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Original Research Article

AN EVALUATION OF THE POSTOPERATIVE ANALGESIC EFFICACY AND OPIOID SPARING EFFECTOF TRANSVERSUS ABDOMINIS PLANE BLOCKAFTER CAESAREAN SECTION

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Abstract

The analgesic regimen needs to meet the goals of providing safe and effective analgesia with minimal side effects for the mother and her baby. A multimodal approach to postoperative analgesia after caesarean section is required.

Materials and Methods: 50 female patients who underwent caesarean section by pfannenstiel incision at, were taken up for study. This study done at Dept of Anaesthesiology, Esic medical college and hospital Kalaburagi

Results: In our study we have evaluated the analgesic efficacy and opioid sparing effectof Transversus abdominis plane block in caesarean section for postoperative painrelief, the observation and results were analyzed, using two sample student's t-test and chi square test, the results were considered statistically significant when "p" valuewas ≤ 0.05.

Conclusion: Transversus abdominis plane (TAP) block as a component of multimodal analgesia provides highly effective postoperative analgesia inthe first 24 hours after caesarean sections.

Keywords: TAP, Caesarean

Introduction

Caesarean section is a major surgical procedure after which substantial postoperative discomfort and pain can be anticipated.[1] The provision of effective postoperative analgesia is important to facilitate early ambulation, infant care (including breast feeding, mother infant bonding)and prevention of postoperative morbidity.[1] The analgesic regimen needs to meet the goals of providing safe and effective analgesia with minimal side effects for the mother and her baby. A multimodal approach to postoperativeanalgesia after caesarean section is required. Postoperative pain is often treated with systemic or neuraxial opioids.Although single-shot neuraxial analgesic technique using long-actingopioids, or patient-controlled epidural opioid administration, produceeffective analgesia, they are associated with side effects, like nausea, vomiting, and pruritus, which reduces overall patient satisfaction.[1,2] Use of opioids and their subsequent side effects can be reduced or eliminated by regional anaesthesia with local anaesthetics. Direct blockade of the neural afferent supply of the abdominal wall, such as abdominal field blocks, ilioinguinal, and hypogastric nerve blocks provide significant postoperative analgesia in patients undergoing caesarean section.[3] However, the lack of clearly defined anatomical landmarks make the abdominal wall blockade difficult in patients undergoing caesarean section. All these lead to thedevelopment in new post operative pain relief methods. An alternative,simple, reliable and effective regional analgesic technique is required.

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An important component of pain experienced by patients after abdominal surgery is from the abdominal wall incision. The nerves that supply the anterior abdominal wall course through the neurofascial plane between internal oblique and transverses abdominis muscles.[8, 9] By injectinglocal anaesthesia into the transverses abdominis plane via petit triangle, it is possible to block the sensory nerves of the anterior abdominal wall, before they leave this plane and pierce the musculature to innervate the entireanterior abdominal wall on that side.[10, 11] TAP Block as a part of multimodal analgesic regimen would result in decreased opioid consumptionand improved analgesia.[4-7] Thus the efficacy of Transversus abdominis plane (TAP) block in providing postoperative analgesia in caesarean section and its opioid sparing effect is evaluated in this study.

Materials and Methods

50 female patients who underwent caesarean section by pfannenstiel incision at, were taken up for study. This study done at Dept of Anaesthesiology, Esic medical college and hospital Kalaburagi

Case definition

Female patients of age group 18-35 with ASA I and II undergoingcesarean section by pfannenstiel incision

Groups

Group(R): Ropivacaine group – 25 patients Group (N): Normal saline group – 25 patients
Outcome Measures for this Clinical TrialPrimary Measures:

- To evaluate efficacy and safety of TAP Block

Secondary Measures:

- To evaluate pain scores at 1, 2, 3, 4, 5, 6, 12, 18, and 24 hrs after surgery
- To evaluate the time it takes for a woman to ask for the first analgesic medication after the surgery
- To evaluate postoperative total opioid consumption
- Eligibility:
- Ages: Between 18 and 35 years
- Gender: Female

Inclusion Criteria:

- ASA physical status class I and II
- Age between 18 and 35 years

Exclusion Criteria:

- Patient refusal
- Patient with known reaction to local anaesthetics
- History of bleeding diathesis
- Known psychiatric illness,
- Patients on chronic analgesics.

