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Original article

ЛАПАРОСКОПСКА ТАПП НАСПРОТИ ПОПРАВКА ПО LICHTENSTEIN; РАН КЛИНИЧКИ ИСХОД

LAPAROSCOPIC TAPP VERSUS LICHTENSTEIN REPAIR - ERLY CLINICAL OUTCOME

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Abstract

Introduction. Laparoscopy as a minimally invasive technique has its place in inguinal hernia repair. Lower postoperative pain, earlier mobilization and earlier return to usual activities are comparable to an initially high cost of the hospital charge. Also, there is a lower percentage of postoperative complications especially related to the wound.

Methods. The study was designed as a prospective randomized controlled study conducted in a three-year-period. Sixty-five patients were randomly assigned into two groups, *examined*-35 patients treated with TAPP technique and *controlled*-30 patients treated with Lichtenstein technique.

Surgical time, preoperative pain, hospital stay, postoperative analgesia, functional status and convalescence were evaluated. The postoperative complications, hematoma, seroma, wound infection and urinary retention were also taken into consideration.

Results. A significant difference was found in the surgical time favoring Lichtenstein over TAPP technique; postoperative hospitalization was significantly longer in case of the Lichtenstein procedure. There was a significant difference concerning postoperative pain and functional status between the groups, as well as in the same group regarding the postoperative days.

The percentage of early postoperative complications was significantly lower in TAPP group (6.3% versus 16.7%); there was a significant difference in convalescence (TAPP 4.6±1.2 / Lichtenstein 6.6±1.10).

Conclusion. Patients treated with laparoscopic TAPP technique had better early clinical outcome compared to open Lichtenstein technique. It is a result of a lower intensity of the postoperative pain, less postoperative complications which leads to a shorter hospital stay, better functional status and short convalescence.

Keywords: inguinal hernia, laparoscopic hernia repair, open hernia repair, TAPP, early clinical outcome

Апстракт

Вовед. Лапароскопијата како минимално инвазивна техника има свое место во поправката на ингвинални хернии. Помалата болка, раната мобилизација и враќање на секојдневните активности се компарабилни со иницијалната повисока цена на болничкиот третман. Исто така има низок процент на компликации, особено поврзани со оперативната рана.

Методи. Студијата е дизајнирана како проспективна, рандомизирана и контролирана, спроведена во период од три години.

Шесет и пет пациенти се поделени во две групи, испитувана од 35 испитаници третирани со ТАПП техника и контролна од 30 испитаници третирани херниопластика според Lichtenstein.

Се евалуираше времетраењето на оперативен зафат, периоперативната болка, времето на испишување од болница, постоперативна анлгезија, функционален статус и реконвалесценцијата. Исто така се евалуираше и појавата на компликации-хематом, сером, инфекција на рана и уринарна ретенција.

Резултати. Значителни разлики има во времетраењето на оперативниот зафат, постоперативната хоспитализација. Во однос на болката и функционалниот статус има значителна разлика помеѓу групите, како и во групите по однос на постоперативните денови.

Процентот на постоперативни компликации е значително помал кај лапароскопската ТАПП метода (6,3%, Lichtenstein 16,7%), исто така има значителна разлика и во реконвалесценцијата (ТАПП изнесуваше 4,6±1,2 дена, а на оперираните според Lichtenstein 6,6±1,10 дена).

Заклучок. Пациентите третирани со лапароскопската ТАПП метода, споредено со пациентите третирани со отворената Lichtenstein метода имаат подобар ран клинички исход. Тоа е резултат на помалата периоперативната болка, поретката појава

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на рани постоперативни компликации што води до пократка хоспитализација, подобар постоперативен функционален статус и реконвалесценција.

