Comparison Of Lichtenstein Repair And Mesh Plug Repair Methods In The Treatment Of Indirect Inguinal Hernia

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Aim: Inguinal hernias occur in approximately 3%–8% of the population, especially in men. Methods of hernia repair currently involve prosthetic mesh applications. The aim of this study is to compare the Lichtenstein repair and mesh-plug repair methods in the surgical treatment of indirect inguinal hernias and to identify which of these two techniques is superior regarding its conferred advantages.

Methods: In this study, a total of 102 patients who were diagnosed with indirect inguinal hernias without a previous operation were included in the study. Patients undergoing Lichtenstein repair (LR) and mesh-plug repair (MPR) were compared, especially concerning operation time, hospital stay, postoperative pain, and other aspects.

Results: Both MPR and LR were performed in 52 and 50 patients, respectively, among the 102 patients. The mean age of patients was 28.7 years (range, 19–73 years). The mean duration of operations and hospitalizations was significantly shorter in patients who had undergone mesh-plug repair. Inguinal pain in the operation area on postoperative day 1, 2 weeks, and 6 months was significantly less in patients who had undergone mesh-plug repair. Patients were followed-up for two years.

Conclusion: We concluded that mesh-plug repair was superior to Lichtenstein repair regarding postoperative pain, quality of life of the patient, shorter duration of operation, and duration of hospital stay although the two methods were similar regarding both recurrence and complication rates. Considering this information, we suggest that mesh-plug repair can be used safely for the treatment of indirect inguinal hernias.

Key World: Inguinal hernia, Mesh-plug repair, Lichtenstein repair

1. Introduction

Inguinal hernia repair is one of the most frequently performed operations in general surgery clinics since inguinal hernia is a common disorder affecting almost 3%–8% of the population. Although advanced techniques have been adopted in inguinal hernia repair parallel to those in developing medical technologies, currently no consensus has been reached on which method is the best among all existing techniques [1].

In 1986, Lichtenstein used polypropylene mesh to strengthen the fascia transversalis and named the repair technique he developed as tension-free mesh repair [2]. Subsequently, mesh-plug hernia repair was developed and was then adopted into common use. This technique has been widely performed at some centers in the USA with good results [3]. The mesh-plug repair (MPR) method is relatively simple compared with the Lichtenstein's repair (LR) and involves placing a polypropylene mesh in the area of the defect [4]**.** The aim of a successful hernia repair is to achieve a minimal rate of recurrence while allowing the patient to return to normal activity in the shortest time with minimal discomfort.

In this study, we compared cases in which we performed either MPR or LR in patients with indirect inguinal hernias.

2. Methods

This study was designed as a prospective randomized study. One hundred and two patients who were diagnosed with indirect inguinal hernias at Edremit Military Hospital and without a previous operation were included in the study. Patients younger than 18 years of age and patients with bilateral inguinal hernias and recurrent inguinal hernias were excluded from the study. Operations were explained to patients and consent was obtained. Both MPR and LR were performed in 52 and 50 patients, respectively, among the 102 patients. The same surgeon operated on all patients. These patients had a mean follow-up of 2 years.

Preoperatively, the two groups were evaluated regarding age, gender, body mass index (BMI), the presence of comorbidity, American Society of Anesthesiologists (ASA) score, hernia type defined according to the Nyhus classification as determined by both superficial ultrasonography and site of the hernia. Superficial ultrasonography was performed in the radiology department using a superficial probe.

Patients were hospitalized in the morning on the day of the operation, and no preoperative medications were administered to any patient. The inguinal area of patients was shaved immediately preoperatively in the operating room. Six patients were given general anesthesia. Spinal anesthesia was performed in the other patients. No prophylactic antibiotics were administered.

Patients were compared by the type of anesthesia, duration of operation, development of scrotal hematoma, and wound infection. The state of pain on postoperative day 1, week 1, and month 1 was assessed by a visual analog scale (VAS) (0 = no pain, 10 = unbearable pain). Patients who underwent surgery, hospitalization, reduction in pain, duration of return to normal activity, and recurrence rates were evaluated. Patients were followed for a two-year risk of chronic pain and recurrence of hernias.

2.1. Surgical Technique

The inguinal area of patients was shaved immediately preoperatively in the operating room following induction of anesthesia. Skin cleaning was performed using 10% povidone-iodine; subsequently, the surgical field was covered with sterile drapes.

