

The Effect of Transversus Abdominis Plane Block in Inguinal Hernioplasty on Chronic Pain

Ahmet Topal, Mehmet Sargin, Alper Kilicaslan, Sema Tuncer Uzun

ABSTRACT

The aim of the current study was to retrospectively evaluate the efficacy of IV analgesia after general anesthesia, transversus abdominis plane (TAP) block after the induction of general anesthesia and before the surgery and spinal analgesia on development of chronic pain following inguinal hernia repair. Forty patients, who underwent hernioplasty for the first-time and for whom at least 6 months had passed since the operation date were included in the study, were included in each group as follows: Group G received IV analgesia with general anesthesia; Group T included patients who received TAP block with general anesthesia; and Group S received spinal anesthesia. The study evaluated early and chronic postoperative pain, as well as pain severity, nature of the pain, predisposing factors, and the effect on various activities. No difference was found in pain incidence among the groups in the early postoperative pain evaluation; whereas VAS scores were lower in Group T. Chronic pain incidence was found to be lower in Group T. However, there was no difference among the groups in terms of VAS scores, pain nature, frequency, its effect on daily activities and sleep for patients with chronic pain. The TAP block is an effective method to prevent chronic pain development after inguinal hernioplasty compared to the other two methods. Because of the retrospective nature of the study, further prospective clinical trials are required.

Key words: TAP block, chronic pain, inguinal hernioplasty

İnguinal Herni Operasyonunda Transversus Abdominis Plan Bloğunun Kronik Ağrı Üzerine Etkisi

ÖZET

Bu çalışmanın amacı inguinal herni onarımı sonrası kronik ağrı gelişimi üzerine genel anestezi sonrası iv analjezinin, spinal anestezi ve genel anestezi sonrası TAP bloğun etkinliğini değerlendirmesidir. İlk kez hernioplasti operasyonu geçirmiş ve operasyon tarihi üzerinden en az 6 ay geçmiş 40' ar hasta, Grup G; genel anestezi ile birlikte iv analjezi, Grup T; genel anestezi ile birlikte TAP bloğu ve Grup S; spinal anestezi olarak, çalışmaya dahil edildi. Hastalarda postoperatif erken ve kronik ağrı ile ağrının şiddeti, niteliği, predispozan faktörler ve çeşitli aktivitelere etkileri değerlendirildi. Postoperatif erken ağrı değerlendirilmesinde gruplar arasında ağrı insidansı açısından fark bulunmazken, VAS skorları Grup T' de daha düşük bulundu. Kronik ağrı insidansı Grup T' de daha düşük tespit edildi. Ancak kronik ağrısı olan hastaların VAS skorları, ağrı niteliği, sıklığı, ağrının günlük aktivite ve uykuya etkisi yönünden gruplar arasında fark gözlenmedi. Diğer iki yöntemle kıyasla TAP blok inguinal hernioplasti sonrası kronik ağrı gelişimini önlemede etkin bir yöntemdir. Ancak prospektif daha ileri çalışmalara ihtiyaç olduğu kanısındayız.

Anahtar Kelimeler: TAP block, chronic pain, inguinal hernioplasty

INTRODUCTION

Chronic pain is defined as pain lasting longer than 3-6 months, requiring long-term treatment, having a subjective and multi-dimensional nature, and involving sensory, emotional behavioral, and cognitive components (1). Chronic pain is the adverse outcome of surgical procedures and it has been clearly identified that surgical trauma causes chronic pain (2-6). Analyzing and understanding the factors affecting chronic pain development is of importance to resolve this serious problem. The risk factors for chronic postoperative pain include preoperative pain, repeated surgery, psychological insecurity, nerve damage, severe acute postoperative pain, radiotherapy, neurotoxic chemotherapy, depression, and anxiety (4,5).

Inguinal hernia repair is a common surgical procedure with a rare postoperative morbidity (5). However, chronic pain and continuous neuralgia have been accepted as complications after inguinal hernia repair (7). Chronic pain was reported at a rate of up to 54% after inguinal hernia repair in some studies (5,8-12). The prominent factors associated with chronic pain that develop after inguinal hernia repair are as follows: repeated hernia operations (10), early postoperative severe pain (8,10), surgeon's experience, and surgical technique (13). The most important issue of interest among chronic pain developing mechanisms after inguinal hernia repair as a consequence of all these factors is damaged sensory nerves at the surgical site (8,9,14,15]. Therefore, the origin of chronic pain after inguinal hernia repair was accepted to be neuropathic (5). The association of delayed postoperative sensory dysfunction with chronic pain supports this statement (8,9).