Клучни зборови: ингвинална хернија, лапароскопска херниопластика, отворена херниопластика, ТАПП, ран клинички исход

Introduction

Inguinal hernia is the most common pathology in general surgery; it is estimated that more than 20 million inguinal hernia repairs are performed in the world annually [1]. In USA that number is close to 800000 and in Macedonia according to the data from the Republic Institute for Public Health around 2000 annually. Till 2012 laparoscopic hernia repair in Macedonia was performed only at the University Clinic for Digestive Surgery in Skopje (from 147, only 4 were laparoscopic surgeries in 2012). Laparoscopic hernia repair is present less than 20% from all inguinal hernia repairs in the developed countries, 15% in USA [2] and 16% in Denmark [3]. Contemporary open tension-free inguinal hernia repair was presented by Lichtenstein in 1986 [4]. Today it is considered as a “gold” standard for open tension-free inguinal hernia repair and it is a recommended technique from hernia associations [5].

The first depiction of laparoscopic hernia repair was presented by Ger in 1982, but the current TAPP (Trans Abdominal PrePeritoneal) approach was independently presented by both Arregui and Dion in 1992 [6,7]. TAPP enables repair through peritoneal cavity of inguinal hernia, there for it is a genuine laparoscopic technique. Today totally extraperitoneal technique (TEP) is also used. It was first presented in 1992 by Dulucq and as an endoscopic technique it is comparable and equal in its performance and results to TAPP [5].

When comparing open mesh technique with endoscopic approach, TAPP and TEP, we found that the initial intraoperative cost was higher in endoscopic, but overall costs and socio-economic impact was equal or lower in endoscopic techniques [8]. Also, the postoperative pain was lower in the minimally invasive approach; postoperative convalescence was shorter and patients returned to their usual activities earlier [9-11].

Primary unilateral inguinal hernia repair in male patients according to the last guidelines [5] has favored endoscopic techniques, yet in the discussion it is stated “large-scaled database studies are urgently needed to compare endoscopic with Lichtenstein operations for primary unilateral IHs in males”.

The aim of the study was to compare laparoscopic TAPP approach and open Lichtenstein technique for unilateral inguinal hernia in male patients regarding early clinical outcome, pain, convalescence and complications.

Materials and methods

The study was designed as a controlled prospective randomized study, with predetermined protocol and data collection. It was carried out at the Clinical Hospital-Shtip, as a single center study, with collaboration of the Faculty of Medicine in Skopje, University Clinic for Digestive Surgery. The study was approved by the Ethics Committee of the hospital in Shtip and Faculty of Medicine in Skopje and a written consent for participation in the study was compiled and approved.

To avoid bias that would occur during surgery, especially in the laparoscopic group (n=35), all patients were operated by the same surgeon. This invalidates the possibility of greater variations in the technique and duration of the surgery that would occur in the operation of different surgeons depending on their training and individual abilities.

In the control group (n=30) patients were also operated by the same surgeon or with active assistance; some patients were operated on by another team but with the same training and technique (working together for 12 years). Inclusion criteria for the study were: male patients aged 18 to 65, with primary unilateral inguinal hernias, that when standing up did not pass the horizontal line at the lower edge of the symphysis of the pubic bones (endoscopic classification according to Nyhys type 1, 2 and 3), with ASA (American Society of Anesthesiologists) grading 1 and 2 and BMI (Body Mass Index) smaller than 30.

Patients with previous interventions in the area of the inguinal region, surgery in the infraumbilical region by entering the pre-peritoneal area (not including appendectomy with McBourney incision) were excluded.

Patients with an occult contralateral hernia were excluded from the study. Only the presence of occult contralateral hernia, which had previously been clinically not diagnosed, was shown.

Also, patients in whom adhesions in the inguinal region were intraoperatively verified through transabdominal approach and there was a risk of laparoscopic adhesiolysis were excluded from the study.

Patients were divided into two groups:

1. **Examined group**, treated with laparoscopic technique (TAPP), n=35 patients;
2. **Control group**, treated with standard open hernioplasty method - Lichtenstein, n=30.

Patients included in the study were examined one day preoperatively. Laboratory analyses and clinical physical examination were performed; the responses were recorded in the VRS (verbal rating scale) for pain and functional status. The next day surgical treatment was performed and patients were assigned to laparoscopic or control group in ratio 1:1 (one to laparoscopic and one to control group); the last five patients were treated with the laparoscopic technique.

