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A PROSPECTIVE OBSERVATIONAL STUDY TO COMPARE THE EFFICACY OF BILATERAL TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK VERSUS TRADITIONAL PARENTERAL ANALGESIA FOR POST OPERATIVE PAIN MANAGEMENT IN LAPAROSCOPIC CHOLECYSTECTOMY

Anaesthesiology

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ABSTRACT

Introduction: TAP block is a regional anaesthetic technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall. **Methods:**This is a prospective observational study to compare the analgesic efficacy of bilateral TAP block versus traditional parenteral analgesia in postoperative pain management in laparoscopic cholecystectomy. The primary objective of the study was to compare the efficacy of bilateral TAP block with parenteral analgesia in terms of pain scores , first request for rescue analgesia, total analgesic requirement and side effects during the first 24 hrs. postoperatively. **Results:**Heart rate, mean arterial blood pressure and duration of analgesia were comparable in both the groups. It was observed that request for rescue analgesia was later and total analgesic consumption was reduced in TAP block group. Ambulation time too was significantly lower in TAP block group. **Conclusion:**Limitations of this study were chances of failed technique due to malpositioning of the needle and risk of visceral injury. Both these limitations can be overcome by ultrasound guided technique.

KEYWORDS

TAP block, postoperative analgesia, parenteral analgesics,laparoscopic cholecystectomy

INTRODUCTION

Patients undergoing laparoscopic cholecystectomy experience moderate to severe pain in the early postoperative period. The transversus abdominis plane (TAP) block is one of the potential modalities of postoperative pain relief for abdominal surgeries by anaesthetizing the anterolateral abdominal wall [1].

Although laparoscopic cholecystectomy is a minimally invasive procedure, it is still associated with a significant incidence of postoperative pain,especially during the first 24 hours following surgery. This pain is typically managed using opiates. However, these medications are associated with a number of side effects such as sedation, nausea and vomiting which may in turn increase hospital stay [2].

A transversus abdominis plane (TAP) block is a regional anaesthesia technique that involves deposition of local anaesthetic into the fascial plane superficial to the transversus abdominis muscle at the level of the T7-L1 dermatomes. TAP block technique was first reported by Rafi in the year 2001 [3].The conventional method was to use the anatomical landmark guided 'triangle of Petit', which is bounded by the latissimus dorsi muscle, external oblique muscle and iliac crest.[4,5] However an ultrasound-guided approach is now becoming more popular [2].

Role of TAP block in upper abdominal surgery like cholecystectomy, where higher dermatomal levels are required for adequate analgesia has been less thoroughly investigated. The present study compares the analgesic efficacy of bilateral TAP block versus traditional parenteral analgesia for postoperative pain management in laparoscopic cholecystectomy.

AIMS AND OBJECTIVES

To compare the analgesic efficacy of bilateral TAP block versus traditional parenteral analgesia in postoperative pain management in laparoscopic cholecystectomy in terms of
pain scores, first request for rescue analgesia and total analgesic requirement during the first postoperative 24 hours.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Anaesthesiology and Critical Care, Bhopal Memorial Hospital and Research Centre, Bhopal, Madhya Pradesh, 350 bedded super speciality hospital.The sample size of the study was 100 patients.The mode of selection of the cases was *purposive sampling technique.*This is a single blind study in which the observer was blind to the cases selected.Selection of cases was done by the consultant anaesthesi ologist based upon subjective selection technique not disclosed to the observer.

The sample size was calculated according to the formula:

$N = t^2 * p(1-p) \setminus M^2$

where

- N = required sample size.
- t = confidence level at 95% (standard value of 1.96).
- p=51% (Prevalance)
- M = margin of error at l0% (standard value of 0.1).

Thus the sample size obtained was 100 and duration of study was one year.

In this study, out of a total of 424 patients posted for abdominal surgeries,217 cases were that of laparoscopic cholecystectomy.Thus, p value corresponds to 51%.

