



## Questions from and answers to a patient with groin hernia



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### Questions from and answers to a patient with groin hernia

*Inguinal hernia surgical treatment are the most commonly performed operations in general surgery practice. There is a need for detailed anatomical knowledge and surgical skills to satisfactorily treat this disease. In this review, we aimed to present up-to-date information and approaches on basic diagnosis, treatment, complications and management of inguinal hernias in our institution.*

KEY WORDS: Chronic pain, Groin hernia, Inguinal hernia, Recurrence, Surgery

#### Patient - surgeon relationship

Hernia is the appearance of itself outside the abdomen wall as being wrapped around a peritoneum of the abdominal organs through an abdominal wall or an acquired defect<sup>1,2</sup>. Abdominal wall hernias are prevalent in the population, including all age groups, with a prevalence of 1.7%. 75% of these hernias constitute inguinal hernia. 27% of male individuals and 3% of female individuals confront this disorder throughout all their lives<sup>3</sup>. Inguinal hernia operations are among the most common operations performed in general surgery practice. In the United Kingdom, 10 out of every 100 thousand people have this operation, while this rate is 28 in one hundred thousand in the United States. Also in the United

States, 600,000 inguinal hernia restorations are done annually<sup>4</sup>. In our clinic at the Ankara Numune Training and Research Hospital, which is a reference center, inguinal hernia operations constitute the average of 10% of annual operations.

Many classification and surgery techniques have been described for this disease, which is quite common in society. The fact that the surgical technique with a recurrence rate of zero is not yet reported, and the fact that this disease is not considered as important among surgical diseases can turn into a nightmare for patients who have undergone surgery.

#### What is the Etiology of Groin Hernia?

The etiology of inguinal hernia is multifactorial. It can be congenital or acquired. Congenital inguinal hernias are originated from patent processus vaginalis. In addition, the negative effects of increased intraabdominal pressure on connective tissue (tumor, pregnancy, acid, chronic cough, prostatism, etc.) are also involved in etiology<sup>5,6</sup>.

#### What are the Symptoms of Inguinal Hernia?

In the inguinal hernia, there is a swelling in the inguinal area. This swelling may be lost by applying a slight pressure while the patient is in a lying position. This clinical condition may impair patients' quality of life by mild

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TABLE I - Differential diagnosis of inguinal hernia

Cord lipomas	Vein graft abscess and hematoma	Sebaceous cysts
Testis torsion	Retroperitoneal phlegmon	Thrombophlebitis
Epididymitis	Appendicitis	Inguinal region hydradenitis
Prostatitis	Meckel's Diverticulitis	Urinary tract infection
Lymph Node abscess and inflammation	Intestinal Obstruction	Perirectal abscesses
Pseudoaneurysm of the femoral artery	Peritonitis	Ascites

to moderate severity. Pain usually occurs due to movement. In patients, pain associated with inguinal is not very common. Severe pain is not in the foreground in about three-quarters of patients <sup>7</sup>. Sometimes hernias can be incarcerated (compression) or strangulated (impaired circulation of the compressed organ). Such clinical situations may require urgent operation.

#### Things to Watch Out on the Medical Examination

During the inguinal hernia examination, the patient is first evaluated while standing. The inguinal region is observed and manually controlled by asking the patient to cough. Then the patient is taken to the supine position and detailed abdominal examination is performed. Depending on the position of the hernia sac, direct or indirect hernia can be distinguished. If the hernia sac originates from the posterior wall of the inguinal canal, it is called as direct inguinal hernia, and if the inguinal hernia protrudes from the inner ring and extends along the spermatic cord, then it is called as indirect inguinal hernia. The important thing is to determine whether the patient has inguinal hernia. There is no role in distinguishing whether the hernia is direct or indirect, in clinical practice and in determining the treatment strategy. Femoral hernia and hydrocele should not be removed from the mind during this examination <sup>8</sup>.