In the laparoscopic-examined group, patients were treated with TAPP (Trans Abdominal Pre Peritoneal) technique. Preoperatively, a single dose of an antibiotic from the group 3 generation cephalosporins was given; ampicillin or clindamycin were used in patients with known allergy to cephalosporins. A standard laparoscopic TAPP procedure was performed, with a patient in Trendelenburg 10-15° position, hands along the body and without a urinary catheter. Three ports were used with intra-abdominal pressure up to 12 mm Hg. Direct and indirect hernias were reduced, peritoneum was incised and a pre-peritoneal space behind the myopectineal orifice was created; transversalis fascia of larger direct hernia was fixed to the Cooper ligament with one or two tackers. A single large polypropylene mesh prosthesis was used (with a mass of >35 g/m², Paha® polypropylene mesh, Altaylar Medical), 13-15 cm wide, high 10-12 cm on the medial part and 8 cm on the lateral. It was fixed with titanium spiral „tackers“ (ProTack™ 5 mm fixation device), 1-3 on the Cooper ligament, 1-2 on the back side of the rectus abdominal muscles and one laterally higher and medial to the level of the anterior upper iliac spine. The peritoneum was also closed above the mesh with titanium tackers.

Patients in the control group were treated with a standard anterior open approach with a polypropylene prosthesis-Lichtenstein technique. They received the same dose of the antibiotic drug as the examined group. The surgery was performed without a urinary catheter, with incision and tissue dissection to the posterior wall of the inguinal canal. Dissection of the nerves and sometimes transaction (most often the ilioinguinal, the iliohipogastric and genital branch of the genitofemoral nerve) was performed as well as cremasterectomy. Hernia sac, direct or indirect, was dissected and pushed in the pre-peritoneal space. The same polypropylene mesh-prosthesis as in the laparoscopic group was used, with dimensions of 13-15x7-8 cm. It was placed with a slit for the spermatic cord on the posterior wall of the inguinal canal. The mesh was then fixed with a polypropylene stitch 3/0.

The duration of surgery from incision of the skin to the closure of the surgical wound was recorded.

VRS (verbal rating scale) was used to rate the pain. We made the recordings preoperatively, POD 1, POD 3 and POD 7 (POD-Postoperative Day).

We used the four-level verbal rating scale: level 1-no pain; level 2-mild pain; level 3-moderate pain; level 4-severe pain.

Pain was measured in a supine position, when resting and provoked pain by coughing.

The number of peroral analgesic drugs was also required in the first three days. Ibuprofen tablets of 400 mg, 500 mg Metamizole sodium and 500 mg Paracetamol tablets were used. Patients were divided into two groups, patients who took ≤2 tablets a day and patients who took >2 tablets a day.

VRS (verbal rating scale) for functional status was used. A four-level scale was developed: level 1-capable; level 2-light fatigue, level 3-fatigued; level 4-tired.

Recordings of functional status were made preoperatively, POD 1, POD 3 and POD 7.

Seroma, hematoma or surgical wound infection on the day of the discharge and the seventh postoperative day were recorded; we used clinical examination and if needed ultrasound. Also, urinary retention was recorded with the need for catheterization of the bladder.

All patients in the study were given "non-restrictive" recommendations on the day of the discharge (all of the activities they feel they can perform) with a weight lifting limit of 5 kg, and a recommendation for the 2nd day convalescence in terms of carrying out daily usual activities. Convalescence was determined in relation to postoperative days (POD). The discharge from the hospital was based on the subjective ability of the patient to cope with the pain and activity at home, and postoperative complication occurrence.

Results

During a period of three years (from March 2013 to March 2016), the study involved 65 patients with primary unilateral uncomplicated inguinal hernia. In the group of examined patients/TAPP group (N1) there were 35 examinees; three were excluded due to occult contralateral inguinal hernia. In the control group/Lichtenstein group (N2) there were 30 patients. The study analyzed a total of 62 patients treated for inguinal hernia.

Demographic characteristics

The analysis showed that there was no statistically significant difference in age between the two examined groups; the average age was 46.1 years in both groups (44.5 in TAPP and 47.7 in Lichtenstein).

