SHORT COMMUNICATION

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Retrospective analysis of 1,211 operated patients due to groin hernia with open surgical approach – single center experience

Retrospektivna analiza 1 211 operisanih bolesnika zbog ingvinalne kile otvorenim hirurškim pristupom – iskustvo jednog centra

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Abstract

Bacground/Aim. Groin hernias are common pathology among men population. Only curative treatment is surgical reparation with various surgical procedures for groin hernia solving. The aim of this study was to evaluate the most prevalent surgical procedures and early postoperative complications after groin hernia reparation in large series of operated patients, and to assess the morphologic characteristics of groin hernias. **Methods.** The retrospective study included all patients with groin hernia who underwent surgical reparation from 2009 to 2012. In all patients a demographic characteristics, including gender and age, clinical characteristics and hernia type were analyzed. The surgical procedure for hernia solving and early postoperative complications were assessed. **Results.** The study included 1,211 patients. The male/female ratio was 1,127/84 ($p < 0.001$). Inguinal hernia was found in 1,195 patients (94.5% males). Femoral hernia was found in 16 patients (25% males and 75% females). Significant difference in distribution of inguinal and femoral hernia between genders was found ($p < 0.001$). In males right sided inguinal hernia was present in 57.6%. In females right sided inguinal hernia was present in 7 and left sided in 5 patients. Sixsten patients had bilateral inguinal hernia, all in males. There was no significant difference in side of inguinal hernia occurrence and gender. Right sided and left sided femoral hernias were present in the same percent in males. In females a higher occurrence in femoral hernia was found on the right side then on the left one (7:5) without significant difference. There were 71.1% of patients in the age group of 51–80 and 27.2% of patients in the age group of 61–70. Surgical procedures included: Lichtenstein in 51.2% of patients, nylon-darn in 29.6% of patients, Bassini in 16.2% of patients, Lothaissen in 1.7% of patients, and Halsted in 1.4% of patients. Overall, postoperative complications were present in 78 (6.4%) of patients. Wound infection was the most common complication, occurred in 2.4% of patients. **Conclusion.** Prevalence of inguinal hernias is higher in men population, while femoral hernias are more common in females. The most affected population is at the age between 61 and 80 years. The most commonly used open surgical procedures for groin hernia reparation are Lichtenstein and nylon-darn. Both methods have low and similar incidence rates of postoperative complications.

Key words:
hernia, inguinal; hernia, femoral; men; women; age of onset; incidence; surgical procedures, operative; postoperative complications.

Apstrakt

Uvod/Cilj. Preponske kile su česte u muškoj populaciji. Jedini način lečenja preponskih kila je hirurški sa različitim hirurškim procedurama. Ciljevi ovog istraživanja bila je analiza najčešćih hirurških procedura u rešavanju preponskih kila i ranih postoperativnih komplikacija, kao i ispitivanje morfoloških karakteristika preponskih kila kod velikog broja operisanih bolesnika. **Metode.** Retrospektivna studija obuhvatila je sve bolesnike operisane zbog preponske kile u periodu od 2009. do 2012. godine. Kod svih bolesnika analizirane su demografske karakteristike uključujući pol i godine, kao i kliničke karakteristike i tip kile. Analizirane su hirurške procedure u rešavanju kile, kao i rane postoperativne komplikacije. **Rezultati.** Studija je obuvatila 1 211 bolesnika. Odnos muškarci/žene bio je 1,127/84 ($p < 0.001$). Ingvinalna kila bila je prisutna kod 1 195 bolesnika (94,5% su bili muškog pola). Femoralna kila bila je prisutna kod 16 bolesnika (25% muškarci i 75% žene). Nađena je statistički značajna razlika u distribuciji ingvinalne i femoralne kile između polova ($p < 0.001$). Desnostrana ingvinalna kila bila je prisutna kod 57,6% bolesnika muškog pola. Kod žena desnostrana ingvinalna kila bila je prisutna kod 7, a levostrana kod 5 bolesnica. Obostranu ingvinalnu