#### What We Can Meet in Differential Diagnosis?

Inguinal hernias can be confused with a great deal of disease due to their complex anatomical localization. These diseases should be kept in mind in the differential diagnosis. These are summarized in the following table (Table I).

#### Is Ultrasound Necessary for the Diagnosis of Inguinal Hernia?

The inguinal hernia is classically diagnosed by physical examination. However, in some cases, it is not easy to diagnose. Ultrasonography (USG) can be used in the evaluation of patients with suspicious physical examination findings and acute inguinoscrotal swelling <sup>9,10</sup>. Images are obtained according to the contents of the herniated organ in the USG. Hyperechoic image if omental tissue is present in the hernia, anechoic image in case of fluid, mixed echocardiogram images in case of bowel loop can be viewed <sup>9,10</sup>. Peristalsis of bowel movements can also be observed with USG.

USG is also valuable in terms of evaluating reductabilization as it plays in the diagnosis of inguinal hernia. It is also very helpful in evaluating viability by monitoring peristalsis and mucosal blood flow of the intestines that are trapped in the hernia sac <sup>11</sup>.

It may not always be possible to visualize hernia sac in USG <sup>9</sup>. However, with the hernia ultrasound, it informs about not only the abdominal defect that causes hernia but also the hernial contents and the state of the internal organs are informed. Thus, it can play a role in decisions to be made in the surgical process.

#### Is Surgical Treatment the Only Option in the Inguinal Hernia?

*"None of the diseases within the surgical margin need to be as accurate as the hernias to mix the correct anatomical knowledge with the surgical skill".*

(Sir Asley Cooper 1804)

This promise is the best expression of the treatment of this disease with only anatomical knowledge and competent surgery. Many surgical techniques have been described in hernia surgery. Although there are advantages and disadvantages compared to each other, a surgical technique that still has a zero-recurrence rate has not yet been reported. The fact that dozens of techniques have been identified in the historical process is an indicator that this search is still going on. Classification of hernia operations is shown in Table II. Hernia operations are generally performed with anterior and posterior approaches. The surgeries in the anterior approach are also examined in two groups as tension

TABLE II - Hernia surgery techniques

Anterior approach	Posterior approach
High ligation	Repair with preperitoneal suture
Bassini repair	Mesh repair (Nyhus)
Halsted repair	Transabdominal preperitoneal repair
Ferguson repair	Totally Ekstraperitoneal
Mc Vay repair	Intraperitoneal On-lay mesh repair (IPOM)
Shouldice repair	
Coskun repair	
Mesh Plug technique	
Lichtenstein repair	

and tension-free operations. There are no stresses in operation where prosthetic graft is used (Lichtenstein, etc.) while there is tension in operations where repair is done with reinforcement with the posterior wall suture (eg Bassini, Ferguson, Shouldice etc.). Tissue tension that develops during suture repair is an important risk factor for recurrences. The most common parameter used to evaluate the superiority of one hernia operation to the other is recurrence. The issue of recurrence will be evaluated in a separate title.

#### **Should the Graft Repair or Sutured Repair be Preferred?**

In the meta-analysis of a total of 58 studies involving 11,174 patients in the EU Hernia Trialist Collaboration group, the recurrence rate was found to be less in the groups of patients receiving grafts (Odds ratio 0.43; %95 CI, 0.34 to 0.55)<sup>12</sup>. In another population-based study, the recurrence rates of patients who were treated with graft repair in the 5-year follow-up of 13,674 patients who underwent graft or suture repair were found to be ¼ of the group treated with suture repair (Hazard ratio 0.25, 0.16 to 0.40)<sup>13</sup>.

In a study performed in our clinic, the results of a total of 493 patients treated with graft-free anatomical repair technique and Lichtenstein described by Co kun were evaluated; recurrence was detected as 3.1% in the anatomical repair group and 2.9% in the Lichtenstein group, and no statistically significant difference was found<sup>14</sup>.