Duration of surgical intervention

The average duration of intervention in patients treated with TAPP was 45.3±11.7 minutes, and with Lichtenstein technique 34.8±5.3 minutes. The performed analysis showed a statistically significant difference in the duration of the intervention between the two examined groups. The intervention was significantly shorter in the control Lichtenstein group (Mann-Whitney U test: Z=4.04 p=0.00005).

Days of hospitalization after surgery

There was a difference in terms of hospital discharge in the postoperative period between the two examined groups. Patients operated with TAPP were hospitalized shorter after surgery, 60% of the TAPP group were discharged POD1.

Perioperative pain

Prior to the intervention, all patients operated with TAPP, as well as all those operated with the Lichtenstein method, stated that they had no pain while resting.

According to the verbal rating scale, while coughing, 27(84.4%) patients from the first group had no pain before the intervention and 25(83.3%) patients from the second examined group. A mild pain was confirmed by 5 patients in both groups.

The first postoperative day, 19(59.4%) patients treated with TAPP said they had no pain, and 13(40.6%) felt a mild pain. Of those operated with the Lichtenstein method, 24(80%) patients confirmed a mild and 6(20%) a moderate pain. The analysis showed a statistically significant difference in the presence and intensity of pain on the first postoperative day between the two investigated groups (Mann-Whitney U test: $Z=4.56$ $p=0.000005$).

The first postoperative day, while coughing, 31(96.9%) patients treated with TAPP stated that they had a mild pain and 1(3.1%) patient had no pain. Of those operated with the Lichtenstein method, 6(20%) patients confirmed a mild and 24(80%) a moderate pain. The analysis showed a statistically significant difference in the

presence and intensity of pain while coughing on the first postoperative day between the two investigated groups (Mann-Whitney U test: $Z=5.45$ $p=0.000001$).

The third postoperative day, 31(96.9%) patients treated with TAPP said they had no pain, and 1(3.1%) felt a mild resting pain. Of those operated with the Lichtenstein method, 9(30%) patients said they had no pain, and 21(70%) confirmed the presence of a mild pain. None of the patients had moderate and severe pain. The analysis showed a statistically significant difference in the presence and intensity of pain on the third postoperative day between patients from both examined groups (Mann-Whitney U test: $Z=4.52$ $p=0.000006$).

The third postoperative day, when provoked with coughing, 14(43.8%) patients treated with TAPP stated that they had no pain, and 18(56.2%) patients had a mild pain. Of those operated with the Lichtenstein method, 22(73.3%) patients confirmed a mild and 8(26.7%) patients a moderate pain while coughing. The analysis showed a statistically significant difference in the presence and intensity of pain on the third postoperative day between patients in the two examined groups (Mann-Whitney U test: $Z=3.97$ $p=0.00007$) (Table 1).

Table 1. Distribution of respondents comparing the strength of pain on the third postoperative day while coughing

Examined groups	Without pain	Mild pain	Moderate pain	Severe pain	Total
TAPP(N1)	14 43.8%	18 56.2%	0 0.0%	/	32
Lichtenstein (N2)	0 0.0%	22 73.3%	8 26.7%	/	30
Total	14	40	8	/	62

On the seventh postoperative day, all 62 respondents said they had no pain while resting. While coughing, all 32(100%) patients treated with TAPP said they did not feel any pain. In the controlled group, 4(13.3%) said they had no pain, and 26(86.7%) confirmed the presence of a mild pain while coughing. The analysis showed a statistically significant difference in the presence and intensity of provoked pain on the seventh postoperative day between patients in the two examined groups (Mann-Whitney U test: $Z=5.86$ $p=0.000001$).

Following the intervention, of the total of 32 patients

treated with TAPP, 26(81.3%) took up to 2 painkillers and 6(18.7%) more than two daily. Of the patients treated with Lichtenstein technique, 8(26.7%) patients took up to 2 painkillers, the remaining 22(73.3%) needed more pills a day. The analysis showed a statistically significant difference in the need for analgesia after surgery between the two study groups (Mann-Whitney U test: $Z=3.69$ $p=0.00020$) (Figure 1).

