hospitalization and increased morbidity and mortality.

Several methods have been deployed to achieve adequate post-operative analgesia. Traditionally analgesia is provided parenterally by drugs such as Opioids and NSAIDS. Opioids are also administered neuraxially as part of multimodal approach. However, they are associated with side effects like nausea, vomiting, pruritus, sedation, respiratory depression, urinary retention and constipation. Besides complications, considering the effects of the opioid on breastfeeding is vital, as opioid passes into breast milk and lead to infant mortality secondary to CNS depression. Thus, alternative strategies are needed to reduce its consumption and decrease opioid related side-effects.

Use of intravenous Paracetamol which has a better safety profile is commonly practiced in many Obstetric centers including ours. It is a non-opioid analgesic which exerts its analgesic activity by inhibiting the synthesis of prostaglandins in central nervous system. This central analgesic action raises pain threshold but has weak peripheral anti-inflammatory component.

Alternatives to provide post-caesarean pain relief are to use epidural analgesia,patient-controlled analgesia (PCA) and ultrasound-guided nerve block which are known techniques to provide effective analgesia. But they are more often associated with the challenge of limited supply related to medical equipments.

Infiltration of long-acting local anaesthetic at wound site appears to be an attractive method because of its simplicity, safety, and affordability. Due to their favorable analgesic properties, local anesthetic drugs have become increasing popular in the treatment of surgical pain. Following their infiltration into the surgical wound, local anesthetic drugs modulate peripheral pain transduction by inhibiting the transmission of noxious impulses from the site of injury and decreasing efferent barrage and central sensitization.

Pain following caesarean section involves two components, namely somatic pain from abdominal wall incision and visceral pain from uterine contractions. Different mechanisms underlie somatic and visceral pain transmission, at spinal and supraspinal levels, supporting different sensitivity to analgesics. Majority of the pain experienced by a patient is from the abdominal wall incision. The inflammatory response to surgical incision can be reduced with the subcutaneous infiltration of local anaesthetic as it has been shown to reduce the levels of interleukin 10 in the wound.6 Local anaesthetics, particularly Bupivacaine administered subcutaneously exhibit bacteriostatic and bactericidal action.

The result is in line with the study done by Zewdu D *et al*. (2021)[7] which found that wound site infiltration with 20 ml of 0.25% Bupivacaine acted for 314 ± 47.71 mins compared to the control group 216 ± 43.18 mins. Another prospective study conducted by Kakade AS *et al.* (2019)[8] showed port site and intraperitoneal instillation of 0.25% Bupivacaine (20ml) had a prolonged mean duration of analgesia (315.60±79.9 mins) as compared to control group 138.20 ± 46.97 mins. Kamel*et al.* (2018)[9]found that the time for first request analgesia in Bupivacaine infiltration group was 153 ± 50min compared toconventional intravenous group (55 ± 13 min) in IV Paracetamol + Ketorolac group. This short duration of analgesia may be attributed to use of 0.125% Bupivacaine.

Similarly, duration of action of local infiltration with different local anaesthetics has been reported variably in the range of 4.2-9.5hours by Nguyen *et al*. (2010)[10] (Ropivacaine-4.2 hours), Juliana *et al.* (2022)[11] (Bupivacaine+Lignocaine 6.63 hours) Kingsnorth AN *et al.* (2002)[12] (Levobupivacine-9.5 hours). In our study, the longest duration of analgesia was 1440mins

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with Bupivacaine (1 patient) and 300mins with Paracetamol (5 patients) 3 patients in Group B had analgesia more than 8 hours.

In a study conducted by Anirban Pal (2014)[13]Paracetamol 1G IV was given every 8 hours in 30 post-operative cases of total abdominal hysterectomy which demonstrated that Intravenous Paracetamol did not produce post-operative analgesia beyond 4 hours; the mean VAS values were higher from 4-12hr post-operatively, and remained high for the first 24 hour after surgery and 50% of patients were supplemented with rescue analgesia of which 80% alone were supplemented within 4 hour post-operatively[14].

CONCLUSION

It is concluded from our study that Bupivacaine (0.25%) local wound infiltration is a preferable technique compared to Intravenous Paracetamol (1G 8th hourly) for post-caesarean pain relief following spinal anaesthesia since,

1. It provides early, rapid and prolonged analgesia with less requirement of cumulative rescue doses and better patient satisfaction over 24hrs.
2. Infiltration is technically simple, needing no special expertise and is highly cost- effective.

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