



Original Research Article

Transversus abdominis plane block versus wound site infiltration using 0.25% bupivacaine for post-operative analgesia after caesarean delivery performed under subarachnoid block

Deepak Kumar^{1,*}, Sonia Wadhawan¹, Amit Kohli¹, Poonam Bhadoria¹,
Abhijit Kumar¹

¹Dept. of Anaesthesiology and Intensive Care, Maulana Azad Medical College & Lok Nayak Hospital, New Delhi, India



ARTICLE INFO

Article history:

Received 23-12-2020

Accepted 08-01-2021

Available online 01-06-2021

Keywords:

Transversus abdominis plane block

Wound site infiltration

Caesarean section

Multimodal analgesia

ABSTRACT

Background: Transversus abdominis plane (TAP) block has been described as an effective technique to reduce postoperative pain after caesarean section. Wound site infiltration (WSI) has been a traditional method for pain relief. In our study we attempt to compare the analgesic effect of TAP block with wound site infiltration after caesarean section.

Materials and Methods: A randomized comparative study was conducted on 60 parturients. Patients were randomized into Group T (TAP block, n=30) and Group I (WSI, n=30). Spinal anaesthesia was administered and at the end of surgery, Group T was administered TAP block with 20 ml of 0.25% bupivacaine on each side and in Group I, 20 ml of 0.25% bupivacaine was infiltrated along the wound site. Postoperatively parameters assessed were time to first rescue analgesia, postoperatively patient's Numeric pain score (NPS) which was assessed periodically over 24hrs and if NPS ≥ 4 or patient demanded rescue analgesia, Inj diclofenac 75mg i/m was given as first rescue analgesic, total number of doses of first rescue analgesic given over 24hrs, total number of second rescue analgesic and complications were assessed.

Results: The mean time to first rescue analgesia in Group T was 13.40 ± 4.51 hours and in Group I was 6.20 ± 4.25 hours ($p < 0.001$). NPS at 2, 4, 6, 12 and 24 hours were lower in Group T compared to Group I. Also, analgesic requirement in first 24 hours was significantly less in Group T ($p < 0.001$).

Conclusions: TAP block was found to be superior to wound site infiltration in providing effective postoperative pain relief in patients undergoing caesarean section.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1. Introduction

Caesarean Section is the most common obstetric surgical procedure performed and it is associated with moderate to severe pain which may last upto 48 hours, so adequate postoperative pain control is important to reduce morbidity in these patients.¹ Inadequate pain relief after Caesarean delivery can negatively impact ambulation, breastfeeding, and even maternal bonding.²

Pain management in a parturient is challenging and opioids should be avoided in the parturient because of

their excretion in milk which predisposes the neonate to their adverse effects.³ Hence, multimodal approach for pain relief are often selected which include use of intravenous paracetamol, NSAIDs, patient controlled analgesia (PCA), Wound site infiltration (WSI) with local anaesthetic and regional nerve blocks.⁴

Most of the obstetric units practice the WSI with the local anaesthetic after completion of the surgery as part of multimodal approach. It offers the advantage of being a safe simple technique with low cost. However, delayed healing, wound site hematoma and infection are apprehensions cited amongst some obstetricians though scientific documentation of the same is limited.

* Corresponding author.

E-mail address: deepakkumar3090@gmail.com (D. Kumar).

Transversus abdominis plane (TAP) block which is another popular technique for postoperative analgesia for lower abdominal surgeries such as caesarean section, hernia repair, appendectomy etc.⁵ TAP block has been studied in last decade but some researchers have mentioned that there may be an inadequate pain relief specifically of the skin incision extends beyond the dermatome supplied by the peripheral nerve where WSI is needed in addition.

Hence, we would like to conduct this study to evaluate and compare the effectiveness of TAP block with wound site infiltration for post-operative analgesia in caesarean section.

2. Materials and Methods

This was a randomised comparative study conducted in a tertiary care hospital after prior approval from the institutional ethics committee. Written and informed consent was obtained from all the parturients after explaining about the objective of the study, the technique and its related complications. This trial was registered with Central Trial Registry - India (CTRI) with reference number CTRI/2018/05/014048.

Sixty parturients (ASA II) of height 150 – 170 cms who were either primigravida or previous one LSCS posted for elective/emergency caesarean section were included in this study.

The sample size was calculated using preliminary data i.e the results obtained from the previous study conducted by Aydogmus MT et al.⁶ In order to have power of study of 90% and taking α error as 5% in our study, thirty patients were included in each study group. Based on computer generated random number table, all parturients were randomly allocated into two groups namely, Group T (TAP block with 20 ml of 0.25% bupivacaine on each side was given), Group I (WSI with 20 ml of 0.25% bupivacaine was given).