ASA grade 1 and 2 patients between 25 to 50 years of age for elective laparoscopic cholecystectomy were included in the study.After approval from the Institutional Ethical Committee, a written informed consent was taken from the patients. As per protocol, all the patients posted for surgery were kept fasting for 6 hours. Premedication with an anxiolytic and histaminic blocker was administered the night before surgery and on the morning of surgery.Base line parameters such as heart rate, non-invasive blood pressure, spo2, end tidal co2 and continuous ECG were monitored.Induction of anaesthesia was achieved by midazolam 0.05mg/kg, fentanyl 2 mcg/kg followed by propofol 2mg/kg and muscle relaxation using vecuronium 0.lmg/kg. Supraglottic device was inserted to maintain patient's airway. Maintenance of anaesthesia was with isoflurane in oxygen and air and incremental doses of vecuronium.Neuromuscular reversal was achieved with neostigmine 0.05mg/kg and glycopyrrolate 0.0lmg/kg at the end of surgery followed by extubation.

In group A- IV paracetamol in a dose of 15 mg/kg towards the end of surgery (7-10 minutes before closure)was administerd.

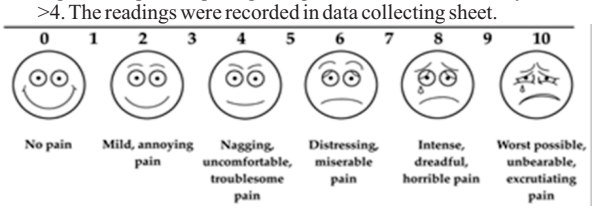
In group B-TAP block was administered with 20 ml of 0.25% bupivacaine infiltrated on each side using double-pop loss of resistance technique. At the end of surgery,Petit's triangle was identified on both sides above the iliac crest between the fibers of external oblique and lattismus dorsi muscle. Under all aseptic precautions, the block was given through Petit's triangle with 22 g blunted spinal needle attached to 20 ml syringe containing the drug. The needle was introduced perpendicular to the skin and advanced until 2 "pops" and "give way" felt . The first pop indicates penetration of the fascia of the external oblique muscle and the second indicates piercing of the fascia of internal oblique and entry of the needle into the TAP [12].The drug was deposited in the fascial plane after check aspiration.The patient was observed for l5 minutes and then shifted to post anaesthesia recovery room.

Postoperatively,the patients were assessed for pain using Visual Analogue Scale from 0 to 10 at specific time interval -2^{nd}, 6^{th},12^{th}&24^{th} hour postoperatively. The time of request for rescue analgesia was

noted during 24 hours. Side effects like nausea, vomiting and any other significant adverse effect was also assessed.

Visual Analogue Scale

- 0: no pain
- 1 -4 : mild pain,
- 5 -7: moderate pain,
- 8 -10: severe pain.
- Significant pain requiring analgesia was considered only if VAS >4. The readings were recorded in data collecting sheet.



Analgesia:

Numerical variables were presented as mean &standard deviation (SD) while categorical variables were presented as percentage. In group comparison,unpaired student's t-test was used for numerical variables while for categorical variables,chi- square test was used.

Data is expressed as Mean±SD A difference with significant level <0.05 was considered statistically significant.

OBSERVATION AND RESULTS

Based on the data analysis following observations were made:

Most common age group was 41-50 years in both Group A(n=22)and Group B (n=19)and was statistically comparable (p=0.568)

Female preponderance was observed in both Group A (n=40) and Group B (n=35)

Gender distribution in both the groups was comparable (p=0.299).

Table 1: Comparison Of Mean Arterial Pressure (map) Between Groups

Time	Group A	Group B	P value
0 min	82.15±10.73	86.06±13.77	0.163
15 min	80.92±9.48	84.20±13.91	0.277
30 min	81.35±11.67	84.14±14.34	0.475
60 min	79.62±9.50	80.22±11.87	0.680
2 hours	80.40±9.52	79.00±10.56	0.609
6 hours	78.88±10.84	75.61±13.94	0.416
12 hours	77.21±11.63	78.22±10.75	0.899
24 hours	76.92±9.20	79.37±8.73	0.396

MAP between both the groups was comparable (p>0.05) at all the time point.