The operation started with an oblique inguinal incision. This incision was about 6–7 cm long and was made starting approximately 3–4 cm medial to the inguinal ligament and extending to the pubis. The incision was deepened, and the superficial layer of the subcutaneous fascia (Camper fascia) was entered. The fatty and aponeurotic tissue on the aponeurosis of the m. obliquus externus was sharply dissected to expose the aponeurosis. After the aponeurosis had been cut, the lateral leaf was separated from the cord under it by blunt dissection up to the Poupart ligament. Subsequently, the medial leaf was separated by blunt dissection up to the conjoint tendon or transverse aponeurotic arch. Cremaster fibers were separated from the aponeurosis close to the pubis to mobilize the cord. External spermatic vessels and the genital branch of the genitofemoral nerve were preserved. The inguinal cord was suspended by a thin rubber drain. The inguinal sac was dissected from the pubis up to the internal ring, and the posterior wall was exposed. The ilioinguinal nerve was routinely preserved in this study.

For LR, the inguinal sac was tied using a high transfixion suture (2/0 polyglactin) and resected. Subsequently, a synthetic polypropylene mesh (L Prolene® mesh 10 x 15 cm) (Ethicon Inc., Somerville, NJ, USA) was cut and prepared so that its edges would fit the posterior wall and its upper edge would cover the cord. Following placement of the mesh into its place, its lower edge was sutured to the pubic periosteum using 2/0 polypropylene suture. The synthetic polypropylene mesh was fixed to the lateral edge of the m. rectus sheet and to the Poupart ligament on the other side (see Figure 1).

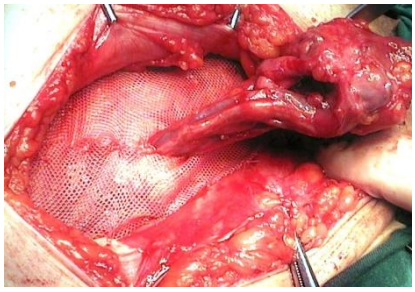

Figure 1: Lichtenstein repair

The same steps were followed in the MPR group as well, and the cord was suspended. The indirect hernia sac was freed completely and reduced into the abdominal cavity. Subsequently, the same plain polypropylene mesh piece was cut longitudinally, folded like a cone or an umbrella, and thus formed a mesh plug. The mesh was inserted into the internal ring so that its narrow end remained inside and was fixed to the surrounding tissues with 3/0 polypropylene sutures. Posterior wall mesh was not placed. A mesh plug was applied in all patients using the Rutkow technique (see Figure 2).

Figure 2: Mesh-plug repair

Layers were closed in an anatomic plane in both groups following the repair. The aponeurosis of the external oblique muscle was sutured continuously using a 2/0 polypropylene suture, and the inguinal canal was reformed. Subcutaneous tissue and skin were closed primarily using 2/0 polyglactin and 3/0 polypropylene suture, respectively. The surgical field was cleaned with saline solution, and a dressing was applied at the end of the operation. The duration of the operation was recorded for all patients.

In the second postoperative hour, a single dose of diclofenac sodium (75 mg) was administered intramuscularly through the gluteal region as a standard analgesic medication during the postoperative period. Subsequently, patients received oral paracetamol 500 mg twice daily for seven days. On the first postoperative day, the VAS was measured, and patients were questioned whether they required additional analgesics.

The time of discharge was recorded, and then an outpatient clinic follow-up was performed during the first postoperative week to evaluate the VAS, possible complications, and duration of return to normal physical activity. Patients were invited to attend the outpatient clinic during the first and sixth postoperative months for follow-up visits.

2.2. Statistical Analysis

The data obtained in this study were evaluated using the SPSS 20.0 package program. Frequency and percentage distributions of the data are presented. When comparing two groups, a Mann-Whitney U test was used for variables without a normal distribution as identified by a test for normal distribution. Following this, a Wilcoxon signed rank test was used for non-normally distributed variables to compare pre- and post-measurement values. When evaluating differences between groups, the level of significance used was.05. A significant difference between the groups was reported when p <.05, while no significant difference was reported when p >.05. Dependency between variables was analyzed by a chi-square test. As before, the level of significance used was.05. A significant dependency between the groups was reported when p <.05, while no significant dependency was reported when p >.05.