Results

In our study we have evaluated the analgesic efficacy and opioid sparing effectof Transversus abdominis plane block in caesarean section for postoperative pain relief, the observation and results were analyzed, using two sample student's t-testand chi square test, the results were considered statistically significant when "p" valuewas ≤ 0.05.

The patients included in this study were divided into two groups consisting of25 patients each. Group R (n=25) received ROPIVACAINE
Group N (n=25) received NORMAL SALINE

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Groups were comparable in terms of age, weight and duration of surgery. Inall patients, the triangle of Petit was located easily on palpation, the transversus abdominis neurofascial plane was localized after one to two attempts, and the blockperformed without complication.
In order to ascertain the significance of demographic features, sample data wereanalysed using chi square test, continuous variables are analysed using two samplestudent t-test.

Table 1: Age distribution

Drug groups / Age groups	R	N
20-25	14	11
25-30	9	11
30-35	2	3
Total	25	25

Table 2: Age in years

Group	N	Mean	Std.deviation	Std.Error	p value
R	25	25.4000	3.16228	.63246	
N	25	26.4400	3.53648	.70730	>0.05

The two groups were similar with respect to age distribution anddifference was statistically insignificant (p >0.05).

Table 3: Weight in kilogram

Group	N	Mean	Std.deviation	Std.Error	p value
R	25	55.8000	3.74166	.74833	
N	25	56.8800	3.90854	.78171	>0.05

The two groups are comparable with respect to weight anddifference is statistically insignificant (p >0.05).

Table 4: Duration of surgery in minutes

Group	N	Mean	Std.deviation	Std.Error	p value
R	25	37.3200	4.44147	.88829	
N	25	37.8400	4.33667	.86733	>0.05

The two groups were comparable with respect to duration of surgery and difference was statistically insignificant (p >0.05).
Thus the groups were comparable with respect to Age, Weight, Duration of surgery, but the differences were statistically insignificant (p value > 0.05), so that the difference proved in other variables has least possibility of occurring by chance.

Table 5: VAS pain score:

VAS Score	Drug groups		P value
	R	N	
1 hr	0	1.28±1.10	>0.05
2 hr	0	5.20±0.52	<0.05
3 hr	0	3.64±0.38	<0.05

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4 hr	0	4.92±0.20	<0.05
5 hr	1.52±0.93	5.04±0.47	<0.05
6 hr	1.92±0.91	4.8±0.35	<0.05
12 hr	2.24±0.62	4.68±0.54	<0.05
18 hr	2.20±0.62	4.48±0.51	<0.05
24 hr	2.00	4.00±0.64	<0.05

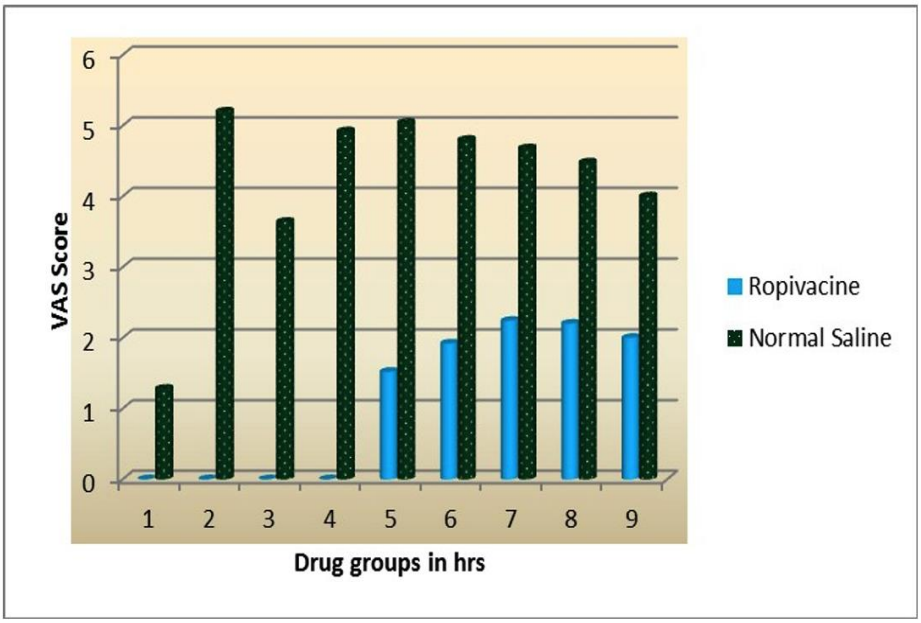

Fig.1. Postoperative vas pain scores

Postoperative VAS pain scores were significantly reduced inRopivacaine group in all the time intervals when compared to Normal saline group as shown in table.5.