Table 2: Comparison Of Heart Rate (hr) Between Groups

Time	Group A	Group B	P value
0 min	83.83±10.23	85.76±11.62	0.681
15 min	82.94±10.22	84.02±12.20	0.718
30 min	82.52±11.42	83.51±12.88	0.571
60 min	81.77±15.18	81.90±12.14	0.648
2 hours	81.00±13.80	80.16±11.11	0.359
6 hours	82.52±11.76	79.96±10.93	0.333
12 hours	80.60±9.43	79.31±11.09	0.811
24 hours	79.77±8.59	79.94±11.26	0.621

HR between both the groups was comparable (p>0.05)

Table 3: Vas Score

Time	Group A	Group B	P value
0 min	2.12±0.672	1.63±0.564	0.001
30 min	2.96±0.617	2.29±0.610	<0.001
60 min	3.71±0.922	2.88±0.791	<0.001
2 hours	4.56±0.769	3.59±0.853	<0.001
6 hours	4.23±0.805	4.10±1.005	0.764
12 hours	5.15±0.743	4.57±0.806	<0.001
24 hours	5.08±0.871	4.24±1.088	<0.001

VAS score at 30 min, 60 min, 2 hours, 6 hours and 24 hours was significantly lower in Group B as compared to Group A.

Request for rescue analgesia was statistically significantly later in Group B (8.08±5.899 hours) as compared to Group A (3.48±3.22 hours) (p<0.001).

Total analgesia was statistically significantly higher in Group A (2.60±0.818) as compared to Group B (1.84±0.946) (p<0.001).

Comparison of nausea status between groups revealed that more patients in Group B (n=35) experienced mild nausea as compared to Group A (n=21) whereas most patients in Group A (n=24) experienced moderate nausea as compared to Group B (n=8). Difference was statistically significant between the two groups (p=0.007).

Difference in vomiting status was statistically insignificant between the groups (p=0.314).

Ambulation time between the groups was comparable.(p=0.177)

DISCUSSION

Transversus abdominis plane (TAP) block is a regional anaesthesia technique that involves deposition of local anaesthetic into the fascial plane superficial to the transversus abdominis muscle at the level of the T7 - L1 dermatomes [1].

In the present study, the prevalent age group in Group A (n=22) and Group B (n=19) was 41-50 years (p=0.568) along with female preponderance (p=0.299). Tihan et al. [6] in their report cited that most of the patients undergoing laparoscopic cholecystectomy were in the 6th decade of their life and reported a female preponderance (74.8%) too.

The difference in ASA grade of patients was clinically insignificant (p<0.001) in the present study.Mean arterial pressure and heart rate were comparable between the two groups (p>0.05) at all points of time. In this study, VAS score at 30 min, 60 min, 2 hours, 6 hours and 24 hours was significantly lower in Group B as compared to Group A. One of the earliest prospective randomized controlled trials about the efficacy of TAP block published by McDonnell et al [7] declared that TAP block was"highly" effective in postoperative wound pain relief. Keir et al, [1] in their meta-analysis have concluded that TAP block in laparoscopic cholecystectomy leads to a reduction in pain scores and analgesic requirement.Tihan et al [6]demonstrated the effectiveness and safety of TAP block for postoperative pain control in 147 patients undergoing laparoscopic cholecystectomy and reported that median values of postoperative 24th-hour VAS for pain was statistically significantly higher in the control group which correlates with the present study.Petersen et al[8] showed a significant reduction in pain scores during coughing in the first 24 hours postoperatively although they did not show a significant difference in pain scores at rest between the two groups. In a similar study, Niraj et al[9] reported significantly lower pain scores at rest and on coughing in the TAP block group as compared to control group.Zhao et al [10] reported that pain score was significantly different at 2 hours interval postoperatively, a borderline difference between the groups seen at 6 hours interval and there was no difference at 24 hours postoperatively in TAP block group compared with the control group.Guo et al[11] in a study of nine randomized controlled trials with a total of 500 participants reported that TAP block was associated with a significant lower pain score at rest and on movement at 8 hours and 24 hours postoperatively in comparison to local anaesthetic wound infiltration. However, no significant difference was found at 1st hour postoperatively.Peng et al[12] have compared ultrasound guided TAP block with the control group.Their study concluded that postoperative pain intensity was significantly reduced in the ultrasound guided TAP block group both at rest and on movement at 0, 2, 4, 8, and 24 hours postoperatively. Nevertheless, some authors claimed that TAP block could not provide such an effective analgesia as presented.Ortiz et al [13] found no statistically significant difference between the analgesic efficiency of TAP block and local anesthetic infiltration on trocar insertion sites for overall postoperative pain relief in patients who underwent laparoscopic cholecystectomy. Further a study by McMorrow et al [14] concluded that TAP block does not provide any significant pain relief as compared to spinal morphine group in post cesarean section patients.