Results

Among the 102 patients with primary inguinal hernias, 52 underwent MPR, 50 underwent LR, and all received a prolene graft. The same surgeon operated on all patients at the same hospital.

When both patient demographics and characteristics were analyzed, the mean age was 26.3 years in the MPR group, and all patients were males. The mean BMI was 26.4 kg/m^2 with a global ASA score of 1 (normal and healthy), and patients had mostly Nyhus type II indirect inguinal hernias on the right side. Among individuals who underwent LR, the mean age was 30.4 years, and there were 49 males and 1 female patient. The mean BMI was 28.8 kg/m^2 with a global ASA score of 1, and patients had mostly Nyhus type II indirect inguinal hernias on the right side. In the MPR group, 3 patients received general anesthesia, and 49 underwent spinal anesthesia, while 3 received general anesthesia, and 47 received spinal anesthesia in the LR group.

No statistically significant differences were found between the two groups when the two different techniques were compared regarding gender, age, BMI, ASA score, comorbidity, Nyhus type of hernia, and hernia site (p >.05). No significant associations were found between the technique used and complications, such as wound infection and scrotal hematoma/seroma (p >.05).

When the duration of the operation was evaluated, the mean duration of the operation was found to be significantly higher in the LR group compared with that in the MPR group (p <.05). When the duration of hospitalization was evaluated, the mean duration of hospitalization was found to be significantly higher in the LR group compared with that in the MPR group (p >.05) (see Table 1).

Table 1 Comparison of operative time and hospitalization time values

	Technique Used						
Time	**Technique Used**	**n**	**Mean**	**Min.**	**Max.**	**SD**	***p value***
Operation time	**Mesh-plug**	52	31.92	25	60	6.27	
	Lichtenstein	50	45.50	30	65	8.47	<.05
	Total	102	38.58	25	65	10.06	
Hospitalization time	**Mesh-plug**	52	1.46	1	4	.64	
	Lichtenstein	50	3.10	1	8	1.58	<.05
	Total	102	2.26	1	8	1.45	

Evaluation of postoperative first-day pain values revealed that the mean VAS was significantly higher in the LR group compared with that in the MPR group (p <.05). Evaluation of postoperative first-week pain values revealed that the mean VAS was significantly higher in the LR group compared with that in the MPR group (p <.05). Evaluation of sixth month postoperative pain values revealed that the mean VAS was

significantly higher in the LR group compared with that in the MPR group (p <.05), (see Table 2).

Table 2 Comparison of postoperative pain values

Pain values (VAS scale)							
Time	**Technique Used**	**n**	**Mean**	**Min.**	**Max.**	**SD**	***p value***
Post-Operative 1st Day Pain	**Mesh-Plug**	52	2.33	1	5	1.12	
	Lichtenstein	50	3.86	2	6	.88	<.05
	Total	102	3.08	1	6	1.26	
Post-Operative 1st Week Pain	**Mesh-Plug**	52	1.02	0	4	.78	
	Lichtenstein	50	2.08	0	3	.85	<.05
	Total	102	1.54	0	4	.97	
Post-Operative 6th Month Pain	**Mesh-Plug**	52	.33	0	2	.58	
	Lichtenstein	50	.60	0	2	.70	.028
	Total	102	.46	0	2	.66	

Post-operative pain status was evaluated by asking the patient and scoring the VAS scale. When the decrease in pain was evaluated, the mean decrease in pain in the MPR group was significantly higher compared with the mean decrease in pain in the LR group (p <.05), (see Table 3).

Table 3 Comparison of the decrease in pain status

Pain reduction process (VAS scale)							
Pain	**Technique used**	**n**	**Mean**	**Min.**	**Max**	**SD**	***p value***
Decreased amount of pain	**Mesh-plug**	52	2.00	1	5	1.05	<.05
	Lichtenstein	50	3.26	1	5	.90	
	Total	102	2.62	1	5	1.16	

The averages of returning to normal activity in the MPR and the LR groups were 21 and 25 days, respectively. Although patients in the MPR group returned to normal activity quicker than patients in the LR group did, no statistically significant difference was found between the groups (p >.05). No recurrence was found after the follow-up period of two years in the MPR group. Recurrence was observed in only one patient in the LR group. No statistically significant difference was found in recurrence between the two technical repair groups (p >.05).

