Transverses Abdominis Plane Block Versus Trocar Site Infiltration in Gynecologic Laparoscopy An Observational Study

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Abstract

**Background and Aims:** Laparoscopic surgery is nowadays gold standard procedure undertaken for various surgical procedures and people prefer laparoscopic approach but the effective analgesic regimen for such patients has not been devised and anaesthesiologists prefer multimodal regimes. Despite the minimally invasive nature of this procedure, patients experience a considerable amount of pain in the first 24 h postoperatively. In our study, we are comparing the degrees of pain relief with TAP block vs Trocar site infiltration using VAS, the duration of postoperative analgesia achieve by TAP block and compare it with Trocar site infiltration and total consumption of rescue analgesia consumed in first 24 hours postoperatively in patients undergoing gynaecologic Laparoscopic surgeries.

**Methods:** After obtaining approval from the hospital Ethical committee and written informed consent from patients, this observational study was undertaken at the Government Lalla Ded Hospital which is one of the associated hospitals of Government Medical College, Srinagar during routine hours on 100 patients posted for elective Gynecological Laparoscopic surgery under general anesthesia. A total sample size of 100 patients (n= 50) for each group was calculated using PASSE (power and sample estimation) for study design and analysis. Assuming 30% improvement in pain score with error of 0.05 (i.e. 5% of DOF (degree of freedom).

**Results:** Visual analogue scale at different time intervals were statistically significantly lower at all times in Group A than Group B p-value (p<0.05). The time to first request for analgesia was higher in group A as compared to group B with statistical difference among the study groups p-value (p<0.05).

**Conclusion:** As a promising novel post-operative pain treatment procedure, TAP block is cost effective and one of the safest, easiest and the most effective supplemental techniques as part of analgesic regimen. It improves pain scores in gynecologic laparoscopy.

Keywords: post operative pain, laparoscopy, Ropivacaine, TAP block, port site infiltration.
INTRODUCTION

The International Association for the Study of Pain, defines pain as “an emotionally charged and physically unpleasant experience associated with actual or potential existence of tissue damage, or described in terms of such damage.” [1] The purpose of pain is to alert the body to damaging stimuli such as an inflammatory process or reaction or tissue damage. [2] Uncontrolled perioperative pain may potentiate some of these perioperative pathophysologies and increase patient morbidity and mortality. Postoperative pain management is a matter of concern for every anaesthesiologist. Effective pain management is now an integral part of modern anaesthesia practice. Postoperative pain control may result in improved cost effectiveness, more appropriate and efficient use of resources, and ultimately improved patient satisfaction. [3]

Proper pain control is essential for optimizing clinical outcomes and earlier ambulation after surgery. Traditional pain management with opioids increases the incidence of side effects such as excessive sedation and postoperative nausea and vomiting (PONV). Multimodal analgesia strategies with different classes of analgesics or local anesthetics may enhance pain relief and reduce side effects after surgery [4]. Transversus abdominis plane block (TAP Block) has become a popular component of postoperative analgesia after abdominal interventions. First described by Rafi et al. [5], this technique proved to be efficient in reducing perioperative opioid consumption in lower abdominal surgery. [6, 7] Hebbard et al. [8] described the achievement of this peripheral block by an ultrasound guided subcostal oblique approach, which allowed efficient analgesia in both the upper and lower abdomen, and a lower rate of complications due to the direct ultrasound visualization. Transversus Abdominis Plane (TAP) block is a widely practiced peripheral nerve block utilized to anaesthetize the somatic nerves supplying the anterior abdominal wall by depositing local anaesthetic in the neuromuscular plane between internal oblique and transversus abdominis muscle layer. [9] The TAP block has been used for postoperative analgesia for abdominal and pelvic surgical procedures including caesarean deliveries. Multiple approaches have been used for TAP blocks including commonly used ultrasound guided midaxillary approach. TAP block provides analgesia mainly in T10-12 dermatome. [10] TAP blocks are sometimes patchy with variable wound coverage. [11]

The use of ultrasound greatly facilitates the performance of TAP block and eliminates the need to feel subjective “pops” (indicating loss of resistance as the needle pierces the external oblique fascia and internal oblique muscle), which is necessary for the correct performance of TAP block by the traditional landmark technique, but is a subtle and imprecise endpoint. However, using surface ultrasound, the muscle layers of the anterolateral abdominal wall are easily identified and accurate needle placement and deposition of local anesthetic can be facilitated by using ‘real time’ imaging. [12–14] The success rate and safety of TAP block may be improved by the use of ultrasound. [15]

METHODS

The present observational study was undertaken at the Government Lalla Ded Hospital which is one of the associated hospitals of Government Medical College, Srinagar during routine hours on 100 patients posted for elective Gynecological Laparoscopic surgery. A total sample size of 100 patients (n= 50) for each group was calculated using PASSE (power and sample estimation) for study design and analysis. Assuming 30% improvement in pain score with error of 0.05 (i.e. 5% of DOF (degree of freedom). Women 18 years and older undergoing gynecological laparoscopic surgery using a three port symmetrical technique were included. Two group study design were made. In group A, the patients receive TAP block and in group B patients receive...
trocarsite infiltration at the end of surgery.

