Original Article

Transversus abdominis plane (TAP) block with levobupivacaine versus levobupivacaine with dexmedetomidine for postoperative analgesia following cesarean delivery

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Abstract

Background and Aims: Transverse abdominus plane (TAP) block provides good quality analgesia with minimal side effects. Addition of adjuvant like dexmedetomidine to the local anesthetics has been shown to prolong the action of the block in earlier studies. In this prospective randomised study TAP block with levobupivacane with or without dexmedetomidine was compared with control group for post-operative analgesia following cesarean delivery.

Material and Methods: Ninety healthy women undergoing cesarean delivery under spinal anesthesia were randomized into three groups (GroupC, GroupL and Group LD). And following this Group L received ultrasound guided bilateral TAP block with 20 ml 0.25% levobupivacaine on each side, while Group LD received TAP block with same volume of levobupivacaine with 1μg/kg of dexmedetomidine. Group C, the control group did not receive TAP block. Postoperatively, time for first request for rescue analgesia and the number of women requesting analgesia in 6 h, 12 h and 24 h were noted.Pain score was measured with the Visual Analogue Scale (VAS) at rest and on movement for the first 24 h. Patient comfort and satisfaction with analgesia was evaluated at the end of 24 h.

Results: Time for first rescue analgesia was significantly longer and patient satisfaction scores were significantly higher in patients who received TAP block (Groups LD and L) as compared to control (Group C). Pain scores were also lower in the TAP block groups compared to control group. Among the women who received TAP block, those with dexmedetomidine group (Group LD) asked for rescue analgesia significantly later compared to group L. Patient satisfaction score was highest in the Group LD compared to Group L which in turn was better than control group. There were no significant differences in the observed side effects.

Conclusion: Bilateral TAP block with 0.25% levobupivacaine provides good quality analgesia for early postoperative period. Adding dexmedetomidine further improves pain control and gives higher patient satisfaction without any added side effects.

Keywords: Analgesia, cesarean delivery, dexmedetomidine, levobupivacaine, TAP block

Introduction

Cesarean delivery is often done under spinal anesthesia and postoperative analgesia is not addressed adequately. Additional analgesic plans like long-acting spinal or systemic opioids, regional analgesia or multimodal analgesia are crucial for overall well-being of the patient. However, systemic opioids are associated with side effects/adverse effects like nausea, vomiting, pruritus, sedation, urinary retention and respiratory depression. Thus, it is important to explore safer long-lasting alternative (non-opioid) techniques for postoperative analgesia.[1,2]

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Transversus abdominis plane (TAP) block provides analgesia in the T6–L1 dermatomal area over the anterior abdominal wall.[3] Ultrasound-guided TAP block is easy to perform with a good safety profile. Combination of adjuvants to local anesthetics agents helps in prolonging the analgesia.[4] Dexmedetomidine, a selective alpha-2 adrenergic agonist is one such adjuvant used extensively in the regional techniques.[5] Addition of dexmedetomidine to bupivacaine has been shown to prolong the effect of regional analgesia.[6] Dexmedetomidine is a better neuraxial adjuvant compared to clonidine for providing early onset of sensory analgesia, adequate sedation and a prolonged postoperative analgesia.[7]

We therefore designed a study to assess the postoperative analgesic efficacy of 0.25% levobupivacaine with and without addition of dexmedetomidine in ultrasound-guided TAP block for women undergoing cesarean delivery under spinal anesthesia.

Material and Methods

This was a double-blind randomized control trial conducted over a period of 1 year and 9 months from October 2015 to July 2017 in a tertiary centre. Institutional Ethical Committee approval was taken before conducting the trial. Ninety consenting pregnant women scheduled for elective cesarean delivery under spinal anesthesia were enrolled in the study. The normal uncomplicated pregnancies (ASA 2) and age between 21 and 40 years with body mass index (BMI) 18.5 to 34.9 kg/m^2 were considered as inclusion criteria. Patients who didn't meet the above criteria or with chronic use of pain medications, alpha agonists/antagonists, history of tolerance to opiates were excluded from the study. In the preoperative assessment, written informed consent was obtained. All the cesarean delivery were performed under spinal anesthesia with 10 mg of 0.5% bupivacaine heavy with 25 mcg of fentanyl. At the end of the surgery, all women received per rectal diclofenac 100 mg, as per the standard protocol and were randomly assigned to one of the three groups by a computer generated randomization table.