After following standard pre anaesthetic check-up and preanaesthetic medication parturients were shifted in operating room on day of surgery. ASA standard monitors were attached. After adequate co-loading SAB was given in left lateral position by midline approach in all parturients. At the end of surgery, the level of spinal anaesthesia was checked and documented. Subsequently, the patient received either TAP block or wound site infiltration for postoperative analgesia.

In Group T, at the end of the surgery, all patients received TAP block bilaterally using 20 G blunted stylet by landmark technique (Figure-1) as described by McDonnell et al.⁷ In group I, after the completion of the surgical procedure wound site was infiltrated with 20 ml of 0.25% bupivacaine.

Postoperative pain was assessed using Numeric Pain Score (NPS), which was evaluated on a scale of 0-10, at 2,4,6,12, 24 hours after the block. If the NPS was ≥ 4 or patient demanded analgesia Inj diclofenac sodium 1mg/kg i/m was given as the first rescue analgesic. Subsequent doses

of Inj diclofenac sodium were given if the NPS was ≥ 4 or the patient demanded analgesia but was not repeated less than 6 hours from the last dose (total dose not exceeding 150 mg/day). If within 6 hours of rescue analgesia the NPS was ≥ 4 or patient demanded further analgesia, Inj tramadol 50 mg i/v was given as the second rescue analgesic. If the patient was asleep the patient was not disturbed and NPS was assumed to be 3 or less.

The primary outcome was time to first rescue analgesia (time after performing the TAP block/ wound site infiltration to the first dose of first rescue analgesic). The secondary outcomes were NPS, total number of doses of first rescue analgesic required, total number of patients requiring second rescue analgesic over 24 hours and complication related to TAP block and wound infiltration e.g. local site pain, hematoma was evaluated.

2.1. Statistical analysis

The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 24.0. The quantitative data was expressed in terms of Mean \pm SD, median, inter-quartile range. The qualitative variables were summarized through frequencies and percentages. Quantitative variables (time to first rescue analgesia, NPS, total numbers of first rescue analgesic, number of patients requiring second rescue analgesia) between two groups was compared using independent 't' test. Qualitative data (complications) tested with help of chi square and Fisher exact. Results were considered statistically significant when p value was < 0.05 .

3. Results

Demographic profile was comparable between study groups (Table 1). The mean time to first rescue analgesia in Group T was 13.40 ± 4.51 hours and in Group I was 6.20 ± 4.25 hours which was statistically highly significant (Table 2). The mean NPS score in group T at 2, 4, 6, 12 and 24 hours were lower as compared to group I (Figure 1) and found to be significant. Total number of doses of first rescue analgesic required over 24 hours was less in group T (0.967 ± 0.18) as compared to group I (1.567 ± 0.56) and the difference was found to be statistically highly significant ($p=0.001$). In our study only five patients in group I needed second rescue analgesic (Inj tramadol 50 mg i/v) for pain control while none of the patients required second rescue analgesic in group T ($p=0.02$). Complications like wound site hematoma, local pain, nausea and vomiting may be associated with the above techniques. However, we observed that none of the patients in our study had any such complications.

4. Discussion

With the growing focus on labour analgesia over the years, postoperative pain associated with caesarean section is

Table 1: Demographic profile

Parameters	Group T (mean±SD)	Group I (mean±SD)	p-value
Age (years)	25.73± 3.36	25.30± 4.70	0.683
Weight (kg)	72.90± 10.33	72.40± 10.92	0.85
Height (cm)	158.60± 5.31	159.83± 5.84	0.39

P<0.05, significant

Table 2: Parameters evaluated

Parameters	Group T (mean±SD)	Group I (mean±SD)	p-value
Mean Time to first rescue analgesia (R1) in hours	13.40±4.51	6.20±4.25	0.001
Total number of doses of first rescue analgesic over 24 hours	0.967±0.18	1.567±0.56	0.001
Number of patients requiring second rescue analgesic	0	5	0.02