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kilu imalo je 16 bolesnika, svi su bili muškog pola. Nije bilo statistički značajne razlike u lokalizaciji ingvinalne kile i pola. Desnostrane i levostrane femoralne kile bile su prisutne u istom procentu kod osoba muškog pola. Kod žena veća učestalost femoralne kile bila je sa desne strane (7:5), bez statistički značajne razlike. U starosnoj grupi između 51–80 godina bilo je 71,1% bolesnika, a 27,2% bolesnika u starosnoj grupi od 61–70 godina. Metode hirurškog lečenja obuhvatile su: Lichtenstein kod 51,2% bolesnika, nylon-darn kod 29,6% bolesnika, Bassini kod 16,2% bolesnika, Lothaissen kod 1,7% bolesnika i Halsted kod 1,4% bolesnika. Ukupno, postoperativne komplikacije bile su prisutne kod 78 (6,4%) bolesnika. Infekcija rane bila je najčešća komplikacija, prisutna kod 2,4% bolesnika. **Zaključak.** Zastupljenost ingvinalne kile je veća u muškoj, dok je femoralna kila češća u ženskoj populaciji. Najčešće javljanje preponske kile je u populaciji između 61 i 80 godina starosti. Najčešće korišćene metode otvorenog hirurškog lečenja preponske kile obuhvataju Lichtenstein i nylon-darn procedure. Obe metode imaju malu i sličnu učestalost postoperativnih komplikacija.

Ključne reči:
hernija, ingvinalna; hernija, femoralna; muškarci; žene; životno doba; incidenca; hirurgija, operativne procedure; postoperativne komplikacije.

Introduction

A hernia is defined as a defect of the anterior muscle-aponeurotic and fascial abdominal layer continuity, respiratory or pelvic diaphragm, which permits the protrusion of any tissue, apart those which have normal protrusion throughout the openings in anterior abdominal wall [1]. The etiology of groin hernias involved hereditary and acquired factors, such as genetic predisposition, muscle-aponeurotic dystrophy, collagen-metabolic disorder, smoking, obesity, age and concomitant diseases [1–5]. Hernias can be classified according to localization (groin, femoral, epigastric, umbilical, lumbal, as to left-sided, right-sided, unilateral, bilateral), possibility to reposition of hernias (reponible or unreponible), primary or recurrent, or direction of the hernias spread (indirect, direct or combined) [6]. Also, there are specific types of hernias (Littre, Richter, sliding, etc.) and lot of classifications in accordance to the principles of its authors [6–8]. A contemporary hernia's classification should be clear, simple, based on the hernia localization and diameter of the fascial defect. Also, the classification of hernias should contain preferable method of hernia solving (open surgery or minimally invasive surgery-laparoscopic) [7, 8].

The inguinal hernias are the most common hernias overall. They represent a protrusion of the content of abdominal cavity and/or pre-peritoneal fat through the hernia defect above inguinal ligament [4–7], whilst femoral hernia is a protrusion of the content of the abdominal cavity and/or preperitoneal fat below the inguinal ligament [5, 9]. Clinical symptoms vary significantly from asymptomatic hernia without pain or discomfort to the significant constraint and pain, and serious complications including incarceration and strangulation of hernia sack content [6, 10, 11].

The incidence and prevalence of groin hernias are unknown. However, the possibility that some person will undergo surgery of groin hernia during lifetime is very high with prevalence ranging from 1–30% [12]. Only treatment for groin hernias is surgical reparation through open or laparoscopic surgical approach. There are a lot of methods and their modifications of surgical reparation of groin hernias. Some of the most common open surgical used procedures are Lichtenstein and nylon-darn (Abrahamson) [1, 6]. Although they are not common, the postoperative and long term complications should be reduced to a minimum in order to provide less postoperative discomfort with short recovery, regardless of the type of surgical approach [13, 14].

This study was undertaken to evaluate the most prevalent surgical procedures and early postoperative complications after groin hernia reparation in large series of operated patients, and to assess the demographic characteristics of operated patients and morphologic characteristics of groin hernias.

Methods

This retrospective study included all operated patients with diagnosis of groin hernia in 4 years period (from 2009 to 2012) hospitalized at the Department of Surgery, Military Center in Novi Sad, Serbia. The analysis included 1,211 patients. In all patients a demographic characteristics including gender and age, clinical characteristics (symptoms and signs) and hernia type were analyzed. The patients were stratified in age groups with subsequent comparison between groups. All patients were operated by using an open surgical approach. The surgical procedures for hernia solving were analyzed and early postoperative complications were assessed. All statistical analysis was performed using SPSS software (Statistical package for the social sciences version 18.0, Chicago, IL, USA). χ^2 test was used to test the significance of differences between groups. Data are presented in numbers (percent). *P* values less than 0.05 were considered statistically significant for all comparisons.

Results

The study included 1,211 patients who underwent open surgical reparation of groin hernia. Elective surgery was performed in 1,207 (99.7 %) and urgent treatment was indicated in only 4 patients. In those patients, 3 were presented with inguinal incarcerated hernia and one with femoral incarcerated hernia. Total of the operated patients 1,127 (93.1%) were males and 84 (6.9%) were females with significant difference in gender ($\chi^2 = 898.306$; $p < 0.001$).

