

# The comparison of effects of fentanyl and dexmedetomidine as adjuvants to ropivacaine for ultrasound-guided transversus abdominis plane block for postoperative pain in cesarean section under spinal anesthesia –A randomized controlled trial

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## Abstract

**Background and Aims:** Transversus abdominis plane (TAP) block has been effectively used for anterior abdominal wall analgesia. The aim of the study was to compare the duration of analgesia produced by two drugs fentanyl and dexmedetomidine as adjuvants to ropivacaine in TAP block under ultrasound-guidance after lower segment cesarean section in a randomized controlled trial.

**Material and Methods:** Sixty-four women of American Society of Anaesthesiologists (ASA) physical status II coming for cesarean sections were randomized to receive TAP blocks on each side of the abdomen using the local anesthetic drug 20 ml of 0.5% ropivacaine with either fentanyl 25 mcg or dexmedetomidine 25 mcg. A ten point numerical pain score was done at baseline, at 1 h and then at intervals of 4 h postoperatively. The hemodynamic parameters such as heart rate, blood pressure, and pulse oximetry were also monitored as above. The time to first analgesia demand from the time of the block and the total analgesic consumption were recorded. The statistical analysis was done by Mann-Whitney U test and the analgesics consumption by using Chi-square test with R software.

**Results:** Our primary end-point was to assess the duration of analgesia produced by fentanyl added to ropivacaine for ultrasound-guided TAP block, which were 125 min with Q1–Q3 as 110–180 and dexmedetomidine 130 min with Q1–Q3 as 105–161 ( $P$  value = 0.47). The amount of analgesics used in the postoperative period in both the groups were analyzed using the Chi-square test not found to have any significant difference between both the groups ( $P$ -value = 0.512).

**Conclusion:** Fentanyl and dexmedetomidine as adjuvants to ropivacaine in ultrasound-guided TAP block were equally effective in both prolongation of analgesia and reducing the total consumption of analgesics.

**Keywords:** Dexmedetomidine, fentanyl, ropivacaine, transversus abdominis plane block, ultrasonography

## Introduction

Analgesia is very important after operative delivery because it improves ambulation and enables the mother to give optimal care for the neonate in the immediate postoperative period.<sup>[1]</sup> The commonly employed methods of pain relief are systemic

opioids, non-steroidal anti-inflammatory agents or local anesthetics, and addition of adjuvants to prolong the duration of analgesia. Another mode of analgesia commonly being used is the transverse abdominis plane (TAP) block, first described by Rafi in 2001.<sup>[2]</sup> Ultrasound-guided TAP block first described by Hebbard helps in effectively blocking the lower thoracic, iliohypogastric, and ilioinguinal nerves.<sup>[3]</sup>

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**How to cite this article:** Joseph B, Zachariah SK, Abraham SP. The comparison of effects of fentanyl and dexmedetomidine as adjuvants to ropivacaine for ultrasound-guided transversus abdominis plane block for postoperative pain in cesarean section under spinal anesthesia –A randomized controlled trial. *J Anaesthesiol Clin Pharmacol* 2020;36:377-80.

**Submitted:** 04-Oct-2018

**Revised:** 27-May-2019

**Accepted:** 20-Jun-2019

**Published:** 14-Sep-2020

### Access this article online

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DOI:

10.4103/joacp.JOACP\_313\_18

In this study, we aim at comparing the duration of analgesia obtained by dexmedetomidine and fentanyl when added to 0.5% ropivacaine for TAP block after cesarean section and also evaluate postoperative analgesic requirements. We hypothesized that there is no significant difference in the duration of analgesia produced by both the groups.

## Material and Methods

After getting approval from the institutional ethics board, a prospective randomized controlled trial was conducted in 64 women of ASA physical status II coming for cesarean sections through Pfannenstiel incisions under subarachnoid block. Those with a history of cardiorespiratory illness, allergy to the medications used, or chronic use of pain medications, or those on adrenoceptor agonists or antagonists were excluded. The study was registered with the Clinical Trial Registry of India. The study was conducted over a period of 12 months from April 2017 to March 2018. After getting written informed consent from the patient, numerical pain rating scale with 0 to 10 points was explained to them the evening before the surgery.

All the patients were fasted for 6 hours for solid food and 3 h for clear fluids, and as premedication, all the patients received oral metoclopramide 10 mg and ranitidine 150 mg. Ringer lactate 10–15 ml/kg was infused before the surgery. Electrocardiogram, heart rate (HR), non-invasive blood pressure, and pulse oximetry were monitored.

The parturients were allocated into two groups of 32 in each group using a computer-generated block randomization table. The allocation table was kept with a senior anesthesiologist who was not involved in the study who used to give the random drug as per the serial number in a syringe. The principal investigator, the theater, the post-anesthesia care staff, and the patient were blinded to the drug given.