- Group L: Received ultrasound (USG)-guided bilateral TAP block with 40 ml of 0.25% levobupivacaine (20 ml each side)
- Group LD: Received TAP as in Group L with addition of dexmedetomidine 1μg/kg to levobupivacaine solution
- Group C: Control group, no TAP block.

Under aseptic precautions ultrasound scan of the abdominal wall was performed and transverses abdominis plane (TAP) was identified at the level of umbilicus in the midaxillary line using a high frequency (5–12 MHz) linear array USG probe. TAP block given using 10cm long Stimuplex needle with in plane approach and 20 ml of the drug administered. Procedure was repeated on the other side to complete bilateral TAP block.

In the postoperative period all the women were observed in the high dependency unit (HDU) for first 24 h and an investigator who was unaware of the group allocation noted the observations. The women were given an alerting bell whenever they felt for the need of supplemental analgesia. Intravenous paracetamol 1g was given as first rescue analgesia. If they needed further analgesics they were given tramadol 50 mg IV bolus. Patients were assessed at 1h, and every second hour, thereafter for the first 12h and 24 h for pain at rest and on movement using the visual analogue scale (VAS). We also looked at the number of women requesting analgesia in first 6 h, 12 h and 24 h period. Sedation score (Ramsay Sedation Score), side effects like– nausea, vomiting and pruritus (categorical scale) were also noted. At the end of 24 h patients were asked to rate their analgesic satisfaction using VAS.

Primary outcome measure was time for first request of analgesia. Secondary outcome measured are number of patients requested for analgesia in a particular time interval and the side effects like sedation, nausea and vomiting. We considered difference of 180 minutes between control group and block group for first call for rescue analgesia as clinically significant. Based on pilot study with nine patients in each limb, sample size was calculated with α of 5% and power of the study 80%, we required 28 patients in each group. Considering possible dropouts we included 30 patients in each group. The data were entered into the SPSS 15 SOFTWARE. Statistics were represented in terms of mean ± standard deviation (SD) for normal distribution and median with interquartile range for skewed data.

The Mann–Whitney U test and Kruskal–Wallis test were used for statistical analysis.

Results

All the 90 patients completed the study and data were collected from all of them. Demographic data and mean surgical time was comparable between the three groups [Table 1]. The time for first request for analgesia was significantly longer [Table 2] in Group LD when compared to Group L (median 600 min with Q1 240 min and Q3 1110 min vs 362.5 min with Q1 168.75 min and Q3 487.5 min) and control group, Group C had shortest period (median 90 min with Q1 60 min and Q3 130 min). There were 29 women in Group C, 17 women in Group L and 10 women in Group LD requested

for analgesia within first 6 h. Comparing the data there was significant difference between Group C versus Group L and Group LD ($P < 0.05$), however, there was no difference between Groups L and LD. At the end of 12 h all the 30 women in Group C, 25 women in Group L and 16 women in Group LD requested for rescue analgesia. The difference between Groups L and LD were significant ($P < 0.05$) at 12 h. At the end of 24 h, 30 women from Group C, 27 women in GroupL and 24 women in Group LD requested for analgesia. There was no difference between the groups at 24 h [Table 3]. On enquiring about the VAS rating of postoperative analgesia satisfaction score in the first 24 h, Group C women gave a score of 6.06 ± 1.79 (mean ± SD), Group L women gave 7.76 ± 1.27 and Group LD women gave a score of 8.83 ± 0.69.

None of the 90 patients had vomiting in the first postoperative day. Four patients in Group C, two patients each in Group L and LD had complaints of nausea. Two patients each in Group C and L had pruritus while only one patient had pruritus in Group LD. As per the sedation score is concerned, all the patients had a Ramsay Sedation Score of 2.