In another study measuring the preferences of unskilled surgeons about the hernia, the general trend was to perform open surgery and grafted repair. In the study, 96% of British surgeons, 99% of Japanese surgeons, 95% of Danish surgeons, and 86% of American surgeons stated that they preferred open and graft operations<sup>15</sup>.

#### **Laparoscopic or Open Surgery?**

Systematic reviews, studies, and meta-analyses in this area suggest that the duration of operation is increased for laparoscopic repair compared to open technique, but less complication, faster return to work, and less postoperative pain occur in patients<sup>16,17</sup>. However, the length of learning is long and the recurrence is too high in the learning period, causing surgeons to be a little more distant from this method<sup>18</sup>. In addition, the cost of laparoscopic operations is a separate handicap.

The National Institute for Health and Clinical Excellence (NICE) recognizes that laparoscopic repairs are now a routine treatment procedure and recommends leaving the choice to the patient after the patient is told the details of both techniques<sup>19</sup>.

#### **What about Robotic Surgery?**

The Robotic Surgical System has become very popular since it was approved by the FDA in 2000. This surgical innovation enabled minimally invasive surgical intervention with a console that can be controlled by a sur-

geon at the head of the monitor. Instruments that provided a wider and more detailed field of view and increased mobility were in the sense the surgical revolution. Soon, hernia surgeries have also started to be performed with robotic surgery, which are reflected in the general surgery practice. In a study comparing robotic inguinal hernia surgery and laparoscopic hernia surgery, no significant difference was found between recurrence and postoperative pain rates<sup>20</sup>.

In another study, it was stated that the cost was reduced due to the fact that there was no need for patch fixator and balloon trocars in robotic surgery<sup>21</sup>, but the total cost was significantly higher than the laparoscopic healing in another activity cost analysis study (\$1859 vs \$1471 P<0.01)<sup>22</sup>.

Robotic surgery results, which greatly increase the duration of operation, are similar to laparoscopic surgery (124.0 min vs 84.4 min P<0.01)<sup>22</sup>.

The medical effect of technological developments is inevitable. Competition in technological development and falling costs will facilitate access to medical technology. As cost becomes more reasonable, robotic surgery will be used routinely. There is still a need for prospective randomized trials with extensive patient participation to assess the outcome of robotic surgery in limited centers.

#### **What Type of Anesthesia should be applied in Hernia Surgery?**

In hernia operations, general and regional anesthesia options are available. Regional anesthetic types are local infiltration anesthesia<sup>23</sup>, inguinal block<sup>23,24</sup>, spinal and epidural block<sup>25</sup>.

In a multicenter study conducted in Sweden, patients undergoing local infiltration anesthesia had a shorter hospital stay, fewer postoperative pain, and fewer urine problems<sup>26</sup>. In addition, local infiltration anesthesia shortens the duration of the procedure and costs are reduced by the same amount<sup>27</sup>.

In a study of 57,505 patients with hernia in Denmark, approximately 64% of patients were treated with general anesthesia, 18% with regional anesthesia and the remaining 18% with local anesthesia<sup>27</sup>.

In a study conducted in our clinic, while 68.5% of hernia patients were performed with general anesthesia; 28.2% were given regional anesthesia, and 3.3% were performed with local anesthesia<sup>14</sup>.

Finally; it is most logical to decide on a common decision-making outcome by evaluating the priorities of anesthesia, anesthesiologist, surgeon and patient to be applied for hernia operations.

#### **Will every inguinal hernia be being operated on?**

It has been a topic of debate since a long time. About one third of patients have either minimal symptoms or no symptoms at all. To clarify this issue, prospective randomization studies were conducted in the United States

of America and in the UK<sup>28,29</sup>. Severe aching pain that may occur after surgery will not be acceptable for patients who do not complain before the operation. In both studies, the patients in the observation group needed surgery for some time after feeling swelling and discomfort.