The cesarean sections were done under subarachnoid block using 0.5% bupivacaine heavy 9–10 mg, at the end of which TAP block was given on each side under ultrasound-guidance using the local anesthetic drug 20 ml of 0.5% ropivacaine with the study drug, which was fentanyl 25 mcg or dexmedetomidine 25 mcg. Fentanyl group was designated as the control group, as the duration of analgesia obtained with fentanyl as an adjuvant in neuraxial blocks are comparatively shorter than alpha 2 agonists. Ultrasound-guided TAP block was done with the patient in the supine position with the ultrasound probe placed in a transverse plane between the lower costal margin and the iliac crest in the midaxillary line.<sup>[4]</sup> The needle was inserted after taking all the sterile precautions through the aponeurosis of the external and internal oblique muscles, and the study

drug was injected in the fascial plane between the internal and transversus abdominis muscles [Image 1].<sup>[5]</sup> Recording of the hemodynamic parameters such as HR, BP, and pulse oximetry were done at 5 min intervals perioperatively, a 10-point numerical pain score was recorded after the block at baseline, at 1 h and then 4 h intervals till 24 h postoperatively, and the time to first analgesia demand from the time of the block were recorded. A numerical pain score more than 3 was treated with Paracetamol 1 gm and a score of more than 6 with tramadol 50 mg intravenously and diclofenac suppository. The total analgesic requirement over 24 h was also noted. The hemodynamic parameters were analyzed using repeated measures of ANOVA, the duration of analgesia by Mann-Whitney U test, and the analgesics consumption by using Chi-square test.

## Statistical analysis

The sample size was calculated from a similar study using n Master software, version 2.0 (Produced by the Department of Biostatistics, Christian Medical college, Vellore, Tamilnadu 6823004). For a power of 80% and an alpha error of 5% for a superiority margin of 60 min difference in the duration of analgesia, the sample size calculated was 32 in each group. The statistical analysis was done by Mann-Whitney U test and the analgesics consumption by using chi-square test using R software.

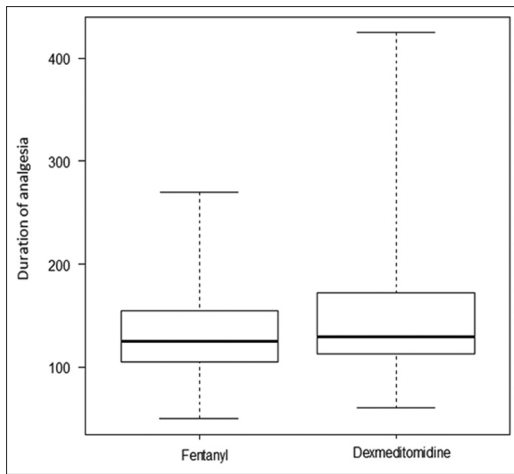
## Results

The demographic data were similar in both the groups with no statistical differences [Table 1]. The duration of analgesia, which was the primary end-point of the study, was analyzed by Mann-Whitney U test [Table 2]. There was no significant difference in the duration of analgesia between the fentanyl and dexmedetomidine groups ( $P$ -value = 0.47) [Graph 1]. The visual analog score recorded for 18 h also were similar in both the groups [Graph 2].

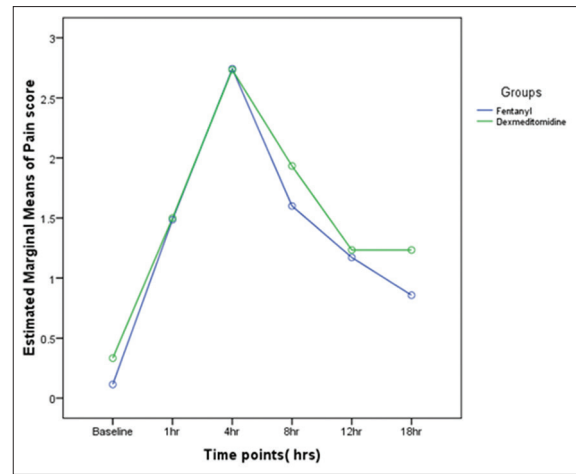
The amount of analgesics used in the postoperative period were analyzed using Chi-square test [Graph 3]. Among those patients who received dexmedetomidine, 47.5% needed only onetime rescue analgesic, whereas only 21.7% of the fentanyl group could manage with