Table 6: Heart rate in beats/minute

Time	Group(R)	Group(N)	p value
1 hr	100.44±5.21	102.88±5.74	>0.05
2 hr	97.08±4.91	100.08±6.22	>0.05
3 hr	95.68±4.36	99.96±5.61	<0.05
4 hr	93.98±5.10	98.12±4.84	<0.05
5 hr	92.68±4.51	97.24±4.67	<0.05
6 hr	91.80±3.44	92.28±7.73	>0.05

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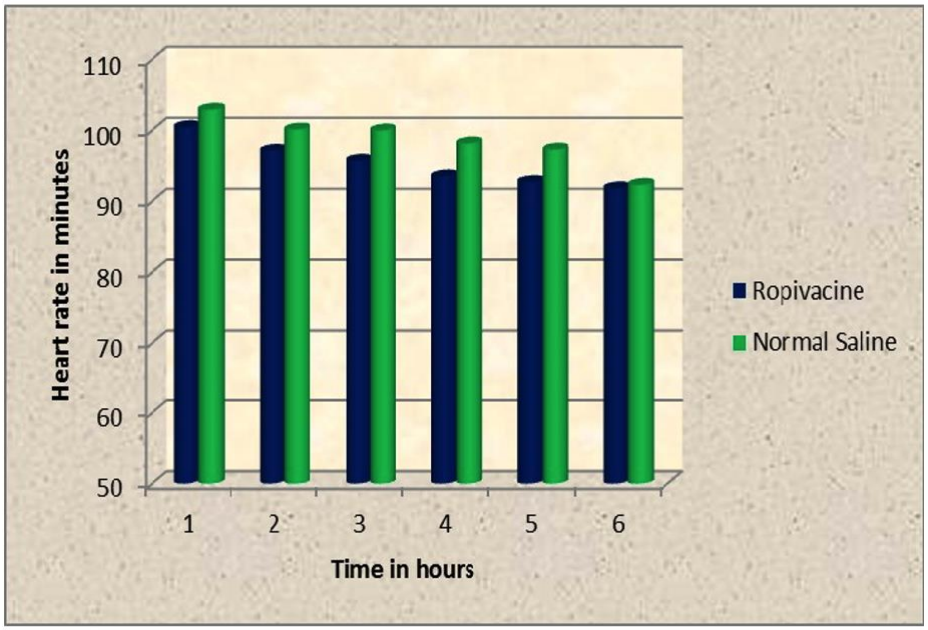

Fig.2. Bar chart for postoperative HR in minutes

Ropivacaine group has decreased HR in all the intervals compared to Normalsaline group with statistical significance ($p < 0.05$)

Table 7: Blood pressure in mmHg

1	Systolic BP			Diastolic BP		
Timehours	Group(R)	Group(N)	p value	Group(R)	Group(N)	p value
1	107.12±4.59	106.2±43.28	>0.05	68.32±4.19	68.60±4.19	>0.05
2	104.24±5.15	108.32±2.62	<0.05	65.12±4.12	67.12±2.89	<0.05
3	103.74±5.07	106.24±3.48	<0.05	63.36±5.62	66.96±4.00	<0.05
4	103.76±3.75	106.72±2.91	<0.05	62.16±4.24	64.72±3.24	<0.05
5	103.56±3.32	106.48±3.93	<0.05	62.80±3.74	64.80±2.71	<0.05
6	104.32±3.14	107.68±3.68	<0.05	63.68±3.35	66.64±3.09	<0.05

