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The Effect of Ultrasound-Guided Transversus Abdominis Plane Block on Chronic Pain Experienced After Inguinal Hernia Surgery: A Retrospective Cohort Study

Ultrasonografi Eşliğinde Uygulanan Transversus Abdominis Plan Bloğunun İnguinal Herni Cerrahisi Sonrası Gelişen Kronik Ağrı Üzerine Etkisi: Retrospektif Kohort Çalışma

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ABSTRACT

Objective: The purpose of this retrospective study was to see how efficient ultrasound-guided transversus abdominis plane (TAP) block was on the incidence of chronic postoperative pain developing after inguinal hernia surgery.

Methods: The records of patients who had unilateral elective grafted inguinal hernia surgery with the Lichtenstein procedure under general anesthesia between July 2018 and October 2019 were examined retrospectively. The patients were placed into two groups (total=70): those who did not receive intraoperative TAP block (Group 1, n=38) and those who received (Group 2, n=32). The patients were contacted by phone 6 months after the procedure, and it was learned and recorded whether they had chronic pain before the operation, the nature of the pain if any, whether it limited their daily activities or not. The Numerical Rating Scale was used to measure chronic pain, and values of 3 and above were considered chronic pain.

Results: This study comprised a total of 70 participants, with 38 patients in Group 1 and 32 patients in Group 2. Patients with chronic pain incidence in the postoperative 6th month (n=21) accounted for 30% of all patients. There was no significant difference between the groups regarding chronic pain development [Group 1 (n=14, 36.8%), Group 2 (n=7, 21.8%)]. It was observed that the patients' pain was predominantly in the burning style.

Conclusion: We concluded that the ultrasound-guided TAP block had no significant effect on the development of chronic pain.

Keywords: Postoperative chronic pain, transversus abdominis plane block, inguinal herniorrhaphy

ÖZ

Amaç: Bu retrospektif çalışmanın amacı, inguinal herni onarımı esnasında ultrasonografi eşliğinde uygulanan transversus abdominis plan (TAP) bloğun postoperatif oluşan kronik ağrı üzerine etkinliğini değerlendirmektir.

Yöntem: Temmuz 2018 ile Ekim 2019 tarihleri arasında genel anestezi altında Lichtenstein tekniğiyle tek taraflı elektif greftli inguinal herni ameliyatı olan hastaların retrospektif olarak kayıtları incelendi. Hastalar intraoperatif TAP blok uygulanmayan (Grup 1, n=38) ve uygulanan olarak (Grup 2, n=32) iki gruba ayrıldı (n=70). Postoperatif 6. aydan sonra hastalar telefonla aranarak; ameliyattan önce kronik ağrı varlığı, varsa ağrının karakteri, günlük aktivitelerini sınırlayıp sınırlamadığı öğrenildi ve not edildi. Kronik ağrı ölçümü için Sayısal Derecelendirme Ölçeği ağrı skoru kullanıldı; 3 ve üzeri değerler kronik ağrı olarak kabul edildi.

Bulgular: Bu çalışmaya Grup 1'de 38 ve Grup 2'de 32 hasta olmak üzere toplam 70 hasta dâhil edildi. Postoperatif 6. ayda kronik ağrı görülen hasta oranı (n=21) %30'du. Gruplar arasında kronik ağrı gelişimi açısından anlamlı bir fark yoktu [Grup 1 (n=14, %36,8); Grup 2 (n=7, %21,8)]. Hastaların ağrı karakterlerinin en sık yanıcı tarzda olduğu gözlendi.

Sonuç: Ultrasonografi eşliğinde uygulanan TAP bloğun kronik ağrı gelişimi üzerine anlamlı bir etkisinin olmadığı sonucuna vardık.