Thus, we recommend surgical treatment of all patients with good medical condition.

#### Is the Use of a Suspensor an Alternative Treatment?

Surgery can pose a risk to elderly patients, especially those with low medical conditions. Also, the group of patients who are afraid of surgery is too much to overcome. For this reason, the inguinal suspensor, which provide the barrier and support role, have been put on the market by commercial firms. The number of studies questioning the acceptability of the crotch ties is also very small.

The benefits of using an inguinal suspensor are exaggerated. These suspenders are used by the patients between 8-12 weeks on average<sup>30</sup>. It is also argued that the use is uncomfortable, but in one study the patients reported 65% satisfaction if they were placed correctly. Inguinal suspenders are rarely successful in resolving the hernia complaints. However, most patients do not use this suspensor permanently<sup>31</sup>.

Inguinal suspensor can increase the complications that may develop due to the hernia. It may cause stangulation, spermatic cord atrophy, and fascial atrophy. It also complicates repair during treatment because it enlarges the abdominal wall defect<sup>32</sup>.

The use of a suspensor, which is often unattainable, uncomfortable to use, and can lead to complications, is not considered an alternative to surgical care in today's conditions.

In addition, efficiency cost analysis is another debate.

#### How is the healing period after hernia surgery?

Recovery after hernia surgery is an important socioeconomic factor. In general, the recovery process is considered to be between 5 and 8 days, but it is also important what is meant by recovery. Recovery can also mean that lighter work can be started as it can be interpreted as the ability to do routine tasks in a precise way. Post-operative pain (60%) and wound problems (20%) were the most frequent causes of delayed return to work postoperatively<sup>33</sup>.

#### What are the Complications of Hernia Surgery?

Some complications may occur during and after surgery. During the operation, situations such as hemorrhage, nerve branching, impaired testicular blood flow, vas deferens incision, bowel and bladder injuries may be encountered.

After surgery, situations such as urine retention, scrotal ecchymosis, testicular atrophy, hydrocele, wound infection, mesh reactions, neuroma, chronic pain and recurrence may be encountered.

#### What is the risk of death in hernia surgery?

In the Scottish Audit of Surgical Mortality reports, the mortality rate hernia patients of for ASA-III (American Association of Anaesthesiologists) and above was indicated as 0.2%<sup>34</sup>.

#### Should we use prophylactic antibiotics?

After hernia operations, wound infections develop between 1-7%. According to recent meta-analysis results, antibiotic prophylaxis does not reduce the incidence of wound infection<sup>35,36</sup>.

#### Dilemma of Surgeon and the Patient: Recurrence and Chronic Pain

Recurrence and chronic pain are the major problems of both the patient and the surgeon within the unwanted conditions that occur after hernia surgery.

**a. Recurrence:** Surgical causes (technical deficiencies and suture tension) have been accused in early recurrence following inguinal hernia operations. Later, tissue deficiencies are on the agenda. In late recurrences, collagen metabolism disorders in elderly patients, thin scar tissue and innate weakness of the inguinal canal are thought to be responsible. In laparoscopic hernias, inadequate dissection, graft placement at small size, unadjusted graft is thought to be responsible. In addition, inguinal cord lipomas that are not removed in the operation will cause pseudo recurrence<sup>37</sup>. Hernia recurrence rates are very low in specialized hernia centers. The rate of recurrence in the operations performed with the graft was found to be lower than the others<sup>38</sup>. In the study published by Amid et al in 1995, 4000 patients with inguinal hernia were treated with the Lichtenstein technique and the recurrence rate of 11-year long-term follow-up results was evaluated. Approximately 87% of the patients were reached and examined. Four patients had 0.1% recurrence rate<sup>39</sup>. Recurrence rates in laparoscopic repair are similar to those in open repair. Recurrence is still one of the major problems of inguinal hernias. A surgical technique with zero recurrence rate has not been reported yet.

