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Transversus Abdominis Plane (TAP) Block with Ropivacaine Using 'Double-Pop' Technique for Postoperative Analgesia

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Abstract:
Background*: Major abdominal procedures are linked to a variety of metabolic and inflammatory responses, which could turn into moderate to severe postoperative pain, increasing morbidity and consequences such as pneumonia and myocardial infarction. In patients undergoing major abdominal surgeries, Cesarean section, and abdominal hysterectomy, recent investigations have shown that TAP block provides good analgesia and lowers postoperative morphine use*
Aim: *To compare the therapeutic efficacy of 'double pop' TAP block technique with 0.2 percent ropivacaine in postoperative pain management in patients scheduled for elective Cesarean section versus.*
Materials and Methods:*Hundred women belonging to American Society of Anaesthesiologists (ASA) grade 2 posted for elective cesarean section were allocated randomly into two groups. Group A (case group) patients received ropivacaineand group B(control) patients received saline.Age, pain scores at rest. Pain scores during movement, mean tramadol consumption, request for 1st rescue analgesia and side effects were compared between two groups.*
Results:*There is no significant difference in the mean age and mean duration of surgery among patients of both groups. There is significantly less pain during rest and during movement as per the Visual analogue scale(VAS)in group B patients compared to group A patients. Total dose of tramadol consumed was more significantly in group B patients compared to group A patients. Group B patients request for rescue analgesia 1st time in less duration compared to group A patients.*
Conclusion: *Transversus abdominis plane block using 'double-pop' technique provided a substantial reduction in opioids like tramadol consumption when compared with control group.*
Key Words: *Control group, Double tap, Postoperative analgesia,Ropivacaine, Transverse abdominis block*

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I. Introduction

Major abdominal procedures are linked to a variety of metabolic and inflammatory responses[1] which could turn into moderate to severe postoperative pain, increasing morbidity and consequences such as pneumonia and myocardial infarction.[2] For treating pain after abdominal procedures, several analgesic methods have been described. Systemic opioids are useful for post-operative analgesia, although they frequently cause nausea, vomiting, ileus, urine retention, and respiratory depression.[3] They also prolong postoperative ileus[4] and impede colonic mobility recovery. A non- steroidal anti-inflammatory medicine (NSAID) that is employed in the treatment of inflammation are opioid analgesic enhancers, but do not lessen opioid-related adverse effects.[5] Epidural analgesia is thought to be important in 'pain management postoperatively' following abdominal surgery.[6,7] Although studies have failed to show that it reduces the length of stay[8,9]in the hospital. In patients undergoing abdominal procedures like as Cesarean section and inguinal herniorrhaphy[10-11,] blocking afferent neural supply of abdominal wall directly like field blocks of abdomen, ilioinguinal nerve blockage, has been utilized for post-operative analgesia. Rafi[12] demonstrated a "transversus abdominis plane (TAP) block", a modified abdominal field block applied via the triangle of Petit. In patients undergoing major abdominal surgeries, Cesarean section, and abdominal hysterectomy, recent investigations have shown that TAP block provides good analgesia and lowers postoperative morphine use. Patients who received TAP had lower rates of postoperative nausea, vomiting, and drowsiness. TAP is increasingly being employed in abdominal procedures

like appendicectomy and incisional hernia repair.[13]Although the TAP has been found to give adequate analgesia following a variety of abdominal procedures, it is a blind procedure with reported consequences including injection of local anaesthetic intraperitoneally and visceral injury.[14-15]Also, locating anatomical markers may be difficult in obese patients, making the block challenging. TAP has been shown to be ultrasound guided in a few recent studies[16-18].

Aim:
Our goal is to comparethe therapeutic efficacy of 'double pop' TAP block technique with 0.2 percent ropivacaine in postoperative pain management in patients scheduled for elective Cesarean section versus.

II. Material And Methods

This study was carried out at a tertiary care centre in India from January 2020 to July2022.
Study Design: Interventionalstudy
Study Location: This study was done at a tertiary care teaching institute in the Department of anaesthesia at Great Eastern Medical School and Hospital, Srikakulam, Andhra Pradesh, India.
Study Duration: January 2020 to July 2022
Sample size: 100 Patients
Simple random sampling was the sampling procedure used.

