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OPEN INGUINAL HERNIA REPAIR IN ADULT PATIENTS

M. S. Tomin

V. N. Karazin Kharkiv National University, Ukraine

The review presents the frequency, anatomy, classification, diagnosis, and the most effective open methods of inguinal hernia's operative therapy in adult patients.

These findings are in agreement with the recommendations of the Ukrainian association of surgeons-herniologists and the European Hernia Society (EHS). The article does not deal with laparoendoscopic options of hernia repair (TAPP and TEP), as they require a separate section in the anatomy of the inguinal region and endoscopic techniques' volumetric description. Besides, in Ukraine inguinal hernia repair is most frequently performed of open access that causes the topic's timeliness.

KEY WORDS: inguinal hernia, open hernia repair, Lichtenstein's operation, Shouldice's operation

ВІДКРИТА ПАХОВА ГЕРНІОПЛАСТИКА У ДОРΟΣЛИХ ПАЦІЄНТІВ

M. S. Tomin

Харківський національний університет імені В. Н. Каразіна, Україна

Розглядаються питання частоти, анатомії, класифікації, діагностики і найбільш ефективних відкритих методів хірургічного лікування пахової грижі у дорослих пацієнтів. Наведені дані узгоджуються з рекомендаціями Української асоціації хірургів-герніологів та Європейського герніологічного товариства (European Hernia Society, EHS). У статті не наводяться лапароендоскопічні варіанти герніопластики (TAPP і TEP), оскільки вимагають написання окремого розділу з анатомії пахової ділянки, і об'ємного опису ендоскопічних методик. Крім того, в Україні найбільш часто пахова герніопластика виконується з відкритого доступу, що обумовлює актуальність розглянутого питання.

КЛЮЧОВІ СЛОВА: пахова грижа, відкрита герніопластика, герніопластика за Ліхтенштейном, герніопластика за Шолдайсом

ОТКРЫТАЯ ПАХОВАЯ ГЕРНИОПЛАСТИКА У ВЗРОСЛЫХ ПАЦИЕНТОВ

M. S. Tomin

Харьковский национальный университет имени В. Н. Каразина, Украина

В обзоре рассматриваются вопросы частоты, анатомии, классификации, диагностики и наиболее эффективных открытых методов хирургического лечения паховой грыжи у взрослых пациентов. Приведенные данные согласуются с рекомендациями Украинской ассоциации хирургов-герниологов и Европейского герниологического общества (European Hernia Society, EHS).

В статье не приводятся лапароэндоскопические варианты герниопластики (TAPP и TEP), поскольку требуют отдельного раздела по анатомии паховой области, и объемного описания эндоскопических методик. Кроме того, в Украине наиболее часто паховая герниопластика выполняется из открытого доступа, что обуславливает актуальность рассматриваемого вопроса.

КЛЮЧЕВЫЕ СЛОВА: паховая грыжа, открытая герниопластика, герниопластика Лихтенштейна, герниопластика Шолдайса

INTRODUCTION

Since Lichtenstein hernioplasty got a widespread acceptance in surgical practice, the rate of hernia recurrence has fallen substantially (from 30 % to 4-14 %) [1-3]. In

addition, a large number of different autoplatic hernioplasties are performed in the national surgical hospitals, mainly because of social reasons [3]. In this context, Shouldice hernioplasty, that until recently was the «gold standard» in North America and Western

Europe, is not so widespread. According to foreign authors the recurrence rate of this surgery is 1-4 % [1-2]. In the domestic authors' opinion a technique's complexity prevents its wide dissemination. Taking into account the fact that in different countries the treatment of inguinal hernia has inhomogeneous surgical approach, in 2009 the EHS published guidelines for the treatment of inguinal hernia in adults, which fully elucidated this pathology - from diagnosis to postoperative management [1].

In March 2014 the Hernia published an updated version of these guidelines, having supplemented it with research results with a level of evidence 1 [2]. The purpose of this article is to review scientific publications with a high level of evidence and recommendations dealing with the diagnosis and surgical treatment of inguinal hernia in adults. The review does not deal with laparoendoscopic options of hernia repair (TAPP and TEP), as they require a separate section in the anatomy of the inguinal region and endoscopic techniques' description equal in length to a separate article.