**b. Chronic Pain:** With the widespread use of grafts in the world, recurrence rates have fallen considerably. This troubled complication was replaced by chronic pain in the postoperative period. Although this pain can be controlled by analgesics, it still significantly reduces the daily quality of the patients. The cause of the pain after hernia is still unclear. Nerve cuts and trapping are thought to be responsible for this pain. However, there was no correlation found between graft type and pain<sup>40</sup>. Young age, female gender, preoperative pain and early postoperative pain risk factors were found as risk factors in chronic pain<sup>41</sup>.

The treatment of chronic pain is still controversial<sup>42</sup>. According to the international consensus algorithm, behavioral and interventional treatment modalities (such as nerve blocks) are present in chronic pain<sup>43</sup>.

Although information on surgical treatment is limited in the treatment of chronic pain, loosening of the trapped nerves, removal of grafts or fixation sutures may be beneficial to the patient<sup>41</sup>. We compared chronic pain in 3 patients who we thought to be graft-headed in our clinic. Graft removal operation was performed in those patients in whom we could not get response to medical treatments. The pain stopped in three patients from the postoperative 1st day and discharged with recovery<sup>44</sup>. Recently, a large number of inguinal hernia have been performed and different grafts and graft fixation techniques have been compared. We believe that, soon, we will have more information about the causes of chronic pain and the treatment algorithm once long-term outcomes have been published

### Finally, Infertility...

The rates of infertility in patients operated due to inguinal hernia were higher than those in the normal population. During surgery, vas deferens injury was detected as 0.3% and testis atrophy was detected as 5%. In recurrent hernia, these rates are 10 times higher<sup>45</sup>. Because of the quite increase in recurrent hernias, surgical technique should be taken care in first operation and a surgical method with a lower recurrence rate should be preferred. In addition, anatomical structures must be carefully protected, avoiding harmful maneuvers and dissections.

### Conclusion

In conclusion, inguinal hernias are the most common surgery of general surgery practice. Intricacy of the region's anatomy will reveal results of the declining quality of life due to the surgeries without sufficient knowledge and consciousness. Although several types of hernia operation have been described, the fact that there is no report on a surgery with a recurrence rate of zero still brings the problem of optimal surgery with it. Whichever type of surgery is chosen, the surgeon must be able to perform anatomic dissection completely and easily observe important anatomical structures. It should not be forgotten that even the most experienced surgeons may find it difficult to solve the complications of primary hernia surgery performed carelessly. It should never be forgotten that untreated hernias and complications that may occur after careless treatment will greatly reduce patients' quality of life standards.

### Riassunto

La riparazione dell'ernia inguinale è l'intervento più frequentemente eseguito nei reparti di chirurgia generale. È necessaria una conoscenza dettagliata della regione anatomica ed una adeguata tecnica chirurgica.

In questa revisione si intende presentare le più recenti informazioni riguardo alla diagnostica di base, al trattamento, alle complicanze e al trattamento dell'ernia inguinale nella nostra istituzione.

