



Anaesthesiology

A COMPARATIVE STUDY OF ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK BETWEEN ROPIVACAINE 0.2% AND ROPIVACAINE 0.2% WITH DEXAMETHASONE FOR POSTOPERATIVE ANALGESIC REQUIREMENT FOLLOWING LAPAROSCOPIC ABDOMINAL SURGERIES

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ABSTRACT

INTRODUCTION Laparoscopic surgery is a popular method of surgery, with many advantages including reducing analgesic requirement and enhancing patient recovery. Despite the minimally invasive nature, pain can be moderate to severe in the immediate postoperative period. The most traditional approach to postoperative pain relief is multimodal using nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids. **AIMS AND OBJECTIVES** To compare the total dose of rescue analgesic requirement in 24 hours. **MATERIALS AND METHODS** The present double blinded randomized clinical trial was conducted for a period of 18 months on 60 patients undergoing laparoscopic abdominal surgeries under the assistance of Department of Anaesthesiology at Shridevi Institute of Medical Sciences and Research Hospital, Tumkur. TAP block is performed at the end of the laparoscopic abdominal surgeries using ultrasound guided technique after general anaesthesia. A syringe filled with the study solution that is Inj Ropivacaine 0.2% 19ml+1ml normal saline is injected to patients of group A on each side of abdomen, ropivacaine 0.2% 19ml+4mg (1ml) of dexamethasone is injected to patients of group B on each side of abdomen, between the internal oblique and transversus abdominis muscles at the lateral abdominal wall in the midaxillary line. Rescue analgesics will be administered if VAS ≥ 4 . The time for first analgesic request will be recorded and also Total dose of rescue analgesic administered within 24 hours will be recorded. **RESULTS** Patients with transversus abdominis plane block with ropivacaine with dexamethasone requires less post-operative NSAIDs, than the patients who received injection Ropivacaine alone. **CONCLUSION** Addition of dexamethasone as an adjuvant reduces the dose of rescue analgesia.

KEYWORDS : TAP block; laparoscopy; Ropivacaine; Dexamethasone; NSAIDs**BACKGROUND**

Laparoscopic surgery is a minimally invasive procedure which is most commonly performed.¹ Though it is a minimally invasive, pain experienced following laparoscopic surgeries in the immediate postoperative period may range from moderate to severe in intensity. Pain after laparoscopic surgeries can be further divided into three entities; visceral, parietal and referred shoulder tip pain. The important sources of pain include pain from incision sites (50-70%), Pneumoperitoneum (20-30%) and post-surgical site wound intraabdominally (10-20%). Common location of the pain post laparoscopic surgeries is intraabdominally and port sites. The main aim of treating the post-operative pain is to eradicate or to minimise the pain and to fasten up the healing process without any adverse effects. As a part of multi-modal analgesia, various approaches are used for achieving effective and safe postoperative analgesia. Clinical application of conventional postoperative analgesic modalities such as epidural analgesia, opioids, NSAIDs was limited because of their own drawbacks. Transversus abdominis plane (TAP) block that delivers local anaesthetic into the transversus abdominis fascial plane has been shown to decrease postoperative opioid use in laparoscopic abdominal surgeries,² including laparoscopic appendicectomy,³ laparoscopic cholecystectomies,⁴ total laparoscopic hysterectomy and laparoscopic cystectomy. The use of ultrasonography in abdominal blocks increases the success rate and safety of the block. Ropivacaine is long acting than lignocaine and has a documented better safety profile than bupivacaine and many other local anaesthetics. It is in common practice nowadays to choose ropivacaine for nerve blocks and fascial plane blocks. Transversus abdominis plane (TAP) block with ropivacaine has been shown to decrease postoperative use of opiates, NSAIDs after surgeries. However, the results have not been consistent, with some studies showing no additional postoperative pain control after TAP block using ropivacaine alone hence led to requirement of an additive.⁵ Dexamethasone is a highly potent, long-acting glucocorticoid with analgesic, antiemetic, and anti-inflammatory properties, and when used as adjuvant in peripheral nerve blocks, increases the duration of analgesia with minimal side effects and has an added advantage in decreasing postoperative nausea and vomiting (PONV).