Anahtar sözcükler: Postoperatif kronik ağrı, transversus abdominis plan bloğu, inguinal herniografi

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INTRODUCTION

Inguinal hernia is a very prevalent condition in today's society. The surgical treatment of inguinal hernia is one of the most commonly performed surgical operations in the world. Despite the fact that there are other procedures for the operation, the open repair technique developed by Lichtenstein in 1990 is still the most widely used (1,2). The most common long-term complications after surgery include hernia recurrence and chronic pain (3). Chronic pain is defined as discomfort that lasts longer than three months after surgery (4). The incidence of chronic pain following inguinal hernia surgery is approximately 5-43% (5). The nerve injury that occurs as a result of connecting, cutting, and compressing the nerve during surgery is thought to be the origin of this chronic pain with a neuropathic character. Recurrent hernia repair, presence of chronic pain before surgery, female gender, young patients, and poor management of postoperative pain are all predisposing factors for chronic pain development (6).

The transversus abdominis plane (TAP) block, first described by Rafi in 2001, is a regional anesthetic technique that may be used in both upper and lower abdominal procedures (7). This procedure, which was first used blindly, became a more successful and safe technique when it started to be used along with ultrasonography (USG). The TAP block is performed by injecting a local anesthetic into the neurofascial region between the internal oblique and transversus abdominis muscles' fascia. The ilioinguinal (L1), iliohypogastric (T12-L1), subcostal (T12), and lower intercostal nerves (T9-T11) all run through this area, commonly known as the transversus abdominis plane (8). The TAP block has been demonstrated to be beneficial for postoperative analgesia and chronic pain after abdominal procedures in studies (9,10).

This study aimed to investigate the effect of USG-guided TAP block on the incidence of chronic pain in patients who underwent inguinal hernia repair under general anesthesia.

METHODS

This retrospective, observational, Cohort study was carried out in a tertiary education and research hospital. Local ethical consent (No:2020/355) was obtained from the scientific research ethics committee. Patients' perioperative records were evaluated retrospectively for those who had elective inguinal hernia surgery between July 2018 and October 2019. Inclusion criteria were American Society of Anesthesiologists (ASA) physical status I-III score, older than 18 years old, and having undergone unilateral mesh hernia repair under general anesthesia. All of the surgeries were performed using the open repair technique (Lichtenstein). All data from 246 patients who underwent surgery between July 2018 and October 2019 were evaluated, with 70 patients receiving complete perioperative medical records being included in the final analysis. The patients were divided into two groups as Group 1, who did not receive TAP block (n=38), and Group 2, who underwent intraoperative TAP block (n=32).

In our clinic, inguinal hernia surgeries are conducted under general or spinal anesthesia after standard monitoring in compliance with the ASA guidelines. We included only patients who were operated under general anesthesia in our study. Fentanyl and propofol were administered for induction. Maintenance was performed with a combination of inhaled anesthetic agents and remifentanil infusion. In order to manage the airway, a supraglottic airway device was usually used. All TAP blocks were performed under real-time ultrasound guidance following anesthesia induction in supine position. The abdominal wall was scanned with a linear probe covered with a sterile plastic sheath. The probe was placed on the lateral aspect of the abdominal wall at the level of the umbilicus between the iliac crest and the subcostal border. The probe was gently manipulated until all three layers of the lateral abdominal wall were visible from surface to depth, namely the external oblique, internal oblique, and transverse abdominal muscles, respectively. A 22 G, 80 mm needle was advanced medial-laterally by in-plane insertion with real-time ultrasound evaluation. The injection site was defined between the aponeurosis of the internal oblique and transverse abdominal muscles. When the tip was correctly positioned in the target plane, 0.5% bupivacaine (1.5 mg kg^{-1}) was injected by intermittent aspiration. All TAP blocks were performed by anesthesiologists with at least five years of ultrasound-guided technique expertise. Paracetamol (1 g) was administered to all patients with a Visual Analog Scale (VAS) score >3 for the management of postoperative pain. In patients who complained of pain despite paracetamol (1 g) and had a VAS score >3, pethidine (0.5 mg kg^{-1}) was administered as rescue analgesia.

