

## Original Research Article

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# Comparative study of ropivacaine versus dexmedetomidine-ropivacaine combination in transversus abdominis plane block for postoperative pain control in plastic surgery patients undergoing abdominoplasty

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## ABSTRACT

**Background:** Requirement of postoperative analgesic medication is decreased by the use of regional nerve blocks. Transversus abdominis plane (TAP) block is an effective way to provide postoperative analgesia in abdominal surgeries. TAP block using ropivacaine alone has not been consistently proven to be effective in alleviating pain after abdominal surgeries. The objective of the study was to compare the combination of dexmedetomidine and ropivacaine to ropivacaine alone in TAP block for abdominoplasty patients. Time to onset of post-operative pain and time interval for need of rescue analgesia were compared.

**Methods:** Sixty ASA (American Society of Anesthesiology) grade I or II patients undergoing abdominoplasty were allocated to two groups with thirty patients in each group. In this randomized, controlled, double-blinded study, the test group received TAP block using 20 ml (100 mgs) 0.5 percent of ropivacaine mixed with 50 µg of dexmedetomidine while as Control group received TAP block with 20 ml (100 mgs) of 0.5 percent of ropivacaine alone. Patient demographics, time to initial reporting of post-operative pain, time to need of first rescue analgesia, quality of pain block and side effects were recorded.

**Results:** Time to initial onset of pain and time to need of first rescue analgesia were significantly longer in the test group than control group. The two groups were similar in demographics and quality of pain block, with no significant difference in side effects.

**Conclusions:** Addition of dexmedetomidine to ropivacaine for TAP block in abdominoplasty patients prolong the time to initial onset of pain and time to need for first rescue analgesia.

**Keywords:** TAP block, Ropivacaine, Dexmedetomidine, Abdominoplasty

## INTRODUCTION

In abdominal surgeries, major reason for the pain is the abdominal wall incision. Various modalities have been used for the postoperative analgesia such as systemic administration of non-steroidal anti-inflammatory drugs (NSAIDS), opioids, ketamine, wound infiltration by local

anesthetics, epidural analgesia, transdermal analgesia, intravenous patient controlled analgesia (PCA), peripheral nerve blocks. The goal of postoperative pain management is to relieve pain while keeping the side effects to minimum. This is often best accomplished with a multimodal approach.<sup>1</sup> Acetaminophen in lower doses (<2 grams/day) is not an effective analgesic for moderate

to severe pain, while as higher doses can lead to adverse side effects. Similarly, using NSAIDs at high doses for moderate to severe pain can cause gastrointestinal injury and other adverse effects. There is a potential risk of opiates in high doses can lead to respiratory depression and death. Local analgesia can help in reducing the requirement of oral or IV analgesic agents, while ensuring good postoperative pain control. Transversus abdominis plane (TAP) block with ropivacaine has been shown to reduce postoperative use of opiates after abdominal surgeries.<sup>2,3</sup> However, the results have not been consistent, with some studies showing no additional postoperative pain control after TAP block using ropivacaine alone.<sup>4,5</sup> Dexmedetomidine has been used as an adjuvant to ropivacaine in TAP block to increase the duration of analgesia after various abdominal surgeries.<sup>6,7</sup> The main indications of TAP block are lower abdominal surgeries like appendectomy, hernia repair, cesarean section, abdominoplasty, abdominal hysterectomy and prostatectomy. There are reports of using TAP block in laparoscopic surgery as well. TAP block is capable of giving good analgesic effect in the region between T10 and L1 following a single posterior infiltration (in mid-axillary line) and to achieve higher block up to T6, it needs to be augmented with an anterior subcostal infiltration.<sup>8</sup>

Various studies have been conducted for the post-operative analgesia in abdominal surgeries by comparing the TAP block with placebo or local wound infiltration. In this study, we compared postoperative analgesia in two groups by giving TAP block using ropivacaine and ropivacaine-dexmedetomidine (RD) combination.