Functional status

Prior to the intervention, all patients stated that they were functionally capable.

According to the verbal rating scale, on the first postoperative day, 12(37.5%) patients operated on with TAPP stated that they felt capable of daily activities and 20(62.5%) felt light fatigue. In the Lichtenstein method group, 15(50.0%) reported light fatigue, and the remaining 15(50.0%) reported feeling fatigue. There was a statistically significant difference in functional status on the first postoperative day between the two groups examined (Mann-Whitney U test: $Z=4.65$ $p=0.000003$).

On the third postoperative day, analysis showed that there was a very strong statistically significant difference in the functional status on the third postoperative day

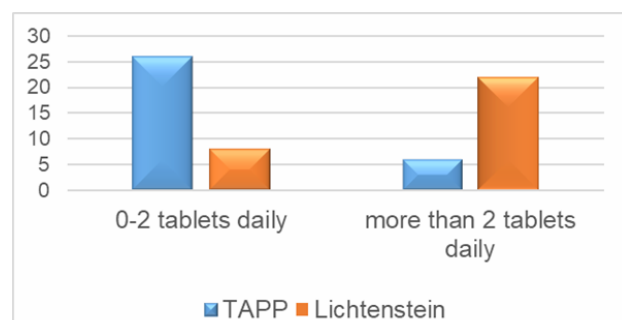


Fig. 1. Distribution of respondents according to the need for analgesics postoperatively

between the two study groups (Mann-Whitney U test: $Z=5.98$ $p=0.000000$) (Table 2). On the seventh postoperative day, all 32 TAPP-treated

patients stated that they were functionally capable. In the Lichtenstein group, 17(56.7%) patients reported being functionally capable, 12(40.0%) patients felt light fatigue,

Table 2. Distribution of respondents by functional status on the third postoperative day

Examined groups	Capable	Light fatigue	Fatigue	Tired	Total
TAPP(N1)	29 90.6%	3 9.4%	0 0.0%	/	32
Lichtenstein (N2)	1 3.3%	25 83.3%	4 13.4%	/	30
Total	30	28	4	/	62

and 1(3.3%) fatigued. The analysis showed a statistically significant difference in the functional status of the seventh postoperative day between the two study groups (Mann-Whitney U test: $Z=2.93$ $p=0.0033$)

longer in patients who underwent surgery with the Lichtenstein method.

Postoperative complications

In the TAPP group, from 32 patients one patient developed a seroma and one patient had a catheter. In the Lichtenstein group, a total of 5 patients (16.7%) experienced some postoperative complication-1 person with seroma, 2 with hematoma, and 2 with urinary catheterization (Figure 2).

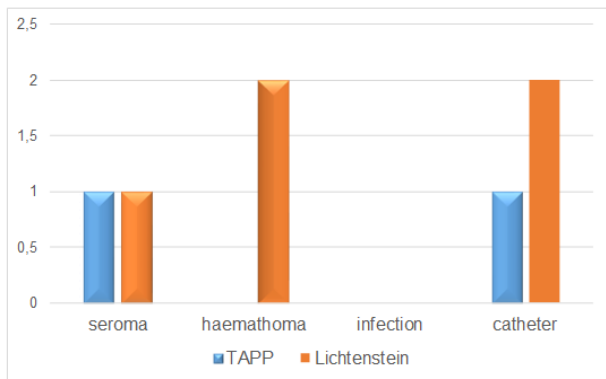


Fig. 2. Distribution of respondents according to the occurrence of a certain complication

Convalescence

The mean time of convalescence expressed in days/group was 4.6 ± 1.2 days in TAPP, and 6.6 ± 1.10 days in the Lichtenstein group. The analysis showed a statistically significant difference in the convalescence time between the two groups (Mann-Whitney U test: $Z=5.14$ $p=0.000001$). Convalescence was significantly

Discussion

Repair of inguinal hernias is one of the most commonly performed surgeries in the world. Although it is a historically old problem, nowadays its solution has enormous socio-economic implications. In the United States, the cost of resolving inguinal hernias and their complications is estimated to reach \$ 28 billion annually [1]. The last paradigm related to inguinal hernioplasty appeared 27 years ago and concerned the laparoscopic repair of inguinal hernias.