Demographic data such as age (year), height (cm), weight (kg), gender (female/male), additional disease (yes/no), history of recurrent surgery (yes/no) were obtained from the hospital management information system. The patients who completed the 6^{th} month after the operation were called, and the presence of chronic pain in the hernia area and chronic pain before the operation were questioned. Additionally, the type of pain characteristics (burning/stinging/throbbing), whether the pain limited daily activities, and they consulted a doctor because of pain were asked. The Numerical Rating Scale (NRS) was used to measure chronic pain, and values of 3 and above were considered as chronic pain.

Statistical Analysis

Statistical analysis was performed using the IBM SPSS for MAC version 25.0 software. The Shapiro Wilk test was used

to assess whether the continuous data conformed to normal distribution. The Independent Sample t-test was used to compare continuous data with normal distribution, and the Mann-Whitney U test was used for comparisons of continuous data that did not show normal distribution. Pearson Chi-Square and Fisher's Exact Chi-Square tests were used to compare categorical data. Results were assessed at a 95% confidence interval, and the significance was evaluated at the level $p<0.05$.

RESULTS

Demographic data of the patients are presented in Table I. No statistically significant difference was observed between the groups regarding demographic data. There was no statistically significant difference between the groups in terms of the presence of additional disease, recurrent surgery, pre-existing chronic pain, pain restricting daily activities (Table I).

Patients with chronic pain in both groups are given in Table II. There was no statistically significant difference between the groups regarding the presence of chronic pain and pain characteristics.

DISCUSSION

This study reveals that TAP block did not have a significant effect on the incidence of chronic pain in patients who underwent unilateral inguinal hernia repair utilizing mesh with an open anterior surgical method under general anesthesia. There was no significant difference in restriction of patients' daily activities or the frequency of consulting a doctor due to chronic pain.

Although there are different definitions of chronic pain, the International Association for the Study of Pain defines it as pain that lasts longer than 3 months (4,11). The inflammatory response to synthetic meshes used for inguinal hernia surgery can last for months, making it difficult to distinguish it from chronic pain (12,13). Therefore, we assessed the pain levels of the patients after the 6th month. Chronic pain is a condition that restricts patients' daily activities, lowers their quality of life, and forces them to seek medical help. In their study, Nienhuijs et al. found that approximately one-third of patients with chronic pain had limited daily activities (3). In our study, however, we discovered that only one patient in the TAP block group had limited daily activities due to chronic pain and had sought medical advice due to the pain. The reason for this, we believe, is recent advancements in mesh technology and improved analgesia planning.

Chronic pain is one of the most prevalent complications seen after inguinal hernia surgery. Its risk factors include young age, obesity, hernia size, preoperative pain, mesh use, open surgery, postoperative infection, and recurrent hernia (14). Van Hanswijck de Jonge et al., found that the incidence of chronic pain after inguinal hernia operation varied between 25-30%, while Alfieri et al. reported that this rate varied between 0-43% (13,15). In this study, we found a 30% incidence of chronic pain in unilateral grafted inguinal hernia operations conducted with open anterior surgical method under general anesthesia, which is consistent with the literature.

Table I. Demographic and Clinical Data

		Group 1 n=38	Group 2 n=32	p*
Age (years), mean±SD		52.0 ± 14.6	53.6 ± 15.6	0.422
Height (cm), mean±SD		173.5 ± 8.4	174.2 ± 7.2	0.242
Weight (kg), mean±SD		79.7 ± 12.6	75.2 ± 12.4	0.894
Gender, n (%)	**Male**	35 (92)	30 (94)	1.00*
	Female	3 (8)	2 (6)	
Additional disease, n (%)	**Yes**	13 (34)	15 (47)	0.329**
	No	25 (66)	17 (53)	
History of recurrent surgery, n (%)	**Yes**	3 (8)	3 (9)	1.00*
	No	35 (92)	29 (91)	
Chronic pain before operation, n (%)	**Yes**	0 (0)	0 (0)	—
	No	38 (100)	32 (100)	
Whether the pain limited daily activities, n (%)	**Yes**	0 (0)	1 (3)	1.00*
	No	38 (100)	31 (97)	
Whether patients consulted a doctor because of pain, n (%)	**Yes**	0 (0)	2 (6)	0.205*
	No	38 (100)	30 (94)	

Independent sample T test, *Fischer's Exact Test, **Pearson Chi-Square Test.