Sample size calculation: In relation to McDonnell J et al's study[19], the sample size was calculated using the formula $N= (Z+Z)^2xSD^2x2d^2$, as per 5% error and 95% confidence intervals, the minimum sample size came to be 87. So, we included 100 patients in our study.

Subjects & selection method:
Group A consisted of 50 patients who received TAP with 10 ml of 0.2 percent Ropivacaine on each side(cases), while Group B consisted of 50 patients who received TAP with 10 ml ofsaline on each side(controls).

Eligibility criteria:

Inclusion criteria:
1. Patients aged above 18 years scheduled for elective cesarean section.
2. Patients who provided informed consent to participate in the study.
3. Patients with ASA grade II.

Exclusion criteria:
1. Patients with infection at injection site
2. Patients with coagulation disorders
3. Patients who used NSAIDs or opioids in last 48 hours
4. Patients with BMI above 35 kg/m2.
5. Patients with fibromyalgia
6. Patients with incomplete data

III. Methodology:

Each patient was preloaded with 10 ml/kg of lactated Ringer's solution before giving spinal anaesthesia. Subarachnoid anaesthesia was administered in the L3-4 or L4-5 interspaces, according to asepsis and antisepsis protocols. A 23 Quincke Babcock spinal needle was used to administer 2-2.5 ml of hyperbaric Bupivacaine. 30 minutes prior to the operation, all patients received Inj Ondansetron 4 mg IV and Inj Rantac 150 mg IV. At the conclusion of surgery, the TAP block was administered using a 'double-pop' approach based on anatomical landmarks, after which the patients were transported to the recovery room for continued monitoring

The TAP block was performed at the end of the process using a blind 'double pop' or loss-of-resistance method. To begin, an 18 G needle was used as an introducer to remove the cushioning effect of the subcutaneous tissue. Then a 23-gauge Quincke Babcock blunted spinal 38 anaesthetic needle connected to a syringe filled with the research solution was inserted through the introducer needle.

Parameters assessed:
- Age
- Pain scores at rest
- Pain scores during movement
- Total tramadol consumption

- Request for 1st rescue analgesia
- Side effects

Pain was assessed using visual analogue scale score, which is a 11-point scale in which 0 indicates no pain, 5 indicates moderate and 10 indicates worst pain.

Statistical analysis:
Data was analyzed using SPSS software version 24.0. Results were expressed as percentages and mean with standard deviation. Students t test was used to compare numerical parameters between two groups and chi square test was used to compare categorical parameters between two groups. P value below 0.05 is considered significant.

Ethical considerations:
Informed consent was taken from every patient participated in the study. Ethical committee approval was taken before starting the study.

IV. Results

The current study included 100 patients scheduled for elective cesarean section.

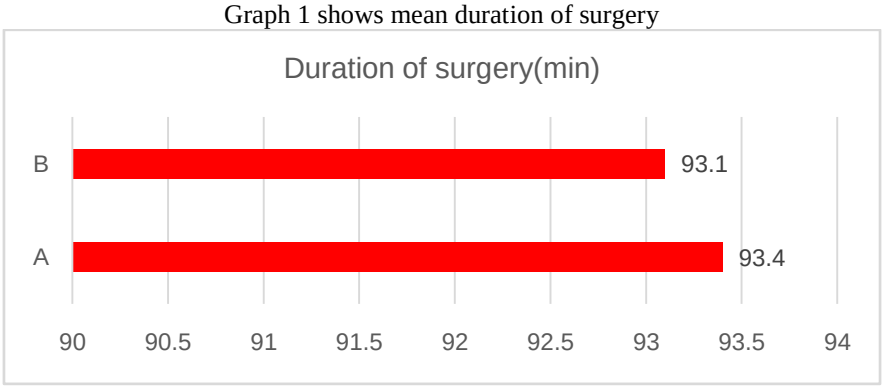
Age:
There is no significant difference in the mean age of patients between two groups(p=0.11).