## METHODS

This randomized, prospective and double blinded study was carried out at District Hospital Ganderbal from August 2014 till July 2015 in patients having above 18 years of age, undergoing abdominoplasty under general anesthesia, with American Society of Anesthesiology (ASA) grade 1 or 2, who could understand and rate their pain on visual analog scale (VAS; scale of 0–10) and written informed consent was obtained. Sixty patients were included in this study and they were equally distributed into two groups using computer generated randomized list. Patients excluded from this study were those, who refused participation, ASA class III and IV patients, patients with any associated ailment, patients allergic to medication used. In the beginning of surgical procedure, in test group patients, bilateral TAP block was given using 100 milligrams (20 ml) ropivacaine 0.5% with 50µg dexmedetomidine diluted with normal saline to make total volume of 40 ml. In control group, bilateral TAP block was given using 100 milligrams (20 ml) ropivacaine 0.5% diluted with normal saline to total volume of 40 ml. The drugs were prepared by anaesthesiologist not involved in the study and drugs were coded, and decoded at the end of the study. The anaesthesiologist who administered the TAP block and

the investigator who assessed its outcome were blinded to the drug used.

### Technique of US-guided TAP block

Bilateral TAP block was performed on all the study patients according to their coded group allocation in the beginning of surgery after intubation. The ultrasound (US) probe was placed transverse to the abdomen (horizontal plane) in the mid-axillary line between the costal margin and the iliac crest. The layers of external oblique, internal oblique, and transversus abdominis muscles were identified. A 100-mm short bevel needle (22 gauge) was introduced in plane of the ultrasound probe and advanced until it reached the plane between the internal oblique and transversus abdominis muscle. Upon reaching the plane, a small volume of local anesthetic (1 ml) was injected to confirm the correct needle position after which the remaining dose (19 ml) of local anesthetic was infiltrated. The same process was repeated on the other side. After completion of TAP block and surgery, each patient was moved to the postoperative recovery room for monitoring of vitals, pulse oximetry, postoperative pain, and adverse effects. The endpoint was to assess duration and quality of postoperative analgesia in both groups. Quality was assessed by visual analogue scale (VAS), and frequency of rescue analgesia given and duration was assessed with the time at which first rescue analgesia was administered.<sup>9-11</sup> Patients were made familiar with visual analogue scale (VAS) preoperatively with score of 0 as no pain and 10 as worst imaginable pain. Patients were also observed for any drug induced side effects of like bradycardia and hypotension. Rescue analgesia was given when VAS score was  $\geq 3$  in the form of intravenous tramadol (1 mg/kg).

### Statistical analysis

All the collected data was entered in Microsoft Excel sheet and then transferred to SPSS software version 23 for analysis. Qualitative data was presented as percentages and frequency then analyzed using chi-square test of fisher's exact test (in case of 2x2 contingency tables). Quantitative data was presented as mean and SD, then compared by unpaired t-test or Man Whitney U test (in case of non-normal distribution).  $P<0.05$  was taken as level of significance.

## RESULTS

The two groups were comparable in terms of age, weight, height, ASA grade, VAS at initial reporting of postoperative pain, and quality of block as assessed by the anaesthesiologist (Table 1). The mean time for initial reporting of postoperative pain was significantly higher in the test group ( $7.6\pm2.01$  hours) as compared with control group ( $4.03\pm1.34$  hour;  $p<0.01$ ). The mean time to first rescue analgesia was significantly higher in the test group ( $8.8\pm2.29$  hour) when compared with control group ( $5.47\pm1.22$  hour;  $p<0.05$ ) (Table 2).