### References

1. Christopher D: *Hernias, Textbook of Surgery Sabiston*. 11 th. Philadelphia: WB Saunders; 1979.
2. Demir UA: *Inguinal ve femoral fitıkların cerrahi tedavisi*. 3. Baskı, Ankara: Ankara Üniversitesi Yayınları; 1974.
3. Kingsnorth A, LeBlanc K: *Hernias: Inguinal and incisional*. Lancet, 2003; 362:1561-71.
4. Malangoni MA, Gagliardi RJ: *Hernias*. In: Townsend, Beachamp, Evers, Mattox (eds): *Sabiston Hernias, Textbook of Surgery*. 17th ed. USA: Elsevier Saunders Publishers; 2004:1199-218.
5. Philips EH, Arregui B, Carrol J: *Incidence of complications following laparoscopic hernioplasty*. Surg Endosc, 1993; 9:370-73.
6. Conze J, Klinge U, Schumpelick V: *Hernias*. In: Holzheimer RG, Mannick JA (eds): *Surgical treatment evidence-based and problem oriented*. New York: Zuckschwerdt Verlag, 2001; 611-18.
7. Page B, Paterson C, Young D, O'Dwyer PJ: *Pain from primary inguinal hernia and the effect of repair on pain*. Br J Surg, 2002; 89:1315-318.
8. Jenkins JT, O'Dwyer PJ: *Inguinal hernias*. BMJ, 2008; 336 (7638):269-72.
9. Yang DM, Kim HC, Lim JW et al: *Sonographic findings of groin masses*. J Ultrasound Med, 2007; 26:605-14.
10. Chou TY, Chu CC, Diao GY, Wu CJ, Gueng MK: *Inguinal hernia in children: US versus exploratory surgery and intraoperative contralateral laparoscopy*. Radiology, 1996; 201:385-88.
11. Jamadar DA, Jacobson JA, Morag Y et al: *Sonography of inguinal region hernias*. AJR Am J Roentgenol, 2006; 187:185-90.
12. EUHernia Trialists Collaboration: *Repair of groin hernia with synthetic mesh, meta-analysis of randomized controlled trials*. Ann Surg, 2002; 235:322-32.
13. Bisgaard T, Bay-Nielsen M, Christensen IJ, Kehlet H: *Risk of recurrence 5 years or more after primary Lichtenstein mesh and sutured inguinal hernia repair*. Br J Surg, 2007; 94:1038-40.
14. Dinç T, Cete HM, Saylam B, Özer MV, Düzgün AP, Coskun F: *Comparison of Coskun and Lichtenstein hernia repair methods for groin hernia*. Ann Surg Treat Res, 2015; 89:138-44.
15. Kingsnorth A: *Controversial topics in surgery: The case for open repair*. Ann R Coll Surg Engl, 2005; 87:59-60.
16. EU Hernia Trialists Collaboration: *Laparoscopic compared with open methods of groin hernia repair: Systematic review of randomised controlled trials*. Br J Surg, 2000; 37:860-67.
17. Memon MA, Cooper NJ, Memon B, Memon MI, Abrams KR: *Metaanalysis of randomised clinical trials comparing open and laparoscopic inguinal hernia repair*. Br J Surg, 2003; 90:1479-492.
18. Neumayer L, Giobbie-Hurder A, Jonasson O, Fitzgibbons R Jr,