Table 1 shows mean age of patients

Group	Mean age	P value
A	27.9±4.99	0.11
B	29.3±3.2	

Mean duration of surgery:
There is no significant difference in the mean duration of surgery between two groups (p=0.73).

Graph 1 shows mean duration of surgery



Pain scores at rest:
There is a significant difference in the pain scores between two groups at various intervals. They were significantly more in group B patients (control patients).

Table 2 shows mean VAS scores for postoperativepain among groups A and B during rest

Time(hrs)	**Group A**	Group B	**P value**
0	0 0.20±0.40	0.04±0.19 0.014	0.014
1	1.48±0.58	2.42±1.14	<0.001
6	2.78±1.01	2.74±1.00	<0.001
12	2.84±0.95	3.44±1.01	0.003
24	2.56±0.70	2.28±0.45	0.02

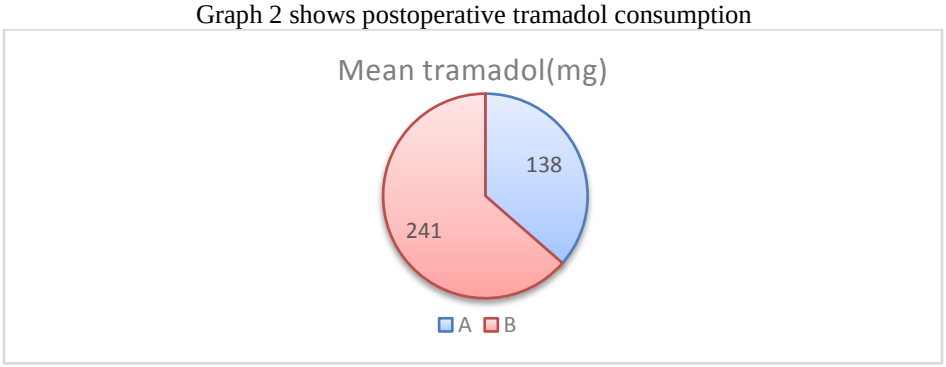
Pain scores during movement:
There is significant difference in the pain scores between two groups at various intervals.They were significantly more in group B patients (control patients).

Table 3 shows mean VAS scores for postoperativepain among groups A and B during movement

Time(hrs)	**Group A**	Group B	**P value**
0	0.80±0.80	0.22±0.50	<0.001
1	1.92±0.66	3.08±1.15	<0.001
6	3.58±0.99	3.32±1.13	**0.22**
12	3.66±0.96	4.22±0.93	0.004
24	3.2±0.70	3.0±0.35	0.07

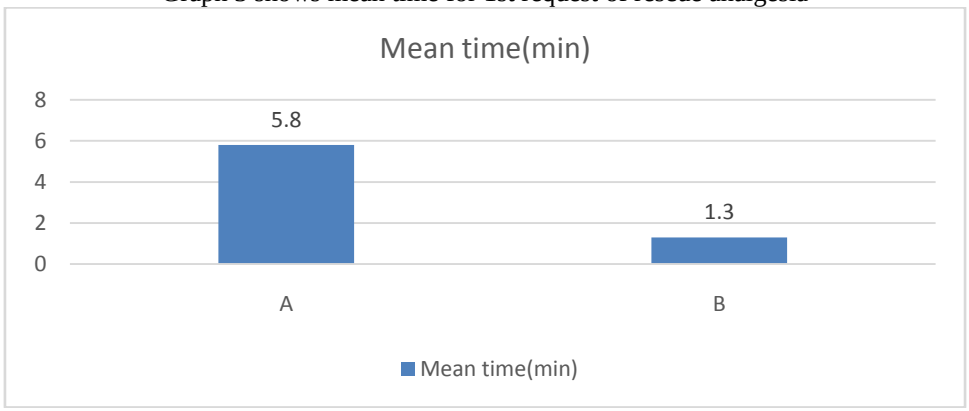
Postoperative tramadol consumption:
Group B patients had significantly more tramadol consumption compared to group A patients(p=0.001).