Almost every abdominal surgery that requires incision of different length on the abdominal wall today has its own laparoscopic replacement. As with any new method or technique, a debate about laparoscopic versus open technique has arisen. Controversy has emerged over the repair of primary unilateral inguinal hernia-whether laparoscopic or open hernioplasty should be performed. Superior results in favor of laparoscopic hernioplasty have demonstrated the studies that include recurrent hernias, and there is also a clear benefit in laparoscopic bilateral inguinal hernia repair [5].

Numerous studies have clearly shown the benefit of laparoscopic repair of primary unilateral hernias in relation to postoperative pain, complications, convalescence, and recurrences. Laparoscopic repair also has proven benefits in some complex hernias [12,13]. However, laparoscopic inguinal hernioplasty depends on advanced medical technology and requires good technical knowledge and appropriate medical expertise. There are also potential complications that rarely occur with conventional open hernioplasty.

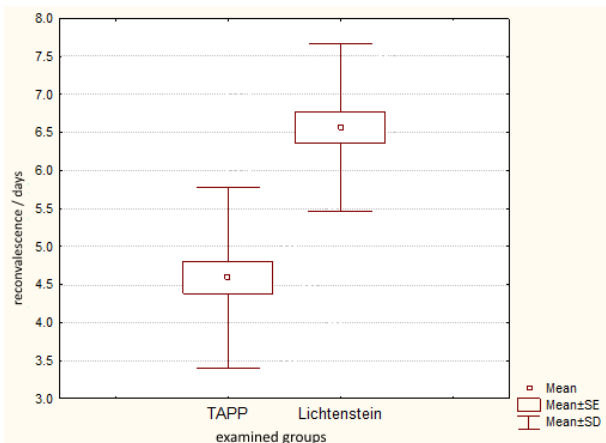


Fig. 3. Mean convalescence per day for respondents in both groups

Despite the extensive data in favor of laparoscopic repair, many surgeons are still reserved, especially for unilateral primary inguinal hernias.

Most laparoscopic procedures have a longer duration than open methods, due to the association of laparoscopy with a special abdominal approach and the use of specific instruments. Laparoscopy is also associated with the development of specific manual abilities and intraoperative evaluation of physiological and anatomical parameters, which distinguishes it from the open surgery [14]. The most commonly performed laparoscopic surgery is laparoscopic cholecystectomy, following the national consensus of the National Institutes of Health (NIH) in 1992. It has become the procedure of choice for gallbladder removal. Although a laparoscopic procedure is most commonly performed, we find that surgeons have a routine in performing it, when compared to open methods it lasts longer.

McCormack *et al.* made a survey of randomized controlled trials and detected 41 studies with 7,161 patients. When analyzing the duration of surgery, it was concluded that laparoscopically operated patients had a longer duration of surgery [15].

In several studies Anadol and Abbas [16] point out that no significant differences were observed in the duration of laparoscopic and open inguinal hernioplasty.

In our study the difference was significant; it showed that the intervention was significantly shorter in patients treated with the open Lichtenstein method.

It is interesting to note that in the laparoscopic group 10 patients (out of 32 analyzed) had left inguinal hernias. In all 10 patients, the duration of surgery was longer with an average duration of 56 minutes. The remaining 22 analyzed patients had right inguinal hernia with a median surgical time of 36.7 minutes. I find this connected to the surgeon's technical skills, which in our case works with the right hand and due to the heavier dissection of the left-sided hernias where the sigmoid colon is often positioned above the peritoneum in the inguinal region, which requires dissection.

One of the parameters for evaluating surgical techniques is the time of hospital discharge (postoperative hospitalization). Laparoscopy reduces tissue trauma at the site of access (incision in open methods), has less postoperative pain, faster mobilization of patients, and less postoperative morbidity associated with the surgical approach that indirectly affects the postoperative requirement for hospitalization.