STATISTICS

Inguinal hernia is one of the most common abnormalities that require an operative intervention. The inguinal hernia's share is about 75 % among the hernias of anterior abdominal wall. Nowadays, there are no accurate data on the incidence and prevalence rate of inguinal hernia. In our country the incidence of inguinal hernia is (3-4) % [1-3]. About 27 % of European men and 3 % of women undergo inguinal hernioplasty throughout life. Approximately 200,000 hernioplasties are performed each year in Europe and 800,000 in the United States [1, 3]. The risk of inguinal hernia's incarceration is (0.3-3) % during the year. In Europe a rate of postoperative lethality during planned operations is less than 0.5 %, during urgent - more than 5 % [1, 3].

ANATOMY

The inguinal region is a genetically determined weak area in the anterior abdominal wall. Anatomically, it conforms to the Fruchaud's myopectineal orifice, which is bounded superiorly and medially by the conjoined tendon and abdominal rectus muscle, laterally - by the iliopsoas muscle, and inferiorly - by the superior pubic ramus. This

area is covered by the transverse fascia. This fascia split into two regions by the inguinal ligament, which perforates by the spermatic cord / round ligament of uterus and femoral vessels. Accordingly, the abdominal wall's integrity in the area of the Fruchaud's myopectineal orifice is provided exclusively by the transverse fascia. Abdominal membrane hernial sac prolapse or preperitoneal lipoma prolapse through the orifice leads to the inguinal hernia formation.

So the transverse fascia failure which holds the abdominal membrane and preperitoneal fat is a fundamental reason leading to the inguinal hernia formation. On the one hand the weakness of the transverse fascia may be determined by constitutional and acquired causes, on the other hand- by abdominal's increasing pressure. Obliteration disorder of the abdominal space's vaginal process is one of the main constitutional causes.

RISK FACTORS

According to the metaanalysis the highest risk of inguinal hernia is associated with the following factors: smoking, family hernial history, non-obliterated abdominal vaginal process, collagen diseases, abdominal aneurysm, appendectomy or prostatectomy in past medical history, ascite, peritoneal dialysis, prolonged laboring job, chronic cough.

Such risk factors as periodic weight lifting, constipation and benign prostatic hyperplasia are not proved. The connection between smoking and aortic aneurysm is associated with a collagen pathobolism, which is common presentation sign within this population. As for prevention measures of inguinal hernia, only smoking cessation is a recommendation, effectiveness of which is proved.

CLINICAL PROFILE OF INGUINAL HERNIA

Inguinal hernia is a protrusion of abdominal contents or preperitoneal fat through the abdominal wall's defect of the corresponding region. In case when there is no pain syndrome or sense of discomfort, inguinal hernia is called *asymptomatic*. A hernia that cannot be pushed back into abdominal cavity is known as an *irreducible hernia*. People with irreducible hernias are more likely to experience a compression of hernia sac contents with the further development of ischemia, necrosis and inflammation of the surrounding soft tissues,

which is known as a *strangulated hernia*. The most dangerous accident is colon shrinkage, which can be complicated by perforation and peritonitis. According to a mechanism of intestinal incarceration there are several types of infringements – *fecal impairment* (due to large amounts of intestinal contents in the intestinal loop), *elastic infringement* (the outlet of the excess intestinal loop length into a hernial sac due to increased intra-abdominal pressure), *retrograde infringement* (the infringement in the form of «W», the intermediate loop in the abdominal cavity is infringed) and *parietal incarceration/ the Richter's hernia*, which was firstly described by the German surgeon August Gottlob Richter in 1778. In 1735 the English surgeon Claudius Amyand described the outlet or/and incarceration of vermiform appendix in the inguinal hernia - *Amyand's hernia*. In 1690s the French anatomist Littre described a case of identifying Meckel's diverticulum in the inguinal hernia - *the Littre's hernia* [4]. There are two basic types of groin hernias depending on the attitude of hernial sac to the elements of the inguinal canal: the *indirect* (the peritoneum prolapses around the lateral inguinal fossa and then descends to the spermatic cord's elements through the internal ring) and *direct* (the peritoneum prolapses around the medial inguinal fossa with the hernial sac's penetration into the inguinal canal, separate from the spermatic cord's elements). A *sliding inguinal hernia* - a hernia in which one of a hernial sac's walls is an organ, covered with a visceral peritoneum.