2.1 | Criteria for Exclusion;

1. Patients belonging to ASA class > II.
2. Patients with Body Mass Index > 30.
3. Patient with known hypersensitivity to local anaesthetic.
4. Patient refusal.
5. Conversion to laparotomy

3 | PROCEDURE

After informed consent, all patients were randomized according to a computer generated randomization list. All patients were transported to the operating room without premedication. On arrival to operating room, written informed consent and fasting was confirmed. All the study patients were instructed about the use of the VAS score (Visual Analogue Score) before induction of anesthesia.

An 18-gauge intravenous (IV) cannula was inserted and 6 ml/kg/h crystalloid were infused. Pre-operatively monitoring of electrocardiography, non-invasive blood pressure, oxygen saturation (SpO2) was started and baseline values was recorded. Premedication with injection Pantaprozole 40 mg intravenous was given.

All patients in recovery room after the end of surgery till 24 hrs after surgery. The primary outcome variable was to access degree of pain relief by using visual analogue scale score. The secondary outcome was the duration of analgesia (till patient has no pain), time to the first request of analgesia in the post-operative period, total dose of analgesic used in 24 hr period (post-operative) and any adverse/side effects.

For each patient: Age, weight, ASA physical status, duration of surgery (first skin incision to last skin suture) was recorded. The intensity of post-operative pain was recorded for all the patients using VAS score at 0, 1, 2, 4, 6, 12, and 24 hours after surgery. (VAS score of 0 – means no pain, VAS score of 10 – means worst possible pain). Patients who report VAS 4 or >4 was given injection Paracetamol 1 gm intravenous infusion as rescue analgesia. Patients were also observed for post-operative nausea and vomiting and other side effects if any. Duration of analgesia (time till patient has no pain considering the time of block as time 0), Time to the first request of rescue analgesia (from time 0), total dose of analgesia and adverse or side effects over 24 hrs postoperatively was noted.

All patients receive general anesthesia with endotracheal intubation. A standard multimodal intraoperative intravenous analgesic regimen was used including 1g of acetaminophen.

The surgical approach consist of 3 laparoscopic ports inserted at or below the umbilicus: 1 periumbilical balloon trocar, 2 accessory ports inserted into the right lower quadrant and the left lower quadrant in the suprapubic region. In every case, peritoneal access was obtained using an open port placement technique in the periumbilical area.

In group A, the TAP block was performed using a posterior approach under ultrasound guidance by 1 of 2 anesthesiologist, both with significant experience with the technique. A high frequency linear ultrasound probe was positioned in a transverse plane in the midaxillary line, between the lower costal margin and the iliac crest. A 18 gauge 10 cm needle was inserted in the plane of the ultrasound beam and followed visually until it reach the plane between the internal oblique and the transversus abdominis muscle. Two milliliters of the local anesthetic solution was injected to visualize the spread of the solution and confirm correct needle position after which the remainder of the 15 ml was administered on either side. In group B, the surgeon performed port site infiltration of local anaesthetic ropivacaine.

All treatments was performed at the end of the surgical procedure and immediately prior to extubation. At the completion of the surgery patients were transferred to the recovery unit, throughout the postoperative period, analgesic medications including acetaminophen, Nonsteroidal anti-inflammatory drugs, and systemic narcotics was administered upon patient’s request. Abdominal pain was assessed at 0,1,2,4,6,8, 12, 18, and 24 hours. (0 hours being at admission to the recovery) on the TAP and trocar site infiltration of local anaesthetic ropivacaine.
infiltration. Vas scores was obtained and recorded accordingly. Subjective and objective methods were used to evaluate postoperative pain at each time point. Patients were asked subjectively to quantify their pain level on each side using a 10 point visual analog scale (VAS), a simple and validated measure of pain ranging from 0, representing no pain, to 10, representing the worst pain imaginable.

4 | RESULTS

A total of 100 patients were enrolled in this study. Distributions of patients in both groups were similar with respect to demographics, American Society of Anesthesiologists’ physical status, and duration of surgery. Table 1.

| Variables     | Group A (n=50) | Group C Control (n=50) | P value |
|---------------|----------------|------------------------|---------|
| Age           | 47.68 ± 8.54   | 46.72 ± 6.62           | >0.05   |
| Weight        | 61.52 ± 4.63   | 62.20 ± 4.35           | >0.05   |
| Height        | 157.10 ± 4.59  | 155.38 ± 4.79          | >0.05   |
| ASA/I/II      | 34/16          | 36/14                  | >0.05   |

There was a significant difference in pain scores between the two groups with the patients receiving TAP block having lower scores up to 24 h (P <0.05) Figure 1.