McCormack in his study found no significant difference in postoperative hospitalization of patients, i.e. the length of postoperative hospital treatment of patients treated laparoscopically and with an open method [15].

Also Abbas stated that there was no significant difference in hospitalization of patients treated with laparoscopic and open method [16].

Salma in their studies found a slightly longer postoperative open hospitalization compared to laparoscopic surgery [17].

In our study the results showed that patients treated for unilateral uncomplicated inguinal hernia had a shorter hospitalization.

Postoperative pain is of particular importance given that most patients treated for primary uncomplicated hernia do not have pain as a symptom. Pain is one of the parameters for comparison of inguinal hernioplasty and is common to all techniques [18].

The laparoscopic approach reduces the tissue injury at the site of surgery which directly affects the pain, acute postoperative pain. Direct tissue trauma leads to the release of mediators, primarily histamine, leukotrienes, prostaglandins, bradykinin and cytokines that cause hyperalgesia at the site of trauma and local tissue. The degree of trauma is commensurate with their release, and accordingly with the degree of pain that appears. A particular problem is the transition from acute postoperative pain to persistent postoperative pain. It is described as a pain that persists for 7 days after surgery and is one of the main causes of prolonged hospitalization and readmission of patients. One of the factors affecting the transition from acute postoperative pain to persistent postoperative pain is the inadequate early treatment of postoperative pain. Other factors affecting are prolonged duration of surgery, type of surgery (laparoscopy *versus* laparotomy), as well as prosthesis placement and type of the implant [19].

The type of surgery has affect through the dissection and nerve injury in the inguinal region. In addition to the direct lesion, exposure of the nerve to the prosthesis is also important; namely through the inflammatory response that causes the prosthesis on the tissue and release of active mediators that cause hyperalgesia. One of the causes of pain is the prosthesis fixation. The fixation can lead to nerve injury or reduce the elasticity of the abdominal wall at the place of the prosthesis, causing tension and pain [20].

McCormack [15] and Neumayer [10] in their studies presented less postoperative pain in laparoscopically treated patients.

The EU Hernia Trialists Collaboration [21] in a systematic review of 34 studies of 6,804 patients found that patients treated with laparoscopic technique had less pain.

The analysis of pain showed a significant difference in pain in the first seven postoperative days, lower incidence and lower intensity of pain in patients treated with TAPP approach after the third postoperative day.

In order to obtain a response to postoperative pain indirectly and to correlate it with the results from VRS, we also used information about the postoperative use of pills (analgesics) in the first three days after the end of hospitalization.

It can be noticed that the number of patients who used more than two tablets per day in the open technique treated group was larger. The larger number of pills in the open technique group also correlated with VRS res-

ponses to pain done on the third postoperative day when nearly two-thirds reported feeling a mild pain at rest.

Functional status is an important parameter in assessing early clinical outcome with a direct impact on convalescence [22]. It is a subjective parameter, but in most studies when comparing certain treatment methods, the determination of functional status has an important place [23]. We measured this by experiencing fatigue as one of the subjective manifestations of functional status in patients postoperatively.

There was an overall better functional status in the TAPP group. The results also correlated with the postoperative pain scale.

The risk of complications after inguinal hernia surgery is low. The introduction of laparoscopy as a method for hernioplasty has led to complications that are specific to laparoscopy and its approach.

The most common complications of inguinal hernioplasty regardless of the approach are: hematoma, seroma, infection at the site of the hernioplasty (or sites of incision), as well as urinary infection. More serious complications include bladder injury, testicular injury, and funiculus elements [18].

Specific and more serious complications that occur more frequently in laparoscopic hernioplasty are visceral injury and injury to the vascular structures, McCormack [15] in his study in the laparoscopic group noted 8 visceral and 7 vascular injuries in 2,315 laparoscopic hernioplasties. The EU Hernia Trialists Collaboration [21] in 2000 conducted a systematic review of randomized controlled trials comparing open methods with laparoscopic one. They found that overall complications were rare in the compared methods, but the more severe, predominantly vascular and visceral injuries occurred more frequently in laparoscopic methods (4.7 per 1,000 and open 1.1 per 1,000).