CLASSIFICATION

According to the International Statistical Classification of Diseases 10th Revision (ICD-10) there are several types of inguinal hernias.

K 40 – inguinal hernia included: bilateral, indirect, direct.

K 40.0 – bilateral inguinal hernia, with obstruction, without gangrene.

K 40.1 – bilateral inguinal hernia, with gangrene.

K 40.2 – bilateral inguinal hernia, without obstruction or gangrene.

K 40.3 – unilateral or unspecified inguinal hernia, with obstruction, without gangrene.

K 40.4 – unilateral or unspecified inguinal hernia, with gangrene.

K 40.9 – unilateral or unspecified inguinal hernia, without obstruction or gangrene.

K 41 – femoral hernia.

K 41.0 – bilateral femoral hernia, with obstruction, without gangrene.

K 41.1 – bilateral femoral hernia, with gangrene

K 41.2 – bilateral femoral hernia, without obstruction or gangrene

K 41.3 – unilateral or unspecified femoral hernia, with obstruction, without gangrene

K 41.4 – unilateral or unspecified femoral hernia, with gangrene

K 41.9 – unilateral or unspecified femoral hernia, without obstruction or gangrene

There are a large number of clinical classifications of inguinal hernia, which allows to determine a surgical approach and optimize the patient allocation resulting from the study. A classification of A.P. Krymov, N.I. Kukud-zhanov, Toskin-Zhebrovsky, Nyhus, Gilbert, Rutkow / Robbins, Schumpelick, Harkins, Casten, Halverson-McVay, Lichtenstein, Bendavid, Stoppa, Zollinger and the traditional (direct, indirect) – are the most widely-used classifications.

In 2009 the European Hernia Society (EHS) has adopted the following classification (tab. 1) [1]:

Table1

Classification of Inguinal Hernia
(European Hernia Society, 2009)

EHS Groin Hernia Primary / recurrent Classification					
	0	1	2	3	X
Lateral (indirect), L					
Medial (direct), M					
Femoral, F					

- 0 = no hernia detectable
- 1 = hernia < 1,5 cm (one finger)
- 2 = hernia < 3,0 cm (two fingers)
- 3 = hernia > 3,0 cm (more than two fingers)
- X = not investigated

DIAGNOSIS

Typically, an inguinal hernia is detected during the original physical examination, the sensitivity of which is about 74, 5-92 % and specificity is up to 93 % [1, 4].

Diagnostic difficulties may arise in case when there is an indistinct boundary of hernial protrusion in the groin, which can periodically appear and disappear.

In some patients a hernial protrusion may not be palpable during the examination.

More rarely there are unspecific «inguinal» complaints against the backdrop of protrusion absence. Hernia with clear clinical implications does not require any additional examination. It is necessary to make the differentiation with femoral hernia, as it affects the surgical approach. Femoral hernia is situated below the inguinal ligament. Differential diagnostics between the direct or indirect hernia is not possible and is determined only intraoperatively.

Ultrasonography is a useful method that complements the physical examination.

In the diagnosis of hidden inguinal hernias the specificity of the method is about 88-100 %, sensitivity is 33-100 % [1]. Computer tomography doesn't play an important role in the inguinal hernia diagnosis. The sensitivity of the method is about 83 % and specificity is 67-83 % [5]. The method is useful when hernia contained urinary bladder.

The advantage of nuclear magnetic resonance imaging is the ability to identify comorbidities (inflammatory lesions, tumors). This method can be used to make hernia's

dynamic estimates on activity. The sensitivity of the method is up to 94, 5 %, the specificity is 96, 3 % [5].

Herniography is a safe diagnostic aid of hidden hernias, the sensitivity of the method is up to 100 % and specificity is about 98-100 % [1]. This method is rarely used in domestic practice, although in foreign countries it is widespread. Herniography is performed by injecting a radiopaque substance into the abdominal cavity with a further study of its distribution by sloping areas during the fluoroscopy.