Graph 2 shows postoperative tramadol consumption



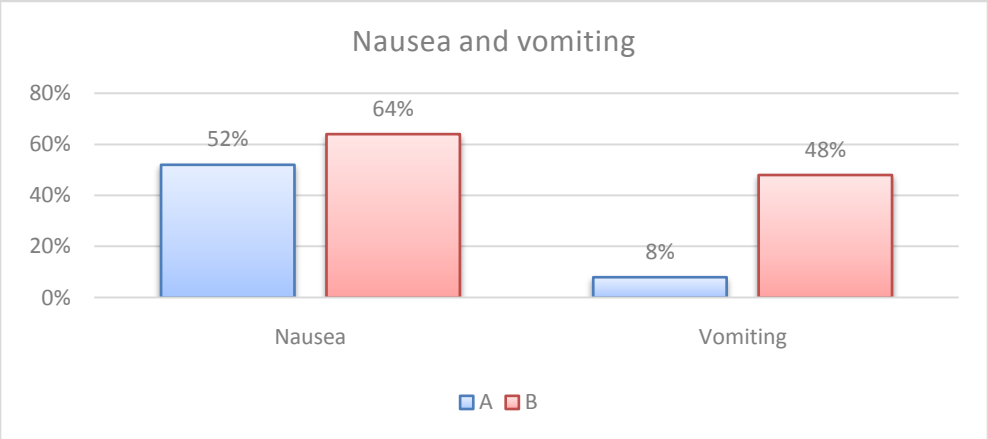
1st request for rescue analgesia:
Group B patients required significantly less time for 1st request for rescue analgesia compared to group A patients(p=0.001).

Graph 3 shows mean time for 1st request of rescue analgesia



Nausea and vomiting:
Nausea and vomiting were more commonly seen among group B patients.

Graph 4 shows nausea and vomiting among two groups



V. Discussion

Hundred women belonging to American Society of Anaesthesiologists (ASA) grade 2 posted for elective cesarean section were allocated randomly into two groups. Group A (case group) patients received ropivacaine and group B (control) patients received saline. Age, pain scores at rest. Pain scores during movement, mean tramadol consumption, request for 1st rescue analgesia and side effects were compared between two groups. Results showed that there is no significant difference in the mean age and mean duration of surgery among patients of both groups. There is significantly less pain during rest and during movement as per the Visual analogue scale (VAS) in group B patients compared to group A patients. Total dose of tramadol consumed was more significantly in group B patients compared to group A patients. Group B patients request for rescue analgesia 1st time in less duration compared to group A patients.**Belavy et al.**[20]assessed the effect of TAP using Ropivacaine on each side among patients undergoing caesarean section, but without spinal Morphine. Postoperative opioid consumption was reduced for 1st six postoperative hours and cumulative opioid consumption at 24 h 69 was reduced in the active group. **Costello et al**[21]found no analgesic benefit from TAP that is performed using ultrasound in patients undergoing Caesarean section under spinal anaesthesia. In the study by **McDonnell et al**[19], the block was given preoperativelyin patients undergoing colorectal surgery via midline incision under general anesthesia, by injecting 20 ml of 0.375% Levobupivacaine solution on each side through triangle of Petit. The pain scores were reduced at all time points up to 48 hrs postoperatively both at rest and on movement. The transversus abdominis plane block reduced postoperative opioid requirements, similar to our study.

In one study,[18]TAP block was done with 0.75 percent Ropivacaine and found that there is reduced postoperativeopioid consumption at all time points till 48 hours. There is an increased delay to 1st need for supplementary analgesia in patients undergoing abdominal hysterectomy. During postoperative period, the block group had reduced VAS pain levels at rest and on movement, similar to our study.

VI. Conclusion

Transversus abdominis plane block using 'double-pop' technique provided a substantial reduction in opioids like tramadol consumption when compared with control group. TAP with 0.2% Ropivacaine significantly decreased time to 1stdose of rescue tramadol. The technique was found to be safe and effective. TAP blocks can be administered with minimal resources and great effectiveness if the anatomy and "cushion effect" are understood. It is also important to master the end points i.e., "bounce" followed by "pop" and free flow of LA at the end of injection to ensure deposition of LA in the right plane.

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