MATERIALS AND METHODS**Study Area**

Department of Anaesthesiology, Shridevi Institute of Medical Sciences and Research Hospital, Tumkur

Study Population This study was conducted at Shridevi Institute of Medical Sciences and Research Hospital Tumkur 572106 on 60 patients undergoing laparoscopic abdominal surgeries.

The study was conducted after getting Institutional Ethical committee clearance. Informed written consent was obtained from the patients included in the study.

Study Design

This was a Prospective, Randomized, double Blinded, Clinical study.

Study Duration

18 months, from January 2021 to June 2022

Sample Size Calculation

1. Sample size : sixty

$$n = \left[\frac{\sigma^2 (z_{1-\alpha/2} + z_{1-\beta})^2}{(\mu_A - \mu_B)^2} \right]$$

Where, σ is standard deviation α is Type I error β is Type II error, meaning $1 - \beta = \text{power}$.Group 'A' mean, $\mu_A = 6$ Group 'B' mean, $\mu_B = 8$ Standard Deviation, $\sigma = 4$ Sampling Ratio, $\kappa = n_A/n_B = 1$ Sample size $n = 63$ Power, $1 - \beta = 0.8$ Type I error rate, $\alpha = 5\%$

Therefore each group will have sample size of 31.5 ~ 30

Sampling Method

stratified randomization.

Inclusion Criteria

- Patients aged between 18 years to 60 years
- Patients belonging to ASA I and II
- Patients coming for elective laparoscopic abdominal surgeries

Exclusion Criteria

- Infection at the site of injection.
- Patients with coagulopathy and anticoagulant treatment
- Allergy to the study drug
- Body Mass Index (BMI) < 18 or > 35 Kg/m²

Methodology

Patients were divided into 2 groups of 30 each. Only patients meeting the selection criteria were included in the study. Group -A(Bilateral Transversus Abdominis Plane block with Ropivacaine 0.2% 19ml+1ml normal saline) Group -B (Bilateral Transversus abdominis plane block with 0.2% 19ml+1ml dexamethasone(4mg)

All patients were assessed in our pre-anaesthetic clinic. Patients with exclusion criteria were excluded. After getting informed consent, patients who satisfied our inclusion criteria were taken under our study Patient put in supine position, ultrasound probe is placed transverse to the abdominal wall between lower costal margin and the iliac crest.

Transverse abdominis plane was identified after visualising external oblique aponeurosis, internal oblique aponeurosis and transversus abdominis muscle and reached using 23G quincke babcock needle.

Correct placement of needle tip in the fascia between transversus abdominis and internal oblique muscle confirmed by injecting 2-3ml Bolus dose which cause hydro dissection and 20 ml of the test drug was administered.

Procedure repeated on the opposite side.

Patients were monitored Post operatively, Visual Analogue Scale (VAS) were observed for 24 hours post operatively. Incidences of side effects were also noted and the time for analgesic initiation and total dose of analgesia was noted.

RESULTS

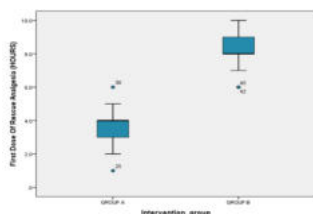
The results obtained from both the groups of patients are entered in Excel. both the study groups were comparable to test the total rescue analgesia required between group A and group B

Table 4: Mean duration of first dose of rescue anesthesia in both the intervention group.

Intervention group	Mean ($\pm$ SD) duration of analgesia (hours)	Range	95% CI	P value
Group A Ropivacaine (0.2%)	3.75 $\pm$ 1.02	1 - 6	3.36 - 4.13	0.000*
Group B Ropivacaine (0.2%) with Dexamethasone	8.41 $\pm$ 1.07	6 - 10	8.01 - 8.81	

*Statistically significant

Figure 6: Comparing mean duration of first dose of rescue anesthesia among the intervention group.