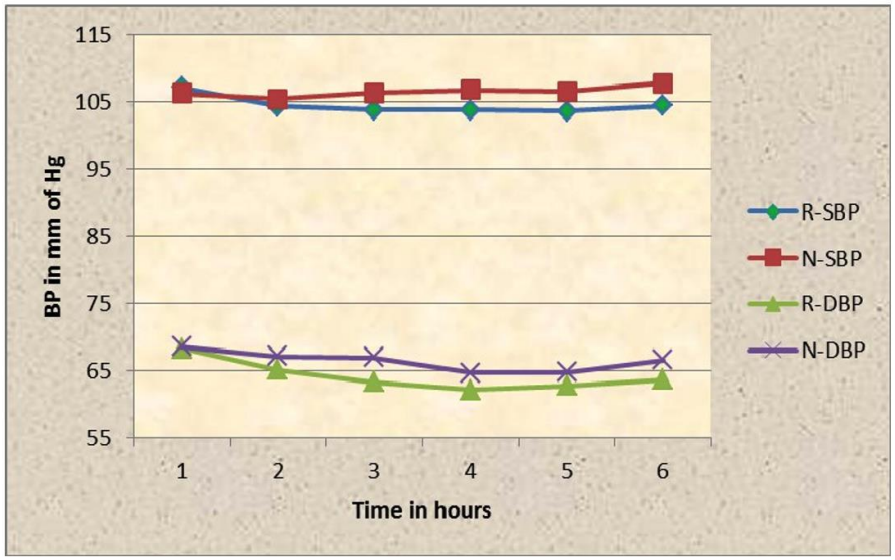

Fig.3. Line diagram for postoperative blood pressure in mmHg

Both R and N groups had a very normal mean systolic BP and diastolic BP inall analyzed intervals

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which shows a statistically significant 'p' value ($p < 0.05$) except in the 1st hour which showed statistically insignificant value ($p > 0.05$).

Table 8: Total Tramadol requirement

Groups	N	Mean	Std.deviation	Std.Error	p value
R	25	104	4.38	0.89	<0.05
N	25	324	26.15	5.34	

Table 9: Time for first demand of analgesic in minutes

Group	N	Mean	Std.deviation	Std.Error	p value
R	25	290.00	20.9414	4.1883	<0.05
N	25	81.00	8.9629	1.7925	

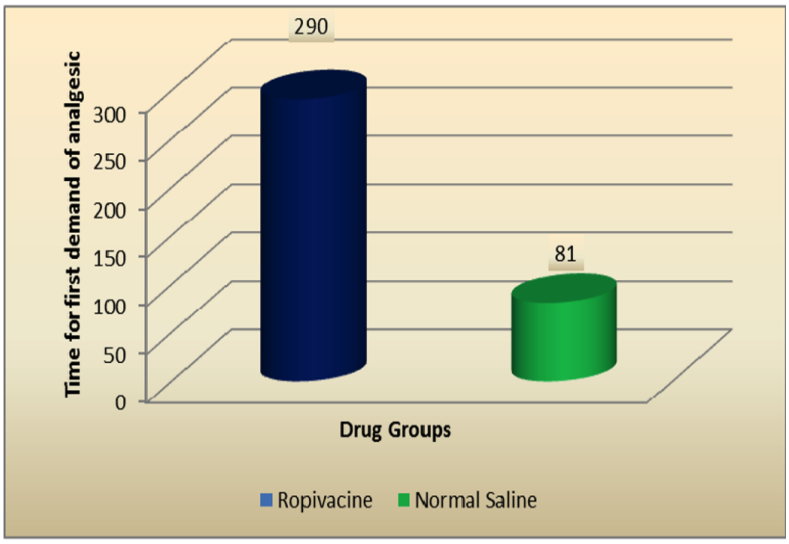

Fig 4.Bar chart for first demand of analgesic

Total Tramadol consumption was less in Ropivacaine group (104±4.38mg)than in Normal saline group (324±26.15 mg), the mean difference of 220mg with $p<0.05$ was statistically significant as shown in (table 9), likewise the mean time for first request of rescue analgesic was 290±20.94 minutes in Ropivacaine group, when compared with 81±1.79 minutes in the Normal saline group which is nearly 3½ times lesser than Ropivacaine group. The difference of 209 minutes with $p<0.05$ was statistically very significant as shown in.

DISCUSSION

Pain after caesarean section is often severe. Effective analgesia has shown to reduce postoperative stress response and accelerate recovery, early ambulation, infant care (including breast feeding, maternal-infant bonding) and prevention of postoperative morbidity from caesarean section. It is well recognized that local anaesthetic techniques can improve the quality of postoperative recovery by reducing pain and analgesic requirements.

We conducted a randomized, double-blind, case-control study to evaluate the postoperative analgesic efficacy and opioid sparing effect of TAP block which was based on *McDonnell et al*,[4] management of postoperative pain secondary to caesarean section by the use of a single-shotTAP block.