Discussion

Currently, inguinal hernia operations have been performed as laparoscopic posterior mesh repair and open anterior mesh repair techniques. The aim of these methods is to perform the operation with the lowest risk of recurrence and decrease the postoperative discomfort of the patient to a minimal level [1].

In general, the most frequently used technique in the treatment of primary inguinal hernias is open anterior mesh repair. In 1986, Lichtenstein was the first to report tension-free mesh repair in adults for inguinal hernia repair [2]. The LR became a standard procedure since it had a lower rate of recurrence compared with other conventional suture repair techniques. Subsequently, different tension-free methods such as mesh-plug and Kugel mesh techniques were developed in 1993 [3]. Mesh is placed more easily in MPR, and the duration of the operation is thus shorter. Mesh plugs in different figures and designs have been produced. The MPR technique has been performed widely, especially in Japan.

In this randomized prospective study, various aspects of both the LR and the MPR methods in the open anterior surgical treatment of inguinal hernias were compared.

When the duration of the operation was evaluated in this study, MPR seems to be shorter and more advantageous when compared with LR regarding the duration of the operation. However, when the duration of the operation was 31.92 minutes was evaluated in the literature, it was found to vary between 20 and 50 minutes. Various investigators, such as Dalenbäck and Zhao, reported no difference in complications, chronic pain, return to work, and recurrence between MPR and LR; however, they reported a remarkably shorter duration of the operation for MPR compared with that for LR [5]. They stated that surgeons both learned and performed MPR more easily [4,6].

The duration of hospitalization was reported to be similar in various studies comparing MPR and LR [7-9]. When the duration of hospitalization was analyzed in this study, compared with the LR method, the MPR technique resulted in a shorter hospitalization, which is more advantageous. In this study, the duration of hospitalization in the MPR group was 1.46 days and is compatible with the literature.

The most important postoperative complication following open anterior mesh repair is chronic pain in general. Chronic pain is seen in approximately 1%–31% of cases and affects patients' quality of life. Mechanical triggers, such as trauma to both the ilioinguinal and genitofemoral nerves and cicatrization, are the main causes of chronic pain following inguinal hernioplasty. In addition, psychological issues may have an adverse effect on the condition. In some studies, less chronic pain was reported in MPR when compared with LR, whereas in other studies, the opposite was found [10-12]. In this study, the inguinal pain level on day 1, week 1, and month 6 was significantly lower in the MPR group compared with that in the LR group. When groups with different techniques were compared, the decrease in pain occurred faster in the MPR group compared with that in the LR group.

In some studies, lower rates of both complications and pain have been reported to develop following MPR [11,13]. In contrast, the complication rate was reported to be higher in MPR

especially due to the migration of the mesh [4,14,15]. In MPR, intestinal volvulus, obstruction, and perforation were reported complications due to mesh migration [16]. However, no statistically significant difference was reported regarding complications between MPR and LR in most studies [5-8].

Antibiotic prophylaxis has been demonstrated to be effective in the prevention of surgical field infections [17]. We did not routinely use antibiotics in this study and a wound infection problem developed in two patients.

No significant differences have been reported between MPR and LR regarding recurrence. In the present study, no significant difference was reported between MPR and LR regarding recurrence similar to the data in the literature [6,7,18].

Laparoscopic posterior mesh repair techniques have been reported currently to be superior to both MPR and LR procedures concerning postoperative pain, duration of hospitalization, and duration of healing. However, MPR repair is expected to retain its place in the treatment of hernias due in part to its low cost, short learning period, no requirement for special equipment, and its ability to be performed using local anesthesia, if preferred by the patient [19-21]. Recently conducted studies reported low rates of chronic pain, early complications, and recurrence rates for both laparoscopic repair and MPR repair 6, 12, and 24 months after surgery with no statistically significant differences between the two techniques [22-24].

Conclusion

Although several surgical techniques for the repair of inguinal hernias have been defined, there is still no ideal method of treatment due to recurrence rates and other postoperative complications. In the present study, the MPR technique was observed to be a safe, simple, and straightforward procedure without any differences in the development of complications, chronic pain, and recurrence. We suggest that the MPR method is easily performed, shortens the duration of both the operation and hospital stay, and is superior to other techniques regarding postoperative pain, quality of life, and low cost as a result of all these.

The authors declares that there is no conflict of interest concerning the publication of this paper.

The authors declared that this study has received no financial support.

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