Groin hernia was found in 1,195 (98.7%) patients; there were 1,123 (94%) male and 72 (6%) female patients. Femoral hernia was found in 16 (1.3%) patients; there were 4 (25%) male and 12 (75%) female patients. See Table 1. The-

re was significant difference in distributions of inguinal and femoral hernia between genders ($\chi^2 = 116.342$; $p < 0.001$).

Bilateral hernia was present in 16 (1.3%) males, but there were no females with bilateral hernia. Primary hernia was present in 1,146 (94.6%) patients, whereas recurrent hernia was present in 65 (5.4%) patients. Patients were stratified in age groups (from 21 to above 81 years) and the structure of the patient's age is showed in Table 2.

There was no significant difference in patient's age and hernia occurrence. However, a significant positive trend of hernia occurrence and patients in the age group of 71 and above was found ($F = 24.905$ $p = 0.008$).

In male patients right sided inguinal hernia was present in 664 (57.6%) patients and left sided in 488 (42.4%) patients. In female patients right sided inguinal hernia was present in 7 patients and left sided in 5 patients. There were 16 patients with bilateral inguinal hernia, all males. There was no significant difference in side of inguinal hernia occurrence and gender ($\chi^2 = 0.182$; $p = 1.000$). The same percentage of male patients suffer from right sided and left sided femoral hernia. In females there were higher occurrence in femoral hernia on the right side then on the left side (7 : 5 patients), but without significant difference in hernia localization.

Surgical procedures for hernia reparation were: the Lichtenstein in 620 (51.2%) patients, the nylon-darn (Abrahamson) procedure in 358 (29.6%) patients, the Bassini in 196 (16.2%) patients, the Halsted in 17 (1.4%) patients, and the Lothaissen in 20 (1.7%) patients.

There were 12 patients with recurrent hernia of which 5 patients were males and 7 females. In those patients, 6 patients were primary operated applying the Lichtenstein procedure and other 6 applying the nylon-darn technique. Surgical reparation of recurrent groin hernia was the Lichtenstein procedure in 8 patients, the nylon-darn procedure in two patients and the Bassini procedure in two patients. Overall postoperative complications were presented in 78 (6.4%) of patients and they are shown in Table 3.

Wound infection was the most common postoperative complication recorded, and it occurred in 2.4% of patients. Among those patients, 16 were operated using the Lichtenstein procedure, 7 using the nylon-darn technique, 4 using the Bassini and 2 of them using the Halsted procedure without significant difference among patients in regard to operative techniques used ($p > 0.05$). Neuralgia as the second most common complication recorded, was observed in 10 patients operated using the Bassini technique, in 4 patients operated using nylon-darn technique and in 2 of them operated using the Lichtenstein procedure. Significant difference was found ($p = 0.018$) in neuralgia occurrence among patients operated using the Bassini procedure and other surgical techniques. Testicular atrophy was found in 2 patients, both of them were operated using the Lichtenstein technique. There was no perioperative mortality.

Table 1

Distribution of hernia type between genders

Gender distribution	Hernia		Total, n (%)
	inguinal	femoral	
Male, n (%)	1,123 (99.6)	4 (0.4)	1,127 (100.0)
Female, n (%)	72 (85.7)	12 (14.3)	84 (100.0)
Total, n (%)	1,195 (98.7)	16 (1.3)	1,211 (100.0)

Table 2

Structure of age in patients with groin hernia

Age (years)	Patients with groin hernia
	n (%)
21–30	87 (7.2)
31–40	78 (6.5)
41–50	143 (11.8)
51–60	273 (22.5)
61–70	330 (27.2)
71–80	259 (21.4)
81+	41 (3.4)
Total	1,211 (100.0)

Table 3

Postoperative complications in 1,211 operated patients with hernias

Complication	Patients, n (%)
Wound infection	29 (2.4)
Seroma	13 (1.07)
Hematoma	7 (0.58)
Urinary retention	5 (0.41)
Scrotal induration	6 (0.49)
Neuralgia	16 (1.32)
Testicular atrophy	2 (0.16)
Total	78 (6.4)