P<0.05, significant

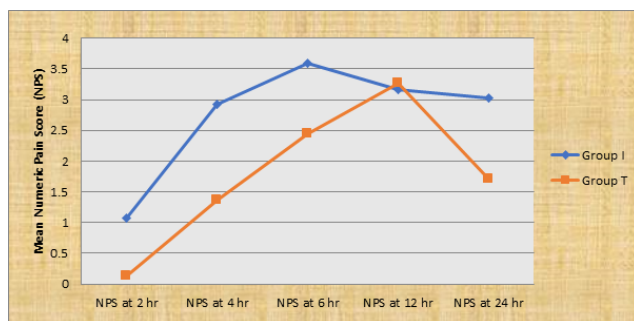


Fig. 1: Showing mean Numeric Pain Score (NPS) at 2, 4, 6, 12, 24hours after the block in both groups

underestimated. Various techniques have been compared for postoperative analgesia in the past. WSI is a simple and convenient method for providing postoperative analgesia, which is being widely practiced for caesarean section. However, many surgical colleagues have apprehensions of infection, wound site hematoma and inadequate analgesia with this technique. Alternatively, TAP block has been recently described and practiced which certainly is more invasive but may have effective analgesia with some sparing effects.⁸ Thus, we undertook this study to compare the effectiveness of TAP block with wound site infiltration for post-operative analgesia in caesarean section.

In our study, we found that TAP block provides prolonged pain relief for around 13 hours and better quality of postoperative analgesia whereas such benefit was limited in patients who received wound site infiltration (6 hours) with local anesthetic. Aydogmus MT et al. also compared TAP block with WSI but their study design was different. They compared the two techniques on a different demographic population and have used 0.25% levobupivacaine as a local anaesthetic instead of bupivacaine that too in larger volumes. Similar to our study

findings they also concluded that the need for first rescue analgesic requirement was significantly delayed (6.11 hrs) than that seen with the local wound site infiltration group (2.63 hrs).⁶ Buluc et al. in 2019 compared ultrasound guided TAP block using local anaesthetic with control group (30 ml NS in TAP block) for caesarean section and found that in study group there was significantly prolonged requirement of first rescue analgesic as compared to control group. However, they had used 30ml of 0.25% bupivacaine on each side and had also given 1mg/kg meperidine in all patients at the end of surgery. In addition, their sample size was too small to validate results.⁹

In our study TAP block provides the lower NPS scores during all study time frames with the largest difference being observed immediately after the patients arrived in the Postoperative anaesthesia care unit (PACU). Moreover, in TAP block there was lesser number of first rescue analgesic required as compared to WSI within 24hours postoperatively. This may be attributed to the fact that transversus abdominis is a neuro-fascial plane that provides a space into which local anesthetic can be deposited to achieve myocutaneous sensory blockade and can also act as a depot for prolonged duration of action.^{7,10} Deposition of the local anesthetic dorsal to the mid-axillary line also blocks the lateral cutaneous afferents, thus facilitating blockade of the entire anterior abdominal wall. Whereas in case of WSI the shorter duration of pain relief can be attributed to the high vascularity of the incision site which may lead to faster local anesthetic absorption followed by its metabolism leading to an early termination of analgesia.¹¹

In the previous studies, WSI with local anaesthetic when compared with placebo was associated with lower morphine consumption, lower pain scores and lower incidence of nausea after caesarean delivery. However, there is no standardization regarding technique of WSI. Some clinicians prefer singleinjection in the subcutaneous tissue

whereas others use multiple injections at different levels including the peritoneum. Some investigators have also used continuous infusion techniques by putting catheters.¹²

Nanze YU et al. conducted a meta-analysis including 4 RCTs where they compared analgesic effect of TAP block with WSI in lower abdominal surgeries including caesarean section. They concluded that both have short term (up to 24 hours) analgesic effect but TAP block provide better analgesia by having lower pain scores, lesser need of rescue analgesics and opioid consumptions compared WSI which were consistent with our study results.¹³ Similarly, Kabsay DT et al in 2017 evaluated analgesic effect of TAP block after caesarean section and they observed that VAS pain scores were significantly lower with TAP block at rest, deep breathing, intentional coughing, and mobilization in all cases. Morphine and diclofenac consumption were also significantly lower with TAP block.¹⁴

Yet another study conducted by Telnes et al. in 2015 compared TAP block with wound infiltration in caesarean section. Contrary to our study results they found that TAP block did not reduce the cumulative morphine consumption following caesarean section and rather it caused more pronounced sedation. This may be attributed to the following reasons. Firstly, they had very few exclusion criteria which resulted in a heterogeneous population with differences in parity, BMI and indications for CS. Secondly, all patients received paracetamol 6 hourly and diclofenac 8 hourly which could have altered the need for additional analgesia in form of morphine by PCA.³ Tawfik et al. in 2017 found that TAP block and wound infiltration did not significantly differ regarding postoperative fentanyl consumption, pain scores, and patient satisfaction in parturients undergoing caesarean delivery under spinal anaesthesia. This may be attributed to the fact that they have given postoperatively ketorolac and paracetamol every 8 hourly as a standard regimen in all the parturients.¹⁵

