Original Research Article

Comparison between Surgeon Administered Intraoperative Transverse Abdominis Plane Block with Wound Site Local Anesthetic Infiltration in Patients Undergoing Open Appendicectomy: A Prospective Double-Blinded Randomised Control Trial

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Abstract

Transversus abdominis plane (TAP) block is a defined technique for managing postoperative pain. In particular, the use of surgeon-administered TAP blocks needs more comprehensive research. Therefore, our objective was to record the pain relief needed in patients who underwent surgical administered TAP blocks followed with an open appendectomy in comparison to those who received local anaesthetic infiltration at the wound site. Additionally, we aimed to assess the time until the first postoperative analgesic application and compare tramadol requirements in the postoperative period for these two groups. We conducted a controlled, prospective, randomised, double-blind study involving patients who underwent open appendicectomy at Hospital Sultanah Aminah Johor Bahru from April 2017 to October 2017. Of 61 patients, 31 were in the intervention group, and 30 were in the control group. Both groups of patients received a dose of 10cc of 0.25% levobupivacaine. Patients in the intervention group experienced a longer interval before requiring their first rescue analgesia (2.6 hours versus 1.17 hours; p=0.02, SD=1.66-2.97). The total tramadol dose needed over the first 24 hours in the intervention group was slightly lower at 115.8mg compared to the control group, which used 136.7mg (p=0.32, sd=72.42-89.96). Notably, patients in the intervention group also had a significantly shorter hospital stay (1.39 versus 1.68 days, p=0.02). It was worth noting that none of our patients experienced any adverse events during the study. Considering our study's effectiveness and safety profile, we recommended the routine use of surgeon-administered TAP blocks in open appendicectomy. This approach not only enhanced patient postoperative analgesia but also reduced the duration of hospitalisation.

Keywords: Analgesia; local anaesthesia; open appendicectomy; postoperative analgesia; transversus abdominis plane block

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Introduction

Transversus Abdominis Plane (TAP) block is a recently developed technique for managing postoperative pain of gynaecological and abdominal surgeries (1). It is also an effective method for pain relief when incorporated as part of a comprehensive approach in pain management for surgical procedures like open appendectomy, laparoscopic cholecystectomy, hysterectomy, caesarean section, and midline abdominal incision (1,2). McDonnell et al. conducted a study comparing a placebo with the TAP

block, and their findings indicated that the TAP block offered superior pain relief for up to 48 hours, it also decreased the need for postoperative opioids and prolonged the duration of the first pain relief application (3). Scharine's publication suggested that TAP block can provide long-lasting pain relief, resulting in lower pain scores, faster initiation of oral nutrition, quicker patient mobilisation, and shorter hospital stays, mainly in the absence of narcotic analgesics (4).

Surgical administration of TAP blocks has gained prominence due to its ability to prevent inadvertent injection into the wrong layer and avoid damage to deeper structures (2). This method ensures asepsis and confirms accurate placement while avoiding harm to internal organs and injury to inferior epigastric vessels (2).

Owen and colleagues detailed a technique for conducting an open surgical TAP block in women who were undergoing caesarean sections with spinal anaesthesia, revealed a significant reduction in the requirement for morphine when this method was employed (2).

Nonetheless, the effectiveness of TAP block as an analgesic method remains debatable. There is a lack of conclusive evidence regarding the precise role of TAP block when performed under direct visualisation during abdominal surgeries, particularly in the context of open appendicectomy. As a result, we conducted this study to ascertain whether a TAP block performed under direct visualisation is superior to the standard practice in Malaysia, which is local anaesthetic infiltration at the wound site.

Materials and Methods

This study was conducted at Hospital Sultanah Aminah Johor Bahru between April 2017 and October 2017, with institutional approval obtained from Universiti Kebangsaan Malaysia (FF-2017-202) and the Ministry of Health Malaysia (NMRR-16-580-30313). The primary objective of this research was to assess the analgesic requirements in adult patients who were undergoing open appendicectomy and compare the effectiveness and safety profile of the TAP block performed under direct vision with LA infiltration at the wound site, which is the current standard practice in Malaysia. We also aimed to determine the time to the first postoperative analgesic application and to compare the postoperative tramadol requirements between patients receiving the TAP block and those receiving local anaesthetic infiltration at the wound site.