Transversus abdominis plane (TAP) block, which is an analgesic technique used to treat both postoperative acute pain (16-20) and chronic pain (21), can be used in the surgical interventions involving the lower abdominal area. Previously performed with traditional methods (22-24), the TAP block has become more popular, together with the use of ultrasound (US). Additionally, it has become a more effective and reliable method together with the use of US.

The researchers of the current study found many studies on chronic pain after inguinal hernia repair during an extensive search of the literature (26-29); however, most of these studies were related to surgical techniques and equipment, and limited to the analgesic technique (11-30). Therefore, the researchers conducted a retrospective

study comparing the efficacy of intravenous (iv) analgesia after general anesthesia, TAP block after the induction of general anesthesia and before surgery and spinal analgesia on the development of chronic pain following inguinal hernia.

MATERIALS AND METHODS

After receiving approval from local ethics committee (Decision No. 2011/224), patient files from the years 2008-2011 were searched using the information processing infrastructure of the hospital. Patients, who underwent inguinal hernioplasty for the first time, were rated as class I-II according to the American Society of Anesthesiologists (ASA), and aged between 18-65 years were included in the study. Patients, who underwent bilateral inguinal hernioplasty, had any disease that would affect the pain severity, and pain of any nature were excluded from the study. The study included 40 patients in each of three groups, who agreed to participate in the study, who underwent "tension-free mesh hernioplasty", and a minimum of 6 months had passed since the time of operation. Written informed consent was obtained from all patients. The groups were divided as follows: Group G received IV analgesia with general anesthesia; Group T received TAP block for analgesia with general anesthesia; and Group S received spinal anesthesia. The patients undergoing inguinal hernioplasty under general anesthesia (including TAP block) were administered 1.5-2 mg/kg tramadol (Tradolex; Keymen, Istanbul, Turkey) approximately 30 minutes before the completion of the operation. If there were no obstacles, the patients were administered 1 mg/kg tramadol (Tradolex; Keymen, Istanbul, Turkey) as a postoperative analgesic regime every 6 hours. The patients with a Visual Analogue Scala (VAS) score ≥ 4 were administered 20 mg tenoxicam (Oksamen-L; Mustafa Nevzat, Istanbul, Turkey), in addition to the routine analgesic regime. Twenty ml bupivacaine at a concentration of 0.25% was used for TAP block. For spinal anesthesia, 12.5 mg bupivacaine (Bustesin, Idol, Istanbul, Turkey) and 0.15 mg morphine (Morphine HCL; Idol, Istanbul, Turkey) was used.

All patients who are administered postoperative analgesia were recorded upon an evaluation by the anesthesiologist from the pain polyclinic under the guidance of a VAS scoring system in the visits made twice a day. In Group S, the first analgesia regime was initiated when the patients first experienced pain. Information on postopera-

Table 1. Demographics of the cases and ASA class

	Group G	Group T	Group S	p value
Age (years)	42.65±12.620	46.10±14.200	43.35±13.008	0.473
BMI (kg/m ²)	28.79±3.94	28.32±4.29	28.68±4.93	0.924
Gender (W/M)*	9/31	5/35	7/33	0.500
ASA (I/II)*	28/12	23/17	29/11	0.396

tive pain was obtained from the patient enrollment forms of the algology department. The pain-related symptoms of the patients were examined and the pain type was established to be nociceptive or neuropathic. Nociceptive pain is caused by the nerves, with a sudden onset, and it is sharp and well-localized. Nociceptive pain generally resolves as the tissue damage resolves (time limited). Neuropathic pain is sensed in the expansion region of the nerve roots or through the peripheral nerves. Such pain occurs with no spontaneous stimuli, which have a sensation of burning, intermittent shooting, stabbing, and an electric-like shock (3,4). The patients were contacted via telephone through their numbers recorded in the file and asked about their chronic pain. The patients were asked if they had pain at the site of the inguinal hernioplasty within the last 1 month; the survey was terminated with the patients responding "no". Those who responded "yes" to the previous question were asked about pain severity, nature of the pain, frequency, its effect on daily activities and sleep, use of analgesics, and the factors affecting [increasing/reducing] pain (Table1).