Table 1: Time (in minutes) for first request for analgesia

	Group C	Group L	Group LD
Median and interquartile range Expressed in min	90, Q1=60, Q3=130	352.5 Q1=168.75, Q3=487.5	600 Q1=240, Q3=1110

Group C vs Group L, P value<0.001. Group C vs Group LD, P value<0.001. Group L vs Group LD, P value=0.036

Table 2: Number of patients requested for rescue analgesia

	First 6 hours	First 12 hours	In 24 hours
Group C (n=30)	29	30	30
Group L (n=30)	17	25	27
Group LD (n=30)	10	16	24
Pain score (VAS) at rest, at 6 hours, 12 hours and 24 hour timeline expressed as mean±SD			
Group C (n=30)	6.13±1.8	5.9±2.36	6.1±1.95
Group L (n=30)	3.6±2.37	3.7±1.96	3.63±2.07
Group LD (n=30)	2.93±1.74	2.36±1.47	2.13±1.48
Pain score (VAS) on movement, at 6 hours, 12 hours and 24 hour timeline expressed as mean±SD			
Group C (n=30)	6.66±1.6	6.3±2.3	6.36±1.97
Group L (n=30)	4.36±2.06	4.4±1.67	4.43±1.90
Group LD (n=30)	3.3±1.84	3.13±1.38	2.76±1.4

Table 3: Patient satisfaction score (mean±SD) at 24 hours

Group C (n=30)	Group L (n=30)	Group LD (n=30)
6.06±1.79	7.76±1.27	8.83±0.69

Group C vs Group L P value <0.001 Group C vs Group L P value <0.001 Group L vs Group LD P value <0.001

Discussion

In our study, the women who received TAP block had prolonged analgesia in the postoperative period and their first request for analgesia came much later compared to patients who did not receive TAP block. Women who got TAP block using levobupivacaine with dexmedetomidine had significantly longer duration of analgesia compared to TAP block with only levobupivacaine. At the end of 6 h number of women requested for rescue analgesia was significantly higher ($P < 0.01$) in the control group compared to the block group (Group L and LD). At 12 h there was significant fewer women in Group LD ($P < 0.05$) requested for analgesia compared to Groups C and L. However at the end of 24 h there was no significant difference in number of women requesting for analgesia between the groups. The above result indicate TAP block with levobupivacaine alone gives pain relief for first 6 h and addition of dexmedetomidine prolongs this effect till 12 h. We interviewed the patients at the end of 24 h and asked them to rate postoperative analgesia satisfaction with the help of the visual analogue score. Patients who received TAP block with levobupivacaine and dexmedetomidine had significantly higher satisfaction compared to group receiving TAP block with levobupivacaine alone. This suggests improvement in quality of analgesia with addition of dexmedetomidine. There was no difference in the sedation score or other side effects with addition of 50 mcg of dexmedetomidine to the local anesthetic solution.

Abdelaal *et al.* evaluated the effectiveness of addition of dexmedetomidine to levobupivacaine in pre-emptive TAP block for postoperative pain management after abdominoplasty.[8] In total of 69 patients, they reported dexmedetomidine (Group M) and levobupivacaine (Group L) group had significant lower pain score as compared to control group. Total postoperative 24 h meperidine consumption was less in M, L groups in comparison to C group with significance of $P < 0.001$. Postoperatively 24 h total meperidine consumption in M group was less than in L group $P < 0.01$.

In a randomized controlled trial McDonnell *et al.* studied 50 women undergoing elective cesarean delivery under spinal anesthesia, and evaluated the usefulness of transversus abdominis plane (TAP) block in providing analgesia over the first 48 h postoperatively.[9] The women were divided into two groups, one receiving TAP block with ropivacaine (1.5 mg/kg) and the other, placebo. Additionally, postoperative analgesia in the form of patient-controlled intravenous morphine and acetaminophen and diclofenac was also given. The VAS scores, total morphine requirement and incidence of sedation,

decreased in the first 48 h postoperatively in favour of TAP block with ropivacaine.

In a similar study Singh *et al.* used bupivacaine alone and clonidine with bupivacaine for TAP block following cesarean delivery in 100 women.[4] They reported longer duration of postoperative analgesia (17.8 ± 3.7 h vs 7.3 ± 1.2 h), lesser consumption of diclofenac and higher satisfaction score in patient who received TAP block with 1 mcg/kg of clonidine added to bupivacaine. However, they noted higher incidence of sedation in clonidine group.