Yulu JIN et al. in 2018 conducted a comparative study on TAP block and iliohypogastric/ilioinguinal (IHINB) nerve block in caesarean section and demonstrated that TAP block and IHINB achieved a comparably satisfactory analgesic effect after cesarean section. However, the analgesic effect of IHINB was better than that of TAP block at the later stages.¹⁶

In our study no complications were found in either of the two groups. However, some studies have reported complications like block failure, vascular injury, abdominal viscera and nerve injuries with TAP block.¹⁷

One may argue that use of opioids as adjunct to local anaesthetic in spinal anaesthesia for caesarean section may ensure effective analgesia and there is no need for an alternative technique such as abdominal wall infiltration or blocks. The safety margin of opioids in a parturient is always debatable and fraught with high risk of delayed

respiratory depression because of cephalic spread as well as other secondary effects such as nausea, vomiting, and pruritis which can be quite distressing and adds to the morbidity. Other techniques of postoperative analgesia, such as epidural morphine or local anaesthetics also have limitations as they require prolonged clinical surveillance. On the other hand, the continuous infusion for WSI may delay patient's ambulation, need for frequent dressing change because of leakage of the anaesthetic solution from the wound and fraught with the risk of vascular absorption of local anaesthetic from incision site.

There is no consensus on the appropriate technique of TAP block and spread of local anaesthetics during block is also debatable. Hebbard¹⁸ has recently classified the TAP block into 5 categories: upper subcostal, lower subcostal, lateral, ilio-inguinal, and posterior. Carney et al., using magnetic resonance imaging, demonstrated different patterns of local anaesthetic spread with different sites of infiltration and Lee et al.¹⁹ demonstrated different extents of sensory block with the posterior and subcostal approaches. Further studies are needed to demonstrate the most appropriate technique.

However, there are certain limitations of our study. It was a time bound study so the sample size was small. A larger sample size would have led to better statistical outcomes. We did not include a control group relying on the previous evidence of effectiveness of both techniques. We did not assess pain on movement, as our primary aim was to find duration of postoperative analgesia by the two techniques. Assessment of pain on movement would have influenced the duration of analgesia.²⁰ Both the techniques which were used in our study influences the parietal component of pain originating from the anterior abdominal wall due to the surgical incision and not the visceral component of pain, which may be a major contributor to the pain on movement. We had used landmark technique to perform TAP block. However, USG guidance would have made it more precise and have better outcomes, but its availability remains a major concern.

5. Conclusion

TAP block was found to be superior to wound site infiltration in providing effective postoperative pain relief in patients undergoing caesarean section and we suggest the use of TAP block as part of multimodal analgesia regime. The procedural simplicity of this block, along with reliable level of analgesia (T10-L1), longer duration and good quality analgesia, with lesser opioid requirement and their side-effects may establish TAP block as an integral analgesic component for lower abdominal surgeries.

6. Source of Funding

None.

7. Conflicts of Interest

None of the authors have any conflicts of interest to declare.