- Dunlop D, Gibbs J, et al: *Open versus laparoscopic mesh repair of inguinal hernia*. N Engl J Med, 2004; 350:1819-27.
19. National Institute for Health and Clinical Excellence: *Laparoscopic surgery for inguinal hernia repair*. 2004. [www.nice.org.uk/guidance/index.jsp?action=download&o=32924](http://www.nice.org.uk/guidance/index.jsp?action=download&o=32924).
20. Arcerito M, Changchien E, Bernal O, Konkoly-Thege A, Moon J: *Robotic Inguinal Hernia Repair: Technique and Early Experience*. Am Surg, 2016; 82:1014-17.
21. Escobar Dominguez JE, Gonzales A, Donkor C: *Robotic Inguinal Hernia Repair*. J Surg Oncol, 2015; 112:310-14.
22. Higgins RM, Frelich MJ, Bosler ME, Gould JC: *Cost analysis of robotic versus laparoscopic general surgery procedures*. Surg Endosc, 2017; 31:185-92.
23. Bridenbaugh PO, Green NM, Brill SJ: *Spinal (Subarachnoid) neural blockade, Neural blockade in clinical anaesthesia and management of Pain*. 3th ed. Philadelphia: Lippincott Raven. 1998; 203-42.
24. Morgan GE, Mikhail MS, Murray MJ: *Inguinal nerve block*. In: *Clinical Anesthesiology*. 3th ed. New York: McGraw Hill; 2002; 306-07.
25. Lloyd MN, Robert EC: *Hernia*. Philadelphia: JB Lippincott; 1992; 487-521.
26. Nordin P, Zetterstrom H, Gunnarsson U, Nilsson E: *Local, regional or general anaesthesia in groin hernia repair: Multicentre randomised trial*. Lancet, 2003; 362:853-58.
27. Nordin P, Zetterstrom H, Carlsson P, Nilsson E: *Cost-effectiveness analysis of local, regional and general anaesthesia for inguinal hernia repair using data from a randomised trial*. Br J Surg, 2007; 94:500-05.
28. Fitzgibbons RJ, Giobbie-Hurder A, Gibbs JO et al: *Watchful waiting vs repair of inguinal hernia in minimally symptomatic men: A randomised clinical trial*. JAMA, 2006; 295:285-92.
29. O'Dwyer PJ, Norrie J, Alani A, Walker A, Duffy F, Horgan P: *Observation or operation for patients with an asymptomatic inguinal hernia*. Ann Surg, 2006; 244:167-73.
30. Law NW, Trapnell JE: *Does a truss benefit a patient with inguinal hernia?* BMJ, 1992; 34:1092.
31. Ljungdahl I: *Inguinal axnd femoral hernia*. Acta Chir Scand, 1973; 439(suppl):7-77.
32. Condon RF, Nyhus LM: *Complications of groin hernia repair*. Surg Clin N Am, 1971; 51:1325-36.
33. Bay-Nielsen M, Thomsen H, Heidemann Andersen F, et al: *Convalescence after inguinal herniorrhaphy*. Br J Surg, 2004; 91:362-67.
34. McGugan E, Burton H, Nixon SJ, Thompson AM: *Deaths following hernia surgery: Room for improvement*. J R Coll Surg Edinb, 2000; 45:183-86.
35. Sanchez-Manuel FJ, Seco-Gil JL: *Antibiotic prophylaxis for hernia repair*. Cochrane Database Syst Rev, 2004; (4):CD003769.
36. Aufenacker TJ, Koelemay MJW, Gouma DJ, Simons MP: *Systematic review and meta-analysis of the effectiveness of antibiotic prophylaxis in prevention of wound infection after mesh repair of abdominal wall hernia*. Br J Surg, 2006; 93:5-10.
37. Gopal SV, Warriar A: *Recurrence after groin hernia repair-revisited*. Int J Surg, 2013; 11: 374-77.
38. Bendavid R: *The Shouldice repair*. In *Nyhus and condon's hernia*. 5th ed. 2002; 129-38.
39. Amid PK, Shulman AG, Lichtenstein IL: *The Lichtenstein open "tension-free" mesh repair of inguinal hernias*. Surg Today, 1995;25:619-25.
40. Nikkolo C, Lepner U: *Chronic pain after open inguinal hernia repair*. Postgrad Med, 2016; 128:69-75.
41. Simons MP, Aufenacker T, Bay-Nielsen M, et al: *European Hernia Society guidelines on the treatment of inguinal hernia in adult patients*. Hernia, 2009; 13:343-403.
42. Muro CM, Pedana N, Scarpelli S, et al: *Inguinal neurectomy for nerve entrapment after open/laparoscopic hernia repair using retroperitoneal endoscopic approach*. Surg Endosc, 2005; 19:974-76.
43. Lange JF, Kaufmann R, Wijsmuller AR, et al: *An international consensus algorithm for management of chronic postoperative inguinal pain*. Hernia, 2015; 19:33-43.
44. Dinc T, Kaylioglu, Coskun F: *Will removal of the mesh pull me through tis pain, doctor?* Surg Chron, 2015; 20:279.
45. Fitzgibbons Jr RJ: *Can we be sure that polypropylene mesh causes infertility?* Ann Surg, 2005; 241:559-61.