Siddiqui *et al.* performed a meta-analysis to evaluate the clinical effectiveness of TAP block. First request of morphine occured at an early stage in the non-TAP block group and TAP block group observed reduced pain up to 24 h postoperatively.[10] They concluded that TAP block decreases opioids requirement postoperatively, increases the time to first request for further analgesia, provides effective pain relief and also has a good safety profile with fewer side effects which are associated with the opioids usage.

Abdallah *et al*. conducted a systematic review and meta-analysis to examine whether TAP block could decrease intravenous morphine usage in the first 24 h post cesarean delivery.[11] The primary outcome was to look for postoperative IV morphine utilisation during the first 24 h. While secondary outcomes were pain scores and side effects in both mother and neonate due to opioids. Stratification of trials was done based on whether or not morphine was used in the spinal route as analgesia. Total 312 patients were included and there was a reduction in the mean 24 h morphine consumption in the TAP block without spinal morphine. TAP block was found to decrease the VAS pain scores and decreased incidence of side effects. When spinal morphine was used there was no significant difference in primary and secondary outcomes. Superior quality of analgesia was achieved with TAP block compared with placebo with reduction in the morphine consumption in 24 h in the setting of a multimodal analgesic plan that does not involve spinal morphine.

We had some limitations in our methodology. We did not provide patient controlled analgesia to our patients so we were not able to comment on the amount of analgesics used by patients belonging to different group.

In conclusion, TAP block with levobupivacaine provides good immediate postoperative analgesia and addition of dexmedetomidine to levobupivacaine prolongs the duration of analgesia and improves quality with better patient satisfaction.

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Conflicts of interest
There are no conflicts of interest.

References

1. Prabhakar A, Mancuso KF, Owen CP, Lissauer J, Merritt CK, Urman RD, *et al*. Perioperative analgesia outcomes and strategies. Best Pract Res Clin Anaesthesiol 2014;28:105-15.
2. Betrán AP, Merialdi M, Lauer JA, Bing-Shun W, Thomas J, Van Look P, *et al*. Rates of caesarean section: Analysis of global, regional and national estimates. Paediatr Perinat Epidemiol 2007;21:98-113.
3. Petersen PL, Mathiesen O, Torup H and Dahl JB. The transversus abdominis plane block: A valuable option for postoperative analgesia? A topical review. Acta Anaesthesiol Scand 2010;54:529-35.
4. Singh R, Kumar N, Jain A, Joy S. Addition of clonidine to bupivacaine in transversus abdominis plane block prolongs postoperative analgesia after cesarean section. J Anaesthesiol Clin Pharmacol 2016;32:501-4.
5. Agarwal S, Aggarwal R, Gupta P. Dexmedetomidine prolongs the effect of bupivacaine in supraclavicular brachial plexus block. J Anaesthesiol Clin Pharmacol 2014;30:36-40.
6. Almarakbi WA, Kaki AM. Addition of dexmedetomidine to bupivacaine in transversusabdominis plane block potentiates post-operative pain relief among abdominal hysterectomy patients: A prospective randomized controlled trial. Saudi J Anaesth 2014;8:161-6.
7. Bajwa SJ, Bajwa SK, Kaur J, Singh G, Arora V, Gupta S, *et al*. Dexmedetomidine and clonidine in Epidural anaesthesia: A comparative evaluation. Indian J Anaesth 2011;55:116-218.
8. Abdelaal W, Metry AA, Refaat M, Ragaei M, Nakhla G. Comparative study between levobupivacine versus levobupivacaine plus dexmedetomidine for transversus abdominis plane block "tap" in post-operative pain management after abdominoplasty. Enliven: J Anesthesiol Crit Care Med 2015;2:1-4.
9. McDonnell JG, Curley G, Carney J, Bentone A, Costello J, Maharaj CH, *et al*. The analgesic efficacy of transversus abdominis plane block after cesarean delivery: A randomized controlled trial. Anesth Analg 2008;106:186-91.
10. Siddiqui MR, Sajid MS, Uncles DR, Cheek L, Baig MK. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. J Clin Anesth 2011;23:7-14.
11. Abdallah FW, Halpern SH, Margarido CB. Transversus abdominis plane block for postoperative analgesia after caesarean delivery performed under spinal anaesthesia? A systematic review and meta-analysis. Br J Anaesth 2012;109:679-87.