Herniography does not allow identifying a spermatic cord's lipoma, which can come out in a pain syndrome and indistinct protrusion in the groin.

Inguinal hernias that have not been earlier accompanied by the protrusion were diagnosed in 12-54 % of patients undergoing herniography.

This method made it possible to detect hidden hernias in 25 % of athletes who have a vague pain in the groin area. The risk of complications of this method is about 0-4,3 %, which include allergy to the contrast substance, enterobrosia and abdominal wall hematoma [1, 3, 5].

If there is a vague pain in the groin area, unspecified diagnosis of inguinal hernia and the absence of negative trend, herniography should be done in no event sooner than 4 months after the specified symptoms' emergence.

A wide range of diagnostic techniques allows carrying out differential diagnostics of inguinal hernia to other diseases with a high reliability degree (tab. 2) [1, 5-6].

Table 2

Differential diagnosis of oligosymptomatic inguinal hernia

Differential diagnosis of inguinal hernia with other lumps in the groin and scrotum	Differential diagnosis of inguinal hernia with diseases accompanied by the pain syndrome and groin protrusion absence
Femoral hernia	Adductor tendinitis
Incisional hernia	Periostitis of the pubic symphysis
Lymph node swelling	Coxarthrosis
Saphena varix	Iliopectineal bursitis
Soft tissue tumors, including elements of the spermatic cord, epididymis and testis	Pain radiation of the lower spines
Abscess	Endometriosis
Genital malformations (ectopic testis, etc.)	
Hydrocele	
Endometriosis	

TREATMENT

The goal of the inguinal hernia's treatment is a symptoms reduction by removing hernia with minimal discomfort to the patient together with economic efficiency.

The treatment principle is the elimination of the posterior wall's defect of the inguinal canal. A support function of the transverse fascia of the Fruchaud's myopectineal orifice can be repaired through the autoplasmic methods, either with the help of synthetic implant. Surgical treatment is required for all patients with the acute symptomatology of inguinal hernia.

The updated version of the EHS guidelines 2014 states that in case when men have a minimal symptomatology or have no hernia symptoms at all, then the expectant management is recommended. There indicated that over time with a probability of 70 % the symptomatology will increase, that in the result will inevitably lead to a surgical treatment [2].

Autoplasty

The most common surgeries are: hernioplasty by Kimbarovskiy, Kukudzhanov (the first and second methods) Spasokukotsky, Bassini, Girard, MacVay, Postemski and Shouldice [3]. According to domestic authors the anterior wall's repair of the inguinal canal is characterized by a high relapse rate - (9-37) % [1-2, 5]. This method does not apply in Western Europe and North America because it is not considered to be pathogenetically reasoned. The only indication to the anterior wall's plastic repair is an inguinal hernia in children – methods of Martynov and Roux-Krasnobaeva.

Shouldice's hernioplasty and in some cases Mac Vey's and Postemski's are the most preferable methods in foreign clinics and domestic herniological centers/ offices of autoplasmic methods.

In 1884 Bassini described the first rational surgery to strengthen the posterior wall of the inguinal canal. The interpretation of this surgery was so arbitrary that there was not paid enough attention to a plastic repair of the transverse fascia. Consequently, the relapse rate reached a high level of 15 %.

In the 1950s Shouldice introduced a modern version of the original Bassini's technique, according to which the posterior wall of the inguinal canal and the internal inguinal ring are recovered by stitching of several layers with the help of long nonabsorbable monofilament suture. The Shouldice operation is considered

to be the best among autoplasmic techniques in the treatment of primary inguinal hernia according to recent recommendations of the EHS (2009) based on the metaanalysis [1-2, 5, 7]. In specialized herniological centers and branches the relapse rate of this operation is at a low level of 0,7-1,7 %. In general surgical departments the health outcome is slightly worse - the relapse rate reached a level of 15 % [8-9].

The shouldice repair technique

According to the technique it is necessary to make the incision in the ilio-inguinal area and secure subcutaneous veins. The aponeurosis of the transversus abdominis is incised while the ilio-inguinal nerve is preserved. The spermatic cord is isolated and taken to the ligature holder. Muscles of the spermatic cord are transected and secured.