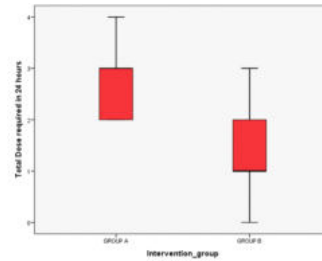
dose of diclofenac required in 24 hours in group A was 2.8 doses while in group B it was 1.5 doses. Thus lesser dose of rescue analgesia was required with the addition of dexamethasone. This mean difference of 1.3 was also found to be statistically significant at $p < 0.05$ with 95% CI: 0.93 – 1.66.

Table 5: Mean dose of rescue analgesia (diclofenac) required in 24 hours in both the intervention group

Intervention group	Mean ($\pm$ SD) dose of drug required in 24 hours	Range	95% CI	P value
Group A Ropivacaine (0.2%)	2.80 $\pm$ 0.71	2 - 4	2.53 - 3.07	0.000*
Group B Ropivacaine (0.2%) with Dexamethasone	1.5 $\pm$ 0.68	0 - 3	1.25 - 1.75	

*Statistically significant

Figure 7: Comparing Mean dose of drug required in 24 hours in both the intervention group



DISCUSSION

In recent years most of the surgeries are preferred to be done laparoscopically whenever feasible. Patient benefits of laparoscopic over open surgeries are decreased blood loss, pain and discomfort. Even the side effects of analgesia is decreased since lesser dose of analgesia is required.²⁰ Although the pain magnitude is always lesser in laparoscopic surgeries, there are additional pain over the shoulder and diffuse abdominal pain due to diaphragmatic irritation and peritoneal stretching associated with insufflation of carbon dioxide.²¹ If these operative pain are not managed adequately, it will result in delayed recovery and prolong hospital stay, thus increasing the cost. The need for research into optimal combination of medication to provide effective postoperative analgesia with minimal adverse effects and been felt for a long time.²²

Transversus abdominis plane (TAP) block is regional anaesthetic technique providing effective post-operative analgesia by blocking the sensory nerves of the anterolateral abdominal wall. It was first described by Rafi et. al.²³ in which local anaesthetic agent is injected into the plane between internal oblique and transversus abdominis muscles using the triangle of Petit as a landmark. Ultrasound guided TAP blocks have been found to be a feasible method with satisfactory analgesia following laparoscopic abdominal surgeries such as cholecystectomy, colectomy, caesarean section, hysterectomy, prostatectomy and hernia repair during the immediate post-operative period.^{24,25} A systematic review by Zhao et. el.²⁶ on comparing the efficacy of TAP block versus placebo, found decreased analgesic consumption and better post-operative analgesia. But this study had not taken into consideration the type and dose of local anesthesia used. Our study has used this technique to compare the efficacy of ropivacaine (0.2%) with 1 ml of normal saline (group A) versus ropivacaine (0.2%) with 8 mg of dexamethasone (group B) among patients undergoing elective laparoscopic abdominal surgeries.

It has been well documented that tissue injury due to surgical procedure can cause inflammatory response leading to complication such as prolonged fatigue, delirium, atrial fibrillation etc. in addition to acute postoperative pain. Medication such as lidocaine, cyclooxygenase-2 inhibitors and other non-steroidal anti-inflammatory drugs have been used to reduce post-operative surgical pain, but the most preferred drugs are steroids.²⁷ A meta- analysis of randomized controlled trails by De Oliveira et. al.²⁸ identified that low dose of dexamethasone (less than 0.1mg/kg) reduced post-operative nausea and vomiting while moderate (0.11 to 0.2 mg/kg) and high dose (more than 0.2 mg/kg) decreased opioid consumption and also post-operative pain score. Dexamethasone was used as adjuvant to local anesthesia in our study since many recent studies^{29,30,31} have found it to prolong the duration of peripheral nerve block.