References

- Keita H, Meyer. Postoperative analgesia after caesarean section in pain assessment and treatment. Elsevier; 2006.
- Larue F. Pain in surgical wounds and nerve lesions in pain assessment and treatment. Elsevier; 2000.
- Telnes A, Skogvoll E, Lonee H. Transversus abdominis plane block vs. wound infiltration in Caesarean section: a randomised controlled trial. *Acta Anaesthesiol Scand*. 2015;59(4):496–504. doi:10.1111/aas.12498.
- Dahl JB, Jeppesen IS, Jørgensen H, Wetterslev J, Møiniche S. Intraoperative and Postoperative Analgesic Efficacy and Adverse Effects of Intrathecal Opioids in Patients Undergoing Cesarean Section with Spinal Anesthesia. *Anesthesiology*. 1999;91(6):1919–27. doi:10.1097/0000542-199912000-00045.
- Sujata N, Hanjoora VM. Pain control after cesarean birth - What are the options? *J Gen Pract*. 2014;2:164.
- Aydogmus MT, Sinikoglu SN, Naki MM, Ocak NB, Sanh N, Alagol A. Comparison of analgesic efficiency between wound site infiltration and ultrasound-guided transversus abdominis plane block after caesarean delivery under spinal anaesthesia. *Hippokratia*. 2014;18(1):28–31.
- McDonnell J, Curley G, Carney J. The analgesic efficacy of transversus abdominis plane block after caesarean delivery: a randomized controlled trial. *Anesth Analg*. 2011;106:186–91.
- Johns N, O'Neill S, Ventham NT, Barron F, Brady RR, Daniel T. Clinical effectiveness of transversus abdominis plane (TAP) block in abdominal surgery: a systematic review and meta-analysis. *Colorectal Dis*. 2012;14(10):e635–42. doi:10.1111/j.1463-1318.2012.03104.x.
- Buluc H, Yildirim AA, Turan G, Karadagan F, Sargin MA, Akgun N. The efficacy of transversus abdominis plane block for post operative analgesia after cesarean section performed under general anesthesia. *North Clin Istanbul*. 2019;6(4):368–73. doi:10.14744/nci.2018.97059.
- Singh TK, Gupta A, Saxena A, Jagar K, Gupta M, Srivastava U, et al. Efficacy of trans abdominis plane block for post cesarean delivery analgesia: A double-blind, randomized trial. *Saudi J Anaesth*. 2015;9(3):298–302. doi:10.4103/1658-354x.154732.
- Bensghir M, Elwali A, Miller C, Azendour H, Drissi M, Bakkali H. Effects of skin infiltration with ropivacaine 0,75% on postoperative pain after caesarean section. *Gynecol Obstet Fert*. 2008;36:516–20.
- Panneerselvam S, Thomas D, Kundra P, Rudingwa P, Sivakumar RK, Dorairajan G. Continuous wound infiltration of bupivacaine at two different anatomical planes for caesarean analgesia – A randomised clinical trial. *Indian J Anaesth*. 2019;63(6):437–43. doi:10.4103/ija.ija_745_18.
- Yu N, Long X, Lujan-Hernandez JR, Succar J, Xin X, Wang X. Transversus abdominis-plane block versus local anesthetic wound infiltration in lower abdominal surgery: a systematic review and meta-analysis of randomized controlled trials. *BMC Anesthesiol*. 2014;14(1):121. doi:10.1186/1471-2253-14-121.
- Kahsay DT, Elsholz W, Bahta HZ. Transversus abdominis plane block after Caesarean section in an area with limited resources. *South Afr J Anaesth Analg*. 2017;23(4):90–5. doi:10.1080/22201181.2017.1349361.
- Tawfik MM, Mohamed YM, Elbadrawi RE, Abdelkhalik M, Mogahed MM, Ezz HM. Transversus Abdominis Plane Block Versus Wound Infiltration for Analgesia After Cesarean Delivery. *Anesth Analg*. 2017;124(4):1291–7. doi:10.1213/ane.0000000000001724.
- Jin Y, Li Y, Zhu S, Zhu G, Yu M. Comparison of ultrasound-guided iliohypogastric/ilioinguinal nerve block and transversus abdominis plane block for analgesia after cesarean section: A retrospective propensity match study. *Exp Ther Med*. 2019;18:289–95. doi:10.3892/etm.2019.7540.
- Lancaster P, Chadwick M. Liver trauma secondary to ultrasound-guided transversus abdominis plane block. *Br J Anaesth*. 2010;104(4):509–10. doi:10.1093/bja/aeq046.
- Hebbard P. TAP block nomenclature. *Anaesthesia*. 2015;70(1):112–3. doi:10.1111/anae.12970.
- Lee THW, Barrington MJ, Tran TMN, Wong D, Hebbard PD. Comparison of Extent of Sensory Block following Posterior and Subcostal Approaches to Ultrasound-Guided Transversus Abdominis Plane Block. *Anaesth Intensive Care*. 2010;38(3):452–60. doi:10.1177/0310057x1003800307.
- Sivapurapu V, Vasudevan A, Gupta S, Badhe AS. Comparison of analgesic efficacy of transversus abdominis plane block with direct infiltration of local anesthetic into surgical incision in lower abdominal gynecological surgeries. *J Anaesthesiol Clin Pharmacol*. 2013;29(1):71–5. doi:10.4103/0970-9185.105807.

Author biography

Deepak Kumar, Senior Resident

Sonia Wadhawan, Director Professor

Amit Kohli, Associate Professor

Poonam Bhadoria, Director Professor

Abhijit Kumar, Junior Resident

Cite this article: Kumar D, Wadhawan S, Kohli A, Bhadoria P, Kumar A. Transversus abdominis plane block versus wound site infiltration using 0.25% bupivacaine for post-operative analgesia after caesarean delivery performed under subarachnoid block. *Indian J Clin Anaesth* 2021;8(2):209-213.