If it is necessary there should be performed a transection and deligation of the spermatic cord's extrinsic vessels while a genital branch of genitofemoral nerve is preserved. Then a hernial sac is incised up to the internal inguinal ring and excised.

After that the transverse fascia is incised up to its unalterable areas. Reconstruction is performed by a continuous stitching using a 2,0 or 3,0 EP (European Pharmacopoeia Dimension) polypropylene suture. The first layer begins medially without trapping the pubic tubercle's periosteum. A lower edge of the transverse fascia (Thompson's ligament) is sutured to the upper flap which includes an anterior part of conjoined tendon. The layer is completed with the narrowing of internal inguinal ring. During the second layer it is used the same suture. A stump of cremasteric muscles with the superior flap of transverse fascia is trapped to the raphe from top, and a lower edge of the inguinal ligament (the ilio-pubic tract) - from below. The third layer begins laterally trapping the conjoined tendon from top and the inguinal ligament - from below. According to the original Shouldice's technique the fourth layer is stitched in the opposite direction. The aponeurosis of the transversus abdominis is sutured with the help of absorbable suture while the external inguinal ring should not be inordinately constricted. The Scarpa's fascia is blended and stitches are put in skin.

Hernia repair using mesh implants

A tension between tissues appears in the result of tissues' approximation, which under

normal conditions does not adjoin to each other. All classical autoplasmic methods of hernioplasty according to which tissues are connected by stitches belong to the so-called «tension techniques». The tension of tissues leads to ischemia, enhancing pain syndrome, necrosis, disruption and hernia recurrence. Moreover, it is proved that some patients with inguinal hernia (especially elderly people) have an abnormality of collagen metabolism that also interrupts the scar's quality elaboration. Strengthening these tissues with synthetic material led to the creation of a new effective method.

The formation of the concept of «Tension-Free Hernioplasty» refers to the end of XIX century. Application of implants for the hernia's defects correction was termed - alloplasty.

By 1960s there has been created a polypropylene mesh that has met all the requirements applicable to the implants. Today, the monopolypropylene and composite mesh implants are the most commonly used. Defect's closure of the posterior wall of the inguinal canal by the implant can be done in two fundamentally different ways. According to the first method it is proposed to be used a tube implant, the second - a mesh implant in a form of a flap covering the transversalis fascia.

Implant insertion in the groin area can be performed anteriorly, through the inguinal incision and posteriorly - through the traditional inguinal access with its placement in the preperitoneal space, or endoscopically.

Selecting the mesh implant

For inguinal hernia's surgical treatment by the method of Tension-Free Hernioplasty it is recommended to use only non-absorbable mesh implants or composite meshes of non-absorbable materials.

There are a large number of mesh implants that differ in textile parameters such as the type of polymer, fiber, structure, pore size, elasticity, tensile and tear strength, weight and surface property.

Using mesh implants may be associated with the occurrence of non-specific (pain, infection, regression) and specific complications (implant shrinkage, displacement, migration, damage of surrounding tissues and organs).

There are two most commonly used types of mesh implants - the heavy-weight meshes with small pore sizes and the light-weight

meshes, characterized by a lower weight and a large «effective» pore ($> 1000 \mu\text{m}$).

Light-weight mesh implants do not actively shrink and they cause a less tissue inflammatory response, as well the formation of scar tissue is less. As a whole they cause less discomfort and initiate a less pronounced foreign body reaction.

The main disadvantage of light-weight mesh implants is a slight increase in the number of relapses. More often it happens in the result of malpositioning and wrong mesh fixing during large direct hernias.

Implantation through the open anterior approach

Since 1984 Lichtenstein actively promoted the method of Tension-Free Hernioplasty.