There were no serious complications in our study in terms of injury to vascular structures or visceral organs.

Schmedt in a meta-analysis of randomized controlled trials in 2005, comparing both laparoscopic TAPP and TEP with the Lichtenstein and other open methods found that significant differences arose in the area of hernioplasty infections and hematoma occurrence, which was smaller in laparoscopic methods. In terms of visceral injuries and vascular structures and bladder catheterization there was no difference between the two methods. The incidence of seroma following the Lichtenstein method was only lower compared to laparoscopic [24].

Ciftci in 2015 conducted a comparative study between laparoscopic and open method. The number of patients screened in the study, open (n=32) and laparoscopic TAPP (n=31) was close to the number of our included patients. The results obtained for early postoperative complications in the open group showed 4 patients or 12.5% with urinary retention, one hematoma, one wound infection and one lung atelectasis. In the laparoscopic

group complications occurred in 2 patients or 6.4%, one with urinary retention and one with atelectasis [25].

Kargar also found in his comparative study between laparoscopic TAPP and open Lichtenstein method that the incidence of early postoperative complications was lower in laparoscopic TAPP. These included hematoma (TAPP 6.6%/Lichtenstein 13.3%), seroma (TAPP 10%/Lichtenstein 13.3%) and infection (TAPP 0%/Lichtenstein 1.6%) [26].

The results of our study indicated that the percentage of early postoperative complications that occurred with the TAPP was lower compared to the open Lichtenstein method. The lower incidence of complications in laparoscopy is probably due to the concept of minimal access incision and correspondingly less tissue dissection.

Convalescence, the return to usual daily activities, is the end-point of any treatment method and is particularly important for evaluating surgical procedures and their success. It is directly dependent on the parameters listed above, such as pain and postoperative complications, but also on the recommendations given by the surgeon [27]. Convalescence data provide answers to postoperative recovery of patients.

In a study of McCormack [15], a systematic review of the Cochrane database, the results showed that patients undergoing a laparoscopic procedure had a 7-day shorter reconvalescence compared to the open group. The trial of EU Hernia Trialists Collaboration [21] including 24 studies showed that laparoscopically treated patients had a faster return to their daily activities compared to open methods. Only in one study did the results show that there was equal reconvalescence in both groups.

Gong compared 62 patients treated with an open method, 50 patients treated with the TAPP laparoscopic method, and 52 patients treated with the TEP (total extraperitoneal) method. The time to return to daily activities in laparoscopic groups was significantly shorter than in the open group [28].

Treadwell [29] also published in 2012 the results of 15 analyzed studies in which the return to daily activities was shorter in laparoscopic techniques. Results showed a median difference in days of -3.9; 95% CI, from -5.6 to -2.2 in favor to laparoscopy.

Ciftci [25] in his study determined the mean time necessary to return to work in the open technique group, which was 11.5 and in the laparoscopic TAPP group 5.1.

In our study, convalescence in both groups ranged from 2 to 7 days. According to the results, convalescence was significantly shorter in laparoscopic TAPP group. We believe the result would have shown even greater difference if we followed patients for a longer period.

However, the obtained results indicate that convalescence was shorter when the laparoscopic techniques were used and correlated with the outcomes for postoperative pain and complications.

Conclusion

Patients in the study group treated with the laparoscopic TAPP method had a better early clinical outcome than patients in the control group.

The perioperative pain in the laparoscopic group was less than in the control group, as was the postoperative need for analgesics.

Early postoperative complications in patients treated with the laparoscopic TAPP method were less frequent than in patients treated with the open Lichtenstein method. Laparoscopically treated patients had better postoperative functional status expressed through a feeling of fatigue than patients in the open group. They also had shorter hospitalizations and convalescence.

The duration of the surgery was shorter in patients treated with the open Lichtenstein method than with the laparoscopic TAPP method.

Conflict of interest statement. None declared.

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