Statistical analysis

The sample size, considering the rate of developing chronic pain in the previous studies (8) and in order to show that these rates were reduced by half, was calculated by G-Power 3.1 program (G-Power; Heinrich-Heine-Universität, Dusseldorf, Germany) as 39 each patients at a significance level of 5% ($\alpha=0.05$) and a power of 80% ($1-\beta=0.80$). The intent was to include 40 patients in each group [for a total of 120 patients]. The obtained data were transferred to a computer and analyzed via Statistical Package for Social Sciences ver. 21.0 (SPSS;

IBM, Chicago, USA). For data extraction, frequency (number), % (percent), arithmetic mean \pm standard deviation were used. For variations, one-sided ANOVA multiple group comparison was used in independent groups. Data comparison was performed by the chi-square test. In all analyses, the inter group difference was considered statistically significant when $p < 0.05$.

RESULTS

No statistically significant difference was observed among the groups in terms of demographics and ASA scores ($p > 0.05$) (Table 1).

No statistically significant difference was found among the groups in the early postoperative pain evaluation ($p > 0.05$). However, a statistically significant difference was found when the VAS scores of the patients with pain were compared ($p=0.000$). Early postoperative values were found to be lower in Group T compared to Group G and Group S ($p=0.002$ and $p=0.002$, respectively) (Table 2).

A statistically significant difference was found among the groups in terms of chronic pain rates ($p=0.030$). Chronic pain development was found to be lower in Group T compared to Group G and Group S ($p=0.000$ and $p=0.003$, respectively). No statistically significant difference was found when the VAS scores, pain nature, frequency, and its effect on daily activities and sleep for the patients with chronic pain were compared ($p > 0.05$) (Table 3).

Table 2. Early postoperative pain evaluation

	Group G	Group T	Group S	p value
Postop. pain	62.5%	47.5%	60.1%	0.293
Postop. VAS	3.44±0.723	2.52±0.512*	3.24±0.736	0.000

VAS: Visual Analog Scale * $p=0.002$ for Group G vs. Group S

Table 3. Early postoperative pain evaluation

	Group G	Group T	Group S	p value
Chronic Pain	47.5%	20.0%*	40.0%	0.030
n	19	8	16	
Chronic Pain VAS	3.94±0.84	3.25±0.70	4.00±0.73	0.073
Nature				0.774
Neuropathic	94.7%	87.5%	93.8%	
Nociceptive	5.3%	12.5%	6.2%	
Frequency				0.143
Everyday	47.4%	0%	43.8%	
More than 2-3 days a week	42.2%	62.5%	43.8%	
Less than 2-3 days a week	10.5%	37.5%	12.4%	
Effect on daily activities				0.277
No effect	15.8%	50%	18.8%	
Restricting	63.2%	50%	68.8%	
Completely prevents	21.1%	0%	12.5%	
Effect on sleep				0.509
No effect	84.2%	100%	93.8%	
Reduces quality of sleep	15.8%	0%	6.2%	
Increasing factors				
Daily activities	78.9%	50%	80.0%	
Heavy exercise	47.4%	75%	46.7%	
Sexual intercourse	15.8%	25%	20.0%	
Decreasing factors				
Resting	95%	94%	100%	
Massage	47.4%	30%	50%	
Cold application	24%	19%	18%	
Hot application	5%	0%	0%	
Analgesic use	31.6%	12.5%	31.3%	0.671

VAS: Visual Analog Scale, *for Group G vs. Group S. ($p=0.000$ and $p=0.003$, respectively)

DISCUSSION

Although the development of chronic pain after inguinal hernioplasty, and its mechanisms and the effect of early postoperative pain management on these mechanisms have been well identified, early postoperative pain management and the potential effects of analgesic methods used on chronic pain have not been previously evaluated. In the current study, the researchers investigated the effects of the methods used for postoperative pain management in patients who underwent inguinal hernioplasty for the first time within the last 5 years, and especially those who received TAP block, which became more popular along with the use of US in recent years, on the development of chronic pain, through a retrospective survey. TAP block is a regional anesthetic technique providing blockade of afferent neurons in the anterolateral abdominal wall (31). A local anesthetic solution is injected into the transversus abdominis facial area, where there are nerve branches from the T10-L1 spinal nerves, by means of US or anatomic indicators; TAP block also includes ilioinguinal and iliohypogastric nerves (24). In the clinical evalu-

ation, the analgesic effect of the TAP block was reported to prolong up to 24 hours postoperatively (19,22,23). Due to of this prolonged effect, it has become a preferred analgesic method in the appropriate surgical procedures.