According to the technique it is necessary to make the incision in the inguinal area and it should be made so that it would be enough for a good visibility of pubic tubercle and sheath of rectus abdominis muscles, subcutaneous veins are to be secured. The aponeurosis of the abdominal external oblique muscle is incised while the ilio-inguinal nerve is preserved. The spermatic cord is isolated and taken to the ligature holder, while the posterior wall of the inguinal canal is exposed. Spermatic cord muscles are excised only in case of hypertrophy which causes an unacceptably large diameter of the internal inguinal ring. Hernial sac is isolated up to the internal inguinal ring and then it can be opened, excised or invaginated. If, in the case of direct hernia, the transverse fascia is significantly stretched, it is necessary to put a continuous suture with the help of absorbable suture, which will constrict the internal inguinal ring to its normal size. During the operation all the groin nerves are preserved. A special attention is paid to the ilio-hypogastric nerve, which can be placed directly under the mesh implant, but only not under its sharp corner, which may lead to a persistent postoperative neuralgia. Thus, it is necessary to cut out the mesh flap of sufficient size. For a Lichtenstein hernioplasty is used a 7×14 cm piece of polypropylene mesh implant covering the pubic tubercle by 2 cm. Fixation is performed by a 3,0 EP (European Pharmacopoeia Dimension) polypropylene suture, 2 cm medial to the pubic tubercle, starting from the lateral border of the rectus sheath with the transition to the inguinal ligament and up to the internal inguinal ring.

Next, a lateral one third of the mesh is medially excised along the spermatic cord. The 2 tails are then tucked together, sutured and fixed to the inguinal ligament. The upper edge of the mesh implant is sutured by interrupted or continuous stitches to the aponeurosis of the internal oblique abdominis. It is important to avoid the entrapment of the internal oblique muscle taking into account that the ilio-hypogastric nerve may be injured. According to the first randomized trial the usage of cyanoacrylate for the polypropylene mesh fixing can be accompanied by the pain reduction in the postoperative period (a level of evidence 1B). However, there were no advantages over the sutural technique with regard to chronic pain. According to the recommendations of the B level, an atraumatic mesh fixation can be performed without the first-year relapse rate increasing [2, 10].

After the implantation the mesh should be like a small dome, indicating the tension absence. In other words, the mesh is implanted with a small overlap. Then the flaps of the aponeurosis of the external oblique abdominis are sutured edge-to-edge over the spermatic cord.

As for inguinal hernia repair in women it should be a very careful attitude to the round ligament and ilio-inguinal nerve, in men – to the spermatic cord. If during the operation the anatomical structures intersected, the lateral part of the mesh implant is not to be incised.

Besides Lichtenstein method there are the following most commonly used types of implants and the ways of their anterior approachable positioning:

- mesh-plugs (a plug is located in the internal inguinal ring and an implant's mesh part covers the posterior wall of the inguinal canal),
- PHS (Polypropylene hernia system) – the implant, covering three areas – the preperitoneal space, deep inguinal ring and posterior wall of the inguinal canal,
- Trabucco performs a sutureless implantation of the mesh,
- Rives performs a preperitoneal mesh-implantation through the inguinal approach.

Implantation through the open posterior approach

Posterior approach to the Fruchaud's myopectineal orifice is performed by dissection of the abdominal wall. A large implant that completely covers all the orifices of this area is

set into the preperitoneal space through the dissection. The method was popularized in the 1980s by Stoppa. First surgeons who advanced this idea were Goss, 1962 and Mahorner, 1962. Stoppa and Wantz applied this method for the unilateral inguinal hernias treatment. Today Stoppa's operation remains the method of choice for the recurrent and bilateral inguinal hernia treatment. Kugel offered to put a mesh implant with a solid outer ring into the preperitoneal space. During short-term observations this method shows the results comparable to Lichtenstein's operation.

Inguinal hernia in females

About 8-9 % of all inguinal and femoral hernia operations are performed to women [1]. Women undergoing autoplasmic method of hernia repair have a comparable number of relapses (2-13%) with similar operations of oblique and direct inguinal hernia conducted in men [1]. At the same time a relapse rate depends on the postoperative term. According to epidemiological studies of different countries, the frequency of reoperation in women is slightly higher than men have, and it does not depend on the type of hernia repair – allo- or autoplasmic. A recurrence of femoral hernia is detected during the operation in about 40% of the cases. There is a pending issue whether these "femoral" recurrences are occult hernias during the previous operation or they formed de novo [1, 9]. Endoscopic plastic according to which the mesh implant simultaneously closes both orifices (inguinal and femoral) is justified by a high relapse rate of femoral hernias in women after the inguinal hernia repair.