Table II. Presence and Characteristics of Chronic Pain

	Group 1 n=38	Group 2 n=32	p*
Presence of chronic pain at 6 months, n (%)	14 (36.8)	7 (21.8)	0.173**
Burning	7 (18.4)	4 (12.5)	0.532*
Stinging	6 (15.7)	2 (6.2)	0.275*
Throbbing	1 (2.6)	1 (3.1)	1*

*Fischer's Exact Test, **Pearson Chi-Square Test.

The TAP block is a regional anesthetic technique used to numb the area between the internal oblique muscle and transversus abdominis muscles in the anterolateral portion of the abdomen known as the "transversus abdominis plane" (8). With its widespread use under USG guidance, this block is commonly utilized as a part of a multimodal analgesic regimen in upper and lower abdominal surgery, particularly for postoperative pain control (16). However, while there is no conclusive evidence that TAP block reduces chronic pain after cesarean section or inguinal hernia, research is still ongoing. Okur et al. showed that TAP block use after inguinal hernia procedures performed under spinal anesthesia minimizes the incidence of chronic postoperative pain (10). On the contrary, Theodoraki et al. reported in their study that TAP block application for postoperative analgesia in inguinal hernia operation had no effect on the incidence of chronic pain (5). In our study, the rate of chronic pain was 36.8% in the patients without TAP block and 21.8% in the TAP block group in unilateral mesh inguinal hernia operations conducted using the open anterior surgical method under general anesthesia. In these results, we believe that TAP block had no effect on the prevention of chronic pain. There is a need for more extensive and in-depth studies on this topic.

Chronic pain following inguinal hernia operation is divided into two types: neuropathic and non-neuropathic (nociceptive) pain (17). According to Lange et al., there is no clear distinction between nociceptive and neuropathic pain, and pain classification can be modified by a number of factors including social, genetic, and psychological factors (18). Neuropathic pain is characterized by a burning sensation that spreads to the sensory nerve region. Neuropathic pain is caused by mesh and sutures compressing, damaging, or cutting the affected nerve (4). Nociceptive pain, on the other hand, is a stabbing, throbbing, and sharp pain. Nociceptive pain is believed to be caused by inflammation around the mesh (17). We asked our patients to categorize their pain as burning, stinging, or throbbing in our study. We discovered that burning pain was the most prevalent and throbbing pain was the least common in both groups.

There are some limitations of this study. The retrospective design of the study can be considered as the first limitation. However, because there are few studies on the effect of TAP block on the development of chronic pain in the literature, we decided it was worthwhile to conduct our study. The small sample size can also be accepted as a drawback. Since our institution is a university hospital, one of the restrictions can be attributed to the fact that the teams performing the surgeries are diverse. Although using neuropathic pain questionnaires such as the LANSS pain scale or the DN-4 scale to assess the neuropathic component of pain would make the results more reliable, we used NRS scale to assess the chronic pain. In addition, we only evaluated 6th months pain scores, 1st and 3rd month values can be added.

CONCLUSION

Finally, chronic pain that arises following inguinal hernia surgery is a big issue that affects patients' quality of life. In this study, there was no evidence of TAP block having a clinically beneficial effect on chronic pain. We believe that further extensive and many studies on this topic are required. Pathogenic mechanisms, pharmacological treatment techniques, and the influence of new surgical procedures should all be investigated in these studies.

AUTHOR CONTRIBUTIONS

Conception or design of the work: FS, GO

Data collection: FS

Data analysis and interpretation: GO

Drafting the article: FS, GO

Critical revision of the article: FS, GO

Other (study supervision, fundings, materials, etc): GO

All authors (FS, GO) reviewed the results and approved the final version of the manuscript.

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