Caesarean section under regional anesthesia provides an excellentopportunity to perform TAP block. Injection in the postoperative period avoids operating room time delays, and by that time

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the neonate has already been delivered and is not placed at risk. So we performed TAP block at the end of surgery. In our study we used 20 ml of 0.375% Ropivacaine or Normal saline on each side for TAP block which is comparable to *McDonnell et al*,[4]bilateral TAP block for caesarean section with 1.5 mg/kg of 0.75% ropivacaine (to a maximal dose of 150 mg) or saline on each side.

We selected Tramadol for rescue analgesia as several studies have confirmed the analgesic effects of single-dose intramuscular tramadol 50– 100mg can provide effective postoperative analgesia comparable to that obtained with morphine, pentazocine and ketorolac.
Bilateral TAP block has been demonstrated to provide excellent analgesia to the skin and musculature of the anterior abdominal wall in patients undergoing caesarean section. All patients in Ropivacaine group breathed deeply, coughed freely, moved without limitation and showed goodsatisfaction as compared to Normal saline group.

Our study results had demonstrated that end operative TAP block reduced VAS score significantly in the study group at all the intervals when compared to control group. Interestingly the VAS score was zero in study group for the first 4 hours which itself explains the effectiveness of TAP block. VAS score even at the end of 24 hours was 50% less than the control group. It is well correlated with the findings of *McDonnell JG et al*,[4] which explains the extension of pain relief by TAP block upto and beyond 24hours. The reason for prolonged duration of analgesic effect after TAPblockade may be due to the relatively poor vascularisation and slowed drug clearance from Transversus abdominis plane, and may be due to avoidanceof central sensitization by giving TAP block end operatively.
Ropivacaine group showed decreased HR and BP with statistical significance which could be explained by the pain mediated sympathetic stimulation (stress response) that occurred in early hours of postoperative period in Normal saline group.

In our study the mean time for first request of rescue analgesic was 290±20.94 minutes in Ropivacaine group, when compared with 81±1.79 minutes in the Normal saline group, the difference of 209 minutes with $p<0.05$ was statistically very significant as shown in (fig. 12). Total Tramadol consumption was less in Ropivacaine group (104±4.38mg) than in Normal saline group (324±26.15 mg), the mean difference of 220mg was statisticallysignificant as shown in (table 9). Thus TAP block as a component of multimodal analgesia has decreased the total tramadol consumption and delayed the time for first demand of rescue analgesic by nearly 3½ times. *McDonnell et al*,[4] demonstrated that the TAP block reduced overall postoperative morphine requirements by more than 70% in the first 48 postoperative hours and alonger time to first PCA morphine request.
McDonnell et al, [4, 12] demonstrated that even with the reduction in postoperative opioid requirements, the TAP block did not reduce the incidence or severity of PONV. This may have been because the amount of morphine consumed in the TAP block group was sufficient to induce PONV.In our study the incidence of PONV was very much reduced in both study group and control group because we had chosen a weaker opioid (i.m.Tramadol) when compared to Morphine which has proportionately higher incidence of PONV.
The only difficulty we expected during the study was blinding. Although patients and the investigator conducting the postoperative assessments were technically blinded to group allocation, true blinding may not have been possible as there would be an appreciable loss of sensation or paraesthesia associated with the TAP block. Investigators were strictly instructed to ask only VAS score and not to determine the level of sensory blockade in order to reduce the risk of blinding of group allocation
Complications like peritoneal and visceral punctures related to TAP block were not

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encountered in our study. *Farooq M, Carey M.* in 2008[13] reported a case of Liver Trauma with a blunt regional anesthesia needlewhile performing Transversus Abdominis Plane Block. Thorough familiaritywith anatomy, safe monitoring and injection technique, knowledge of local anaesthetic pharmacology and toxicity would prevent the possibility of complications and simplify the TAP block technique. These precautions willprevent major complications with TAP block. The use of ultrasound toconfirm needle position is a promising approach that should further reduce the risk of this complication.

CONCLUSION

Transversus abdominis plane (TAP) block as a component of multimodal analgesia provides highly effective postoperative analgesia inthe first 24 hours after caesarean sections. As a component of multimodal analgesic regimen TAP block significantly reduced opioid consumption.TAP block was easy to perform, and provided reliable and effective analgesia in this study, and no complications due to the TAP block were detected.

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