**Table 1: Shows the demographic data**

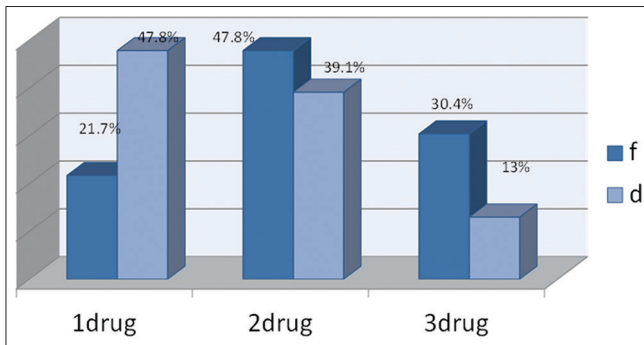
	Group 1	Group 2
Age (Mean±S.D)	28.9±4.75	27.80±3.51
Weight (Mean±S.D)	67.69±9.21	66.65±8.44
Duration of Anesthesia Median [Q <sub>1</sub> , Q <sub>3</sub> ] (minutes)	75 [60,95]	75 [60,90]
Duration of surgery Median [Q <sub>1</sub> , Q <sub>3</sub> ] (minutes)	65 [55,85]	62 [55,73.75]



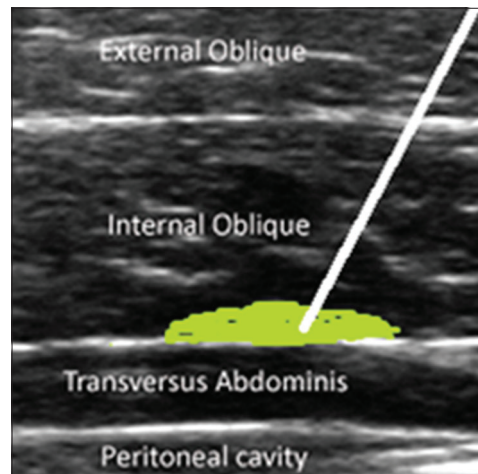
**Graph 1:** Box plot showing the duration of analgesia (minutes) in both groups of drugs



**Graph 2:** Shows the VAS with time



**Graph 3:** Shows the percentage of patients satisfied with one drug, two drugs, or three drugs



**Image 1:** Showing the spread of local anesthetic and the needle insertion

**Table 2: Shows the duration of analgesia**

	Median	Q1, Q3	U	P
Group 1	125	110,180	470	0.47
Group 2	130	105,161		

one rescue analgesic. However, this difference was not statistically significant ( $P$ -value = 0.512). Systolic blood pressure between the two groups was also not significantly different at various time points using repeated measures of ANOVA.

## Discussion

This randomized controlled study showed that the duration of analgesia produced by the addition of dexmedetomidine or fentanyl to ropivacaine was almost the same in both the groups. The total consumption of analgesics over a time duration of 18 h between the two groups were also not found to be statistically significant. A randomized controlled trial done by Mc Donnell J G *et al.* has shown the efficacy of TAP block for reducing the opioid consumption in postoperative cesarean section patients in comparison with the use of

conventional analgesic.<sup>[6]</sup> In their study comparing TAP block with placebo, Carney J and Shin H J have proved that it provides superior analgesia as a component of the multimodal analgesia regimen.<sup>[7]</sup> In a study by Waleed and Almarakbi, the addition of dexmedetomidine to bupivacaine in TAP block provided prolonged postoperative analgesia and better pain control than bupivacaine alone.<sup>[8]</sup> The analgesic consumption can be found to be markedly reduced in those given TAP block in the previous studies.<sup>[9]</sup> The present study did not show a marked difference in the analgesia produced between both the groups. There was no significant difference in the duration of analgesia and significant difference in the time for the first analgesic, but in the dexmedetomidine group, 47% of the patients required only a single postoperative rescue analgesic drug, whereas only 27% of the patients in the fentanyl group could manage with a single drug. The previous studies were done comparing TAP block with either conventional methods of pain relief or block with saline (placebo).<sup>[10]</sup> Further, the postoperative pain relief in cesarean also involves visceral,

which could not be blocked with TAP block alone. This may explain the short duration of analgesia as experienced in this study. However, considering the overall requirement of analgesic consumption, both the groups in this study had very minimal requirements although the difference between the groups was statistically not significant. Because the TAP block was performed while the effect of the subarachnoid block is still there, the analgesic effect produced could have been overlapped. The successful placement of the drug was relied upon by the skill of the person who did the block and the proper positioning of the block under ultrasound-guidance.

## Conclusion

Fentanyl and dexmedetomidine as adjuvants to ropivacaine were equally effective in both prolongation of analgesia and reducing the total consumption of analgesics in ultrasound-guided TAP block.

## Acknowledgments

To all the patients who willingly gave consent for the study. Dr. Kalesh Karun for statistical analysis.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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