In our study, diclofenac was used as the rescue drug and the total dose consumption in 24 hours was lesser in group B (1.5 $\pm$ 0.68 doses) than group A (2.80 $\pm$ 0.71 doses). This difference in doses was statistically significant at $p < 0.05$ (95% CI 0.93 – 1.66). A study by Gnanasekar et. al.³² compared the effect of ropivacaine (0.25%) versus ropivacaine (0.25%) with 8 mg dexamethasone among patients undergoing lower abdominal surgery under general anaesthesia also found decreased consumption of total analgesic (morphine) in 24 hours. Another study by Gupta et. al.³³ among patients undergoing LSCS along with ultrasound guided TAP block, compared ropivacaine (0.375%) versus ropivacaine (0.375%) with dexamethasone 4 mg. This study found much lower consumption of total tramadol in 24 hours. Thus, most of the other studies³⁴ also documented similar results except for a study by

Huanget.al.³⁵ where there was no difference in the analgesic consumption with the addition of dexamethasone.

The hypothesis of adding dexamethasone as an adjuvant to local anesthesia is to assess if it prolongs the effect of analgesia. In our study, it was seen that group A patients needed the

first dose of rescue analgesia within a mean hours of 3.75 while for group B it was 8.4 hours. Thus the use of dexamethasone along with ropivacaine has increased the time duration when the first dose of rescue analgesia is needed. A similar study by Gnanasekar et. al.¹⁰ obtained the same duration of 4.0 hours and 8.7 hours for need of rescue analgesia for surgeries done in lower abdominal under general anesthesia. Several studies on TAP block used for lower segment caesarean^{36,37} also found prolonged duration of rescue analgesia ranging from 5.9 hour to 19.04 hours with addition of dexamethasone versus 3.1 to 11.6 hours in its absence. Sharma et. al.³⁸ had conducted a study among patients undergoing hernia repair under spinal anesthesia, comparing the efficacy of ropivacaine (0.5%) with and without 8 mg of dexamethasone. This study also found a prolonged duration of analgesia of 9.11 hours among the dexamethasone group versus 6.55 hour among those given only ropivacaine. Similar findings were also documented by Ammar et. al.³⁹ among patients undergoing open abdominal hysterectomy. But this study had compared the effect of bupivacaine 0.25% with 8 mg dexamethasone versus bupivacaine 0.25% with saline using TAP block.

Marhofer et. al.⁴⁰ compared the effect of sensory block on ultrasound guided ulnar nerve using ropivacaine 0.75% with and without dexamethasone 4 mg. This study was done among healthy volunteers, to assess the effect of dexamethasone injected through i.v. route versus perineural along with ropivacaine. A standardized study environment was used to assess the return of sensory block through pinprick testing. It was concluded that dexamethasone had no role in prolonging the sensory effect of local anesthesia. They stated a possibility of clinical studies not being accurate since it is done during busy practise hours, thus causing error in the timing of documentation of sensory return.

Acute pain during the post-operative period has many causes such as inflammatory, nociceptive or neuropathic due to nerve injury during the procedure. Post-operative analgesia targets all these possible mechanism. The precise analgesia action of dexamethasone when

added along with local anesthetics is not known. Some studies report that dexamethasone has direct effect on nerve conduction while other report that it causes perineural vasoconstriction resulting in slower absorption of local anesthetic.⁴¹

Post-operative pain relief has always be a huge challenge for anaesthesiologist. Addition of dexamethasone seems to prolong the analgesic effect of local anesthesia and also decrease their dose. Except of patients diagnosed of diabetes and those with infection or decreased immunity, dexamethasone is a safe drug that can be used as an adjuvant along with local anesthesia.

CONCLUSION

In conclusion, our study showed that ultrasound-guided TAP blocks in the manner we have described resulted in decreased systemic opioid and NSAIDS consumption and a positive impact on satisfaction in patients undergoing laparoscopic surgeries.

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