Chronic pain is one of the most common complications after inguinal hernia repair. Chronic pain rates vary between 0% and 54% in the literature (5,8-12). Pain after inguinal hernia repair may be of nociceptive or neuropathic origin (15,32-36,37-39). Hyperalgesia in the surgical incision site may lead to permanent changes at the level of the peripheral nervous system and also in the nociceptive nerve pathways (40,41). Additionally, postoperative wound site hyperalgesia has been associated with severe acute postoperative pain (5,42) and may be an indicator or a risk factor for post-surgical chronic pain (43,44). Therefore, the researchers of the current study believe that postoperative and early postoperative pain management through analgesic techniques may affect chronic pain. However, there are not a sufficient number of studies in this matter; in particular, the non-comparison of analgesic techniques used postoperatively on chronic

pain developed after inguinal hernioplasty is an important handicap. In one of two studies evaluating the effect of TAP block on chronic pain as a postoperative analgesic method, no difference was found between TAP block and placebo at 12 months after cesarean sections (45). Another study compared TAP block guided by USG with ilioinguinal/ iliohypogastric nerve block and reported that TAP block provided better pain management but did not prevent the development of chronic pain (46). When the rates of chronic pain after inguinal hernioplasty were compared in the current study, the researchers identified lower rates of chronic pain in patients who received TAP block. There was no statistically significant difference when the VAS scores in patients with chronic pain were compared; however, VAS scores were found to be lower in the TAP block group. Moreover, there were no patients with a VAS score >4 in TAP group, whereas there were such patients in other groups.

Chronic pain after inguinal hernioplasty has multiple causes and mechanisms (5). However, nerve damage is considered to be the primary cause of chronic pain after inguinal hernioplasty (46). The most important supporting fact is that chronic pain after inguinal hernioplasty is neuropathic in nature (5). Nerve damage was reported to be caused by direct surgical trauma or postoperative inflammatory changes. Although nerve damage seems to change depending on the surgical technique, no difference was observed between open surgery and laparoscopic surgery in terms of chronic pain development (11). In addition to surgical techniques, mesh use is another surgical factor under debate and no difference was found between patients who were operated on with or without mesh in terms of chronic pain incidence (47,48). In contrast to these studies, there are some studies showing reduced chronic pain in patients who were operated on using mesh (9,49-51). Consistent with the literature, in the current study, the nature of the pain was neuropathic and there was no difference among the groups. As stated in the study planning, the same surgical technique was used in all patients and mesh was used in all patients. Therefore, the surgical techniques were fixed in all patients. Furthermore, postoperative pain management was performed in all patients under the guidance of the same protocol. Moreover, the researchers did not find any significant difference among the groups when the pain frequencies in patients with chronic pain were analyzed. Nevertheless, there were no patients that indicated pain in the TAP block group. One of the most important factors

particularly emphasized in the development of postoperative chronic pain is the management of postoperative acute pain. It was revealed that higher pain scores in the early postoperative period are a high risk factor in the development of chronic pain and there was a significant difference compared to lower pain scores (10,52,53). In the current study, reduced chronic pain development was observed in patients operated on with a TAP block, for whom early postoperative VAS scores were found lower, in line with the literature. The primary problems due to chronic pain and consequently chronic pain after inguinal hernioplasty are restriction of daily activities and loss of professional work days. The studies conducted showed that chronic pain after inguinal hernioplasty affected the daily activities of patients at a rate of 7-15% (54-56). A significant restriction was found on daily activities in 2-6% of the patients (55). It was found that daily activities and heavy exercise provoked chronic pain after inguinal hernioplasty as a result of a vicious cycle caused by chronic pain (57). According to the current data, it seems to affect daily activities at a rate of up to 70% and lead to significant restriction of daily activities in 20% of the patients. Although there was no statistically significant difference among the groups, significant restriction was not observed in the daily activities in any patient operated on with TAP block. Important problems seen after inguinal hernioplasty also include developing and/or increasing pain during sexual intercourse (55), testicular pain (55,58-61), testicular atrophy (59), and erectile dysfunction (62,63]. In the current study, the researchers found that sexual intercourse initiated and/or increased pain in patients with chronic pain at a rate up to 25%. No superiority among the groups was determined in this matter. Moreover, the most important factor reported by the patients to reduce pain was resting. For patients with pain, the rate of analgesic use was up to 30% in Groups G and S compared to 12.5% in the TAP block group. Although no statistically significant difference was found, the researchers believe that this lower rate of analgesic use in the TAP group may be due to the lower VAS scores in the TAP group.

In conclusion, we believe that TAP block may be used as an effective method preventing in the development of chronic pain after inguinal hernioplasty. Because of the retrospective nature of the study, further prospective clinical trials are required.

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