The sample size for the study was calculated using the Power and Sample Size Program (PS Version 3.0), where 30 patients for each group were needed. Continuous variables were analysed using mean, median, standard deviation, and interquartile range. Categorical variables were analysed using frequencies and percentages. The inferential analysis included the parametric comparison of means using an Independent t-test for normally distributed continuous variables and the Chi-square test for associations between categorical variables. A p-value < 0.05 was considered statistically significant. Descriptive and inferential analyses were presented in tables. SPSS Ver 26 was used for analysis.

All adults who were undergoing open appendicectomy via the Lanz incision were eligible to be enrolled. Exclusion criteria encompassed patients with perforated appendicitis, a history of blood dyscrasias or coagulopathies, conversion from laparoscopy to laparotomy, allergies to local anaesthetic/paracetamol or tramadol, localised infection at the injection site, recent chronic analgesia usage, history of organ failure, or patients who underwent muscle cutting or had their wound extended during open appendicectomy. All participating surgeons underwent comprehensive training to perform the TAP block proficiently under direct visualisation and skin infiltration techniques.

Patients who provided consent were randomly assigned to undergo surgeon-administered TAP block under direct vision or LA infiltration at the wound site. Randomisation was performed using sealed envelopes, and the surgeon, who was not blinded, was informed about the procedure. Patients and the assessor were kept blind to the assigned procedure. All patients received standard general anaesthesia with monitoring. In the control group, after completion of surgery (i.e., after skin and fascia closure), the skin and subcutaneous fascia were infiltrated using a 22G needle with 0.25% 10cc levobupivacaine, following a careful negative aspiration.

In the TAP group, blocks were performed under direct vision; after completing the appendicectomy via the Lanz incision and closing the peritoneal cavity, the transverse abdominis plane was identified and gently elevated superiorly using a retractor, with care to avoid damaging of the inferior epigastric vessels. After careful aspiration, 0.25% 10cc levobupivacaine was injected slowly using a 22G needle. The surgeon could feel the expansion of this plane with minimal resistance after a significant volume was injected. After surgery and emergence from anaesthesia, patients were transferred to the recovery suite.

Standard postoperative analgesia, consisting of oral paracetamol 1g every 6 hours, was administered to both groups after emergence from anaesthesia. A blinded assessor systematically evaluated the pain intensity and incidence of nausea/vomiting. Assessments were conducted in the recovery suite at 30 minutes and every 2 hours for the first 24 hours or when patients complained of pain. Pain severity was measured using a visual analogue scale (VAS) from 1 to 10 (5,6). A VAS score of 0 indicated no pain. In contrast, scores less than three were considered minimal pain, not requiring rescue analgesia; scores between 3.1 and 6 were considered moderate pain; and scores between 6.1 and 10 were considered severe pain, requiring opiate rescue analgesia (7). When the VAS score exceeded 3, tramadol at 1mg/kg was administered as rescue analgesia (6,8). The time to the first dose of rescue analgesic (in minutes) and the total tramadol consumption within 24 hours postoperatively were recorded. Nausea and vomiting were measured using a categorical scoring system, with rescue antiemetic (IV metoclopramide 0.1-0.3 mg/kg) offered to patients with nausea scores above 2 (9).

Complications of the technique, such as infection, hematoma at the operation site, and injury to surrounding organs, were documented. Outcomes were assessed by a research team member blinded to group allocation. Patients were followed up at six weeks upon discharge or through phone calls for those who did not attend the follow-up.

Results

The study enrolled 63 patients but only analysed 61 patients because two patients were found to have ovarian cysts and were subsequently managed by a gynaecologist. The mean age, sex, ethnicity, chronic illnesses and status of the surgeons were summarised in Table 1. Comparison of the effectiveness of surgeon-administered TAP block against LA infiltration for the time taken for the first dose of rescue analgesia, total tramadol requirement in the first 24 hours and duration of hospitalisation along with the statistical analysis were summarised in Table 2. Table 3 compared patient safety profiles; of the two patients with surgical site infection, one also reported dissatisfaction with the surgeon-administered TAP block.