Indirect inguinal hernia in young males

Taking into account possible recurrences of inguinal hernia and the negative impact of repeated operations, as well as the impact of mesh implant on fertile function, experts of the EHS was carried out a deep analysis of treatment results in this group of patients. Approximately 5 % of all inguinal hernia repairs are performed to men at the age of 18 - 30 years. Indirect inguinal hernia is the most widespread in the majority of cases. Moreover, during the period from 2 to 5 years after Shouldice hernioplasty the number of relapses during indirect inguinal hernia is 1-3 % lower than the number during the direct [1, 2].

During Danish Hernia Database analyzing there were detected that in men younger than 30 years with primary indirect inguinal hernia

after the autoplasmic hernioplasty the frequency of repeated operations almost twice higher in comparison with the Liechtenstein's operation and other open methods of alloplasty [2]. At the same time, in patients under 55 years, who were operated for indirect inguinal hernia by both auto-and alloplastic methods, there was no significant difference in the incidence of chronic pain and the occurrence of specific complications in the case of mesh implantation. Currently, there are no data indicating an advantage of autoplasmic hernia repair in young men in comparison with alloplasty. EHS recommends using mesh implants in men at the age of 18-30 years, regardless of inguinal hernia type [3].

Antibiotic prophylaxis

Routine antibiotic prophylaxis is not recommended during the scheduled inguinal hernia repair in patients with a low risk of wound complications (level A). Antibiotic prophylaxis is considered mandatory in establishments with a high risk of wound infection (more than 5 %). Standard agents are the second-generation cephalosporins.

Debatable questions

The most mandatory method of open inguinal hernia repair

The following factors should be considered while choosing a treatment method of inguinal hernia: the risk of recurrence, the risk of complications (safety), the patient restoration in the postoperative period, the quality of life, terms of return to work, the degree of complexity, and cost.

According to systematic reviews, meta-analyses and individual studies published in reliable publications, the operations of choice are as follows [7-19].

- For the primary inguinal hernia treatment, among the methods that do not use mesh implants, Shouldice hernioplasty is the operation of choice, which gives no more than 1.7 % of relapses in specialized centers and offices

- Liechtenstein hernioplasty is the operation of choice among the methods with the mesh implant open offering. Operation is

characterized by a low rate of postoperative mortality, it may be performed in the one-day surgical hospital and during long observation relapse rates does not exceed 4 %

What to choose: autoplasmic or a mesh?

According to systematic reviews of randomized controlled trials the relapse rate is less while using mesh implants than while performing autohernioplastic interventions, especially Shouldice's operation [5, 10-11, 20-32].

A mesh implants application is characterized by reducing risk of chronic pain. On the other hand, many authors notes that the statistical advantages of the mesh implants usage are associated with technical errors of Shouldice's operation.

Prospects for treatment

In the last 5-7 years there appears more data pointing the benefits of laparoendoscopic hernioplasty (TAPP and TEP) [2, 5, 33-34]. It is necessary to notice that there are a reduction of the frequency and intensity of pain syndrome in the early postoperative period and wound complications abatement. A bed day is less and there is a short period of rehabilitation. Relapse rate is comparable with open methods.

If there is a hernia recurrence after open surgery, laparoendoscopic hernioplasty offers the possibility to reduce postoperative pain syndrome, speed a recovery and reduce the risk of chronic pain compared with Liechtenstein's operation (a level of evidence 1A) [2].

Transabdominal preperitoneal hernioplasty (TAPP) is widespread in large surgical centers of Western Europe, totally extraperitoneal hernioplasty (TEP) – in the United States [2, 3,16]. The main disadvantage of laparoendoscopic hernioplasty is a high cost due to the price of endoscopic rack, instruments, and anaesthetic support. Another deterrent on the way toward a wider implementation of these operations is a surgery technique complexity, especially of extraperitoneal hernioplasty (TEP) on the background of the lack of simulation training centers [29-34].

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