In the present study, first request of analgesia was significantly later in Group B (8.08±5.899 hours) as compared to Group A (3.48±3.22 hours) (p<0.001).This is similar to the study by Ra et al. [15] which showed a decrease in the use of analgesics ketorolac and fentanyl in the TAP group in the first 24 hours postoperatively as well as a reduction in pain scores in the 24th hour following surgery .

In the present study, total analgesia required was significantly higher in Group A (2.60±0.818) compared to Group B (1.84±0.946) (p<0.001).

Keir et al[1] in their meta-analysis found that three of the randomized controlled trials demonstrated a reduction in analgesic requirements associated with TAP blocks following laparoscopic cholecystectomy as compared to placebo. The remaining randomized study compared TAP blocks with local anaesthetic infiltration of laparoscopic port sites and showed no significant difference in clinical outcomes between these two techniques.

Zhao et al[10] in their meta-analysis of 14 trials with a total of 905 patients found that TAP block resulted in significantly less number of patients requiring postoperative analgesia and reduced postoperative 24 hours analgesic consumption.Peng et al [12] reported that fewer patients required analgesics in the recovery room when receiving TAP blocks.In this study, comparison of complaint of nausea between the groups revealed that more patients in Group B (n=35) experienced mild nausea as compared to Group A (n=21) whereas most patients in Group A (n=24) experienced moderate nausea as compared to Group B (n=8). This difference was statistically significant between the two groups (p=0.007).

In our study, complaint of vomiting was also recorded which revealed that more patients in Group B (n=29) experienced mild vomiting as compared to Group A (n=23).Patients in Group A (n=19) experienced moderate vomiting as compared to Group B (n=13) This difference was statistically insignificant between the two groups. (p=0.314).

Petersen et al, [8] studied 136 patients undergoing laparoscopic cholecystectomy and also reported that number of patients having episodes of nausea and vomiting, requiring treatment with ondansetron was not significantly different between the two groups .

A similar study by Zhao et al [10] reported that there was a significant difference in postoperative nausea and vomiting between the two groups.

Peng et al[12]reported that TAP blocks also reduced postoperative nausea and vomiting (RR= 0.48, 95% CI: 0.28 to 0.81, p = 0.006) as compared to the control group. None of the studies reported symptoms of local anesthetic toxicity.

In the present study, mobilization time (hrs) was higher in Group A (29.79±6.578 hours) as compared to Group B (27.65±6.596 hours) (p=0.177) which was statistically insignificant.In a retrospective study, by Favuzza and Delaney, [16] the authors demonstrated that laparoscopic guided TAP block with a well-established enhanced recovery pathway provided a shorter hospital stay and thus was also cost effective in patients undergoing laparoscopic colorectal surgery. Further, in another retrospective analysis by Alvarez et al[17] presented a new concept of “comprehensive enhanced recovery pathway” which includes laparoscopic- guided TAP block in patients undergoing laparoscopic colectomy. However in our study, TAP block did not have any advantage in terms of hospital stay.

CONCLUSION

It can be safely and aptly concluded that TAP block following laparoscopic cholecystectomy leads to a significant decrease in the postoperative pain scores and reduces the total analgesic consumption too when compared to the traditional intravenous method of analgesia.VAS scores at various time intervals were found to be significantly lower in patients with TAP block as compared to those with traditional intravenous method. In addition, time required for ambulation, total analgesics consumption and side effects such as nausea were significantly lower with TAP block.

As a promising and novel post-operative pain treatment procedure, TAP block is cost effective and one of the safest, easiest and most effective supplemental techniques as a part of multimodal post-operative analgesic regimen. Ease in technique of administration during any laparoscopic surgery further adds to its advantages.

Limitations of Study:

1) Chances of malpositioning of the needle resulting in failure to precisely deposit the drug at the required facial plane.
2) Risk of visceral injury.

This can be overcome by ultrasound guided TAP block which lowers the failure rate as there is precision in drug deposition and it also lowers the risk of visceral injury.

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