**Table 1: Comparison of patient characteristics in two groups.**

Patient characteristics	Test group	Control group	P value
	N (%)	N (%)	
<b>Age in years (SD)</b>	29.75 (3.62)	29.45 (6.72)	0.830
<b>Weight in kg (SD)</b>	80.15 (7.16)	81.05 (11.56)	0.617
<b>Height in cm (SD)</b>	154.40 (4.28)	155.50 (5.10)	0.258
<b>ASA grade 1 (%)</b>	23 (76.66)	20 (66.66)	
<b>ASA grade 2 (%)</b>	7 (23.33)	10 (33.33)	0.34

**Table 2: Comparison of time of pain onset, pain score and time interval of analgesic requirement.**

	Test group	Control group	P value
	N (%)	N (%)	
<b>Mean time to initial reporting of postoperative pain in hours (SD)</b>	7.60 (2.01)	4.03 (1.34)	0.0007
<b>VAS at initial reporting of postoperative pain</b>			
1	18 (60)	11 (36.66)	
2	9 (30)	10 (33.33)	0.09
3	3 (10)	9 (30)	
<b>Mean time to first rescue analgesia in hours (SD)</b>	8.80 (2.29)	5.47 (1.22)	0.03

**Table 3: Incidence of complications in both groups.**

Adverse events	Test group	Control group	P value
	N (%)	N (%)	
<b>Hypotension</b>	1 (3.33)	0	0.49
<b>Sedation</b>	2 (6.66)	0	0.23
<b>Bradycardia</b>	0	0	1

Difference in incidence of complications (like hypotension and sedation) between the two groups was statistically insignificant. None of the patients from either group experienced any hypotensive episode (Table 3).

## DISCUSSION

The study shows that addition of dexmedetomidine to ropivacaine resulted in a longer mean time to initial reporting of significant postoperative pain (7.60 vs. 4.03 hour;  $p=0.01$ ) and time to initial rescue analgesia (8.80 vs. 5.47 hour;  $p=0.03$ ) when compared with ropivacaine alone.

A study by Xu et al, showed that TAP block after emergency abdominal surgery with RD reduced the postoperative pain score on VAS scale up to 12 hours, increased the time to first use of PCA (248.5 vs. 157.5 min), and reduced the overall use of PCA when compared with ropivacaine alone.<sup>12</sup> One study showed that US-guided TAP block with RD reduced overall patient-controlled analgesia (PCA) use in patients undergoing abdominal hysterectomy when compared with ropivacaine alone.<sup>6</sup> Another study showed that in patients undergoing lower abdominal surgery, TAP block with RD combination reduced postoperative pain score on

VAS scale up to 12 hour when compared with ropivacaine alone.<sup>8</sup> However, the study conducted by Ding et al in patients who underwent gastrectomy did not show any difference in postoperative pain score or opiate use between ropivacaine alone and RD combination.<sup>7</sup> The results of this and previous studies suggest that addition of dexmedetomidine to ropivacaine in TAP block may improve postoperative pain and/or postoperative analgesic requirement in patients undergoing lower abdominal surgeries.

Several studies have explored other adjuvants with ropivacaine for TAP blocks. Addition of fentanyl to ropivacaine for TAP block after cesarean section in one study did not show any effect on mean time to first use of PCA, overall use of PCA, or in postoperative VAS scores when compared to use of ropivacaine alone.<sup>13</sup> Combination of dexamethasone to ropivacaine (Dex-R) for TAP blocks has also yielded inconsistent results in different studies. In one study, TAP block after inguinal hernia repair with Dex-R was associated with lower pain score at 24 hours postop and lower morphine use in the first 24 hours after surgery.<sup>14</sup> Similarly, TAP block with Dex-R combination was associated with lower VAS score 12 hours after surgery, longer time to first tramadol use, and total tramadol use when compared with ropivacaine alone after abdominal hysterectomy.<sup>15</sup>

However, another study showed that TAP block with Dex-R and ropivacaine did not differ in terms of postop pain score after inguinal hernia repair and spermatocelectomy.<sup>16</sup>

## CONCLUSION

In conclusion, this study shows that addition of dexmedetomidine to ropivacaine for TAP block in abdominoplasty patients leads to delay in time to onset of pain as well as delays use of rescue analgesia.

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