TABLE 1: Demographic data showed age, gender and racial composition as well as presence of chronic medical illnesses and status of those who did the surgery

		N	%
Age (years)	Mean(SD)	27.06 (9.96)	
Gender	Male	35	55.6
	Female	28	44.4
Ethnicity	Malay	39	61.9
	Chinese	3	4.8
	Indian	13	20.6
	Other	8	12.7
Medical Illness	Bronchial Asthma	4	6.3
	Hypertension	1	1.6
	Diabetes	1	1.6
	Diabetes & Hypertension	2	3.2
	None	54	85.7
Surgeon status	Medical Officer	56	88.9
	Registrar	6	9.5
	Specialist	1	1.6

TABLE 2: Comparison of time to first rescue analgesia, total tramadol usage in the first 24 hours and length of hospital stay (days) between patients who received surgeon-administered Transverse Abdominis Plane (TAP) block and local anesthesia at the operation site (LA)

	N	Mean	Standard Deviation	P-value
Time to first rescue analgesia (hours)				
TAP	31	2.58	2.97	0.03
LA	30	1.17	1.66	
Total tramadol usage (mg)				
TAP	31	115.81	72.42	0.32
LA	30	136.67	89.96	
Length of Hospital Stay (days)				
TAP	31	1.39	0.54	0.02
LA	30	1.68	0.48	

TABLE 3: Comparison of safety profile between patients who received surgeon-administered Transverse Abdominis Plane (TAP) block and local anesthesia at the operation site (LA)

		TAP N (%)	LA N (%)
Hematoma	Yes	0 (0.0)	0 (0.0)
	No	30 (100.0)	31 (100.0)
Surgical site infection	Yes	2 (3.2)	0 (0.0)
	No	28 (96.8)	31 (100.0)
Injury to nearby structure	Yes	0 (0.0)	0 (0.0)
	No	30 (96.8)	31 (100.0)
Re-admission	Yes	1 (3.2)	0 (0.0)
	No	29 (93.5)	31 (100.0)
Patient satisfaction	Yes	1 (3.2)	0 (0.0)
	No	30 (96.8)	31 (100.0)

Discussion

A significant portion of the pain experienced by patients after abdominal surgery stems from the incision in the anterior abdominal wall. TAP block has effectively provided postoperative analgesia for various lower abdominal surgeries (10,11). Effective pain relief can reduce the body's stress response to surgery and expedite recovery (12). TAP is a promising technique with the potential for wide application in alleviating pain after surgeries involving the anterior abdominal wall (13). However, blind TAP block has numerous complications and uncertain efficacy (8). This study evaluated the analgesic effectiveness of surgical administered TAP block versus standard wound site LA infiltration in adult patients following open appendicectomy.

Our study revealed that the time to the first dose of rescue analgesia was significantly longer in the TAP block group compared to the control group, indicating improved pain control. This finding was consistent with previous research on cesarean sections and laparoscopic appendectomy, where TAP block extended the time to the first analgesic demand (3,8,14,15). This is likely due to the accurate sensory blockade of the sensory supply of the anterior abdominal wall accomplished through a surgeon-administered TAP block (16,17).

Looking into postoperative tramadol consumption, although not statistically significant, the TAP block group used slightly less tramadol than the control group. This could be due to the nature of pain in appendicitis surgery, which has both somatosensory pain from the surgical wound and vesicoperitonitic pain from inflammation (15,18). TAP block mainly targets pain from the surgical wound (13).

In terms of hospital stay, the intervention group had a shorter duration than the control group, which was statistically significant. This finding was consistent with other studies on laparoscopic appendectomy and open appendectomy, indicating that TAP block could facilitate earlier mobilisation and reduce the length of hospitalisation (13,18).

As we anticipated using direct vision during the blocks with the training and credentialing of the surgeons, we can ensure the safe placement of the blocks without the risk of damaging internal organs. We attribute the zero complication rate in the TAP block to direct vision during the procedure and the experience of the surgical medical officers performing the blocks. A few studies have demonstrated that a direct vision intraabdominal approach ensured safe placement without the risk of damaging internal organs when compared to a percutaneous TAP block (2,19,20).

The limitations of this study were that it was a single-centre study with a limited sample size, which predisposed to type 2 statistical error. Moreover, the definition of a medical officer needs to be narrower as some medical officers may be more experienced and skilful than their specialists.

Conclusion

TAP block performed under direct vision by the surgeons demonstrated its effectiveness as a postoperative analgesic technique for open appendicectomy. It provided better pain control, shortened hospital stays, and a safety profile comparable to the standard approach. While the results may vary in some aspects from other studies, the use of a TAP block should be considered as an option for patients who were undergoing open appendectomy.

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