![Figure 1: Visual analogue scale at different time intervals.](image)

The time to first request for analgesia ranged from 4 to 13 hours with a mean of 7.25±1.20 hours in group A, and 3.5-4.5 hours with a mean of 4.05±0.80 hours in group B. The statistical difference was significant among the study groups (p value 0.003) Figure 2.

![Figure 2:](image)

Total analgesic consumption (PCM) was also lowest in Group A (80 ± 30.2 mg) than Group B (170 ± 70.5). The statically difference was significant with (P value <0.05) Table 2.

| Group | N   | Mean (mg) | SD  | P-value | Remarks |
|-------|-----|-----------|-----|---------|---------|
| GROUP A | 50  | 80 ± 30.2 | 30.2| 0.053   | Sig     |
| GROUP B | 50  | 170 ± 70.5| 70.5|         |         |

We did not face any complications associated with the procedure in both groups.

5 | DISCUSSION

Since laparoscopic surgery is considered to be a minimally invasive procedure, acute surgical pain is common, especially in the first postoperative day. Traditionally, analgesic drugs were used for pain relief, however drug efficacy is not the only prerequisite for a positive acute surgical analgesic trial. [16] in recent years, TAP blocks have demonstrated effectiveness in reducing postoperative pain when used as part of a multimodal analgesic regimen. [17]

With the increasing number of TAP block studies appearing in the literature, many meta-analyses have been published, Rita Champaneria et al. published...
a small meta-analysis of five RCTs showed evidence exists for the short-term efficacy (within 24 h) of transversus abdominis plane blocks during hysterectomy in terms of reported pain and morphine consumption, which may not be sustained at 48 h. [18] Two analysis indicated that TAP blocks improve pain relief after abdominal surgery, [19, 20] Mishriky BM et al reported that significantly improved postoperative analgesia in women undergoing Cesarean delivery. However, there has been no systematic review evaluating the efficacy of the TAP block undergoing laparoscopic surgery, the effect of TAP block has not been clearly defined.

TAP block was introduced by Rafi in 2001. [21] He described it as block delivering local anaesthetics in the TAP using the anatomical landmarks (iliac crest) by first identifying the lumbar triangle of Petit. In 2007, Hebbard et al. introduced the USG-guided approach for TAP block. [22] The USG probe was placed transverse to the abdominal wall which made the three muscle layers distinctly visible after which the probe was moved to the mid-axillary line just above the iliac crest (i.e., over the triangle of Petit). The needle was then advanced medially by in-plane approach. This is referred to as the posterior approach. This approach was used in our study. TAP block has been used for various abdominal procedures other than caesarean section such as large bowel resection, open/laparoscopic appendectomy, total abdominal hysterectomy, laparoscopic cholecystectomy, open prostatectomy, abdominoplasty with or without flank liposuction, inguinal hernia and iliac crest bone graft. [23–31] The TAP has poor vascularity, and hence the action is prolonged and not associated with any major complications. In the present study we used the USG-guided technique to avoid complication more common with the blind approach. [32] In addition, it gives a real-time picture and chances of failure are reduced.

In the present study Total analgesia consumption was also lowest in Group A (80 ± 30.2 mg) than Group B (170 ± 70.5). The statically difference was significant with P value <0.05. Our study is consistent with a study conducted in 2008 using TAP block after caesarean delivery by the blind approach, with 1.5 mg/kg ropivacaine (to a maximal dose of 150 mg) or saline on each side. [33] The study confirmed the usefulness of TAP block as seen by the reduced the VAS and requirement for morphine (66 ± 26 mg vs. 18 ± 14 mg, P < 0.001). In the present study, the time to first request for analgesia ranged from 4 to 12 hours with a mean of 7.25±1.20 hours in Group A, and 3-4 hours with a mean of 4.05±80 hours in Group B and the statistical difference was significant among the study groups (p value 0.003).

Two similar studies of TAP block were conducted in ASA I and II patients undergoing elective caesarean section using 20 ml of 0.25% bupivacaine or levobupivacaine. The studies revealed that pain scores were lower and time of demand for first analgesia was significantly longer in study groups compared to control (no drug) groups. [34, 35] Another study was conducted using 20 ml of 0.375% ropivacaine on either side, which included ASA II patients undergoing caesarean section under spinal anesthesia; reduction in mean VAS score (P < 0.001) and reduced opioid requirement were observed [36].

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