Discussion

Groin hernias are common pathology among men population, the most common pathology in children's population, with a new peak of incidence in early adult period (maximal physical activity), and the second peak in persons older than 65 years (weak structure of the connective tissue) [1, 3, 4, 12]. More than hundred years ago, the male/female ratio of groin hernia incidence was 20/1, and since that the incidence increases towards the female population. However, still the male/female ratio is not reduced much and amounts approximately 8–15/1 at the expense of the male population [12, 15]. Our results are similar showing that inguinal hernia repairs were carried out in total almost 14 times more commonly in the male than in the female population. As opposed to inguinal hernia, the femoral hernia in our study group was more common in the female population than in males (3 : 1) with significant difference in distribution of inguinal and femoral hernia between genders. These results correspond with the incidence of femoral hernia in general population over world [16]. The incidence of groin hernia is approximately 2% in men and 0.3% in women, whereas prevalence in men below 25 years is 18/100000, and increases at the age of 69–74 in up to 40/100,000, reaching 47/100,000 at the age above 75. For the entire population prevalence was reported as 24/100,000 [1, 9, 12, 17]. The age of patient has a strong influence on the incidence, etiopathogenesis and treatment inguinal hernia as well. In our study 71.1% of patients were in the age group from 51 to 80, and 27.2% of patients were in the age group of 61–70, suggesting weak structure of connective tissue in older population as etiology factor of hernia occurrence, as reported recently [12].

More than hundred years after revolutionary rebound in groin hernia surgery initiated by Bassini's operation, surgeons developed many variations of different techniques, tensional or non-tensional, open or laparoscopic. During past two decades, only non-tensional techniques have been applied, but with variable recurrence rates ranging from under 1% to up to 10% [18, 19]. The usage of prosthetic material in hernia surgery led to changes fundamental in the surgical strategy, because the concept of covering miopectineal orifice with non-absorbable prosthesis brought minimal incidence of recurrence [20]. Principles of surgical treatment should be based on right indication and proper selection of a surgical technique, in every individual case.

The most commonly used open surgical techniques in reparation of groin hernia in the last several decades includes the Lichtenstein procedure and plication-darn (nylon-darn) technique. To decrease the tension in the suture line, Lichtenstein added a synthetic mesh and sutured from the edges. Hernia repair in this manner have made the initial recurrence rate drop to less than 1% [21]. However, the recurrence rates have been raised in further series up to 8% [22, 23]. The explanation for raising recurrence rates lied in complications of the synthetic mesh which include fibrosis and chronic inguinal pain, chronic infection and shrinking of the mesh [24]. In 1946, Maloney et al. [25], originally developed a new method of herniorrhaphy, namely the Darn repair, by continuous suture with monofilament nylon. It was a tension-free suture adapted from the Bassini technique. This technique popularized by Abrahamson in the seventies with very low recurrence rate [26].

The longest study about this method was a 23-year study reported by El-Bakry [27] who found the recurrence rate of 0.2% in 600 patients. The main disadvantage in our study was short term follow-up without assessment of recurrence rate of operated patients. However, a large number of operated patients allowed us to make the comparison among surgical techniques for groin hernia reparation. Since the first series of laparoscopic hernia repairs were published in 1990, this minimally invasive surgical approach for groin hernia solving has widely been used. According to the present guidelines of the European Hernia Society the Lichtenstein or endoscopic repair should be the procedure of choice for both primary unilateral and bilateral inguinal hernias with the note that endoscopic repair should only be performed if expertise is available [10].

Decision on the type of a surgical technique for groin hernia reparation in our series was based on the hernia size and type, thickness of the musculoaponeurotic layer, surgical skills and experience. The majority of patients in our study were operated using the Lichtenstein procedure, 51.2% of all operated patients, and the second most common surgical technique was the nylon-darn method in 358 patients. Although in literature there are data of higher complication rates after the Lichtenstein hernioplasty [24], it is certain that careful and meticulous technique could reduce a number of postoperative complications whether the Lichtenstein or darn procedure was used. However, for a good hernia repair, either mesh has to be sutured without inducing foreign body reaction or other type of reparation without tension has to be performed. The nylon-darn method for groin hernia reparation fulfils these conditions.

The most common early postoperative complication in our study was wound infection. It was reported that wound infection or superficial infection is more common in the Lichtenstein than in the darn technique, but without significant difference [28]. Although we noted more patients with wound infection operated using the Lichtenstein than those using the nylon-darn technique, there were almost twice more patients operated by using the Lichtenstein procedure. Actually, 16 patients in the Lichtenstein group and 7 patients in the nylon-darn group had wound infection, which was 2.5% and 1.95% in incidence rate of wound infection in each group, without significant difference between the groups. Significant higher occurrence of neuralgia was found in patients operated using the Bassini procedure, which suggests more common nerve entrapment in this method.

Conclusion

Groin hernias are frequent pathology in general population. Prevalence of groin hernias is higher in men population, while femoral hernias are more common among women. The population which is the most affected is in the age of 61 to 80 years. The most commonly used open surgical procedures

for groin hernia reparation are the Lichtenstein and the nylon-darn. Both methods have low and similar incidence rates of postoperative complications. Adequate technique for groin hernia reparation should be selected on the basis of anatomical findings during surgery and experience and skills of the surgeon.

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