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Inguinal Hernia Repairs: Rutkow–Robbins, Lichtenstein and Gilbert Double Layer Graft Methods

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Abstract

Hernia repair is the most common elective procedure in general surgeryIn terms of recurrence and complication rates, tension-free repairs are the most commonly preferred operative techniques. In the present study, we aimed to compare the Lichtenstein technique with Rutkow–Robbins and Gilbert double layer techniques in inguinal hernia repair. Present study was conducted on 120 patients admitted to the General Surgery Department of NIMS Medical College & Hospital. The patients were randomly allocated to three groups (using table of random numbers): Group A: Lichtenstein operation , Group B: Rutkow–Robbins and ; Group C: Gilbert double layer. The groups were compared with regard to operation length, post-operative pain, early and late complications, recurrence rates, length of hospital stay and time required to return to work.

None of the three methods showed a statistically significant difference regarding age, BMI, hospitalization time and return to normal activities ($p > 0.05$). There was a statistically significant difference between the groups regarding operation lengths ($p < 0.05$). No significant difference was noted between the groups on the basis of early or late complications ($p > 0.05$). VAS analysis showed no statistically significant difference between any of the groups at Day 1, 7, and 30 ($p = 0.14$, $p = 0.7$, $p = 0.56$). Lichtenstein operation is more advantageous than others due to its lesser hospitalization time, lower complication rate and early resumption of daily activities. Therefore, Lichtenstein technique is recognized as the most advantageous method in inguinal hernia repairs.

Key words: Gilbert, Inguinal Hernia, Lichtenstein, Rutkow–Robbins, Tension Free Repair

Introduction

The earliest record of inguinal hernia dates back to 1500 BC [1]. In the middle ages, results of attempted repairs were poor. In the last decades of the 19th century along with the rapid advancement of the knowledge of anatomy, surgical asepsis and anesthesia there was refinements in the techniques of hernia repair as well [2,3]. The early techniques relied on sutures to close the hernial defect [4]. Conventional open herniorrhaphy is associated with high recurrence rate and slower return to unrestricted physical activities. The standard principles of inguinal hernia repair remained unchanged for decades and in fact, suture repair is still used in around 10 to 15% of inguinal hernia repairs [5]. The modern age of hernia repair began about 45 years ago with the introduction of monofilament knitted polyethylene mesh[6] to reinforce a previous sutured repair [7]. The introduction of polypropylene mesh (PPM) as a synthetic biomaterial for hernia surgery soon followed [8]. Most hernia repairs performed today involves the placement of some synthetic biomaterial. The most revolutionary developments occurred over the last 15 years with the development of laparoscopic surgery and its subsequent application in groin hernia repair [9]. Refinements in minimally invasive hernial repair techniques, along with evolving medical technologies have changed the present day scenario altogether.Hernia repair is the most common elective procedure in general surgery.[10] A high failure rate delayed return to normal activities and lastly a high overall cost involved will not only adversely affect the individual patients but will also have a

negative impact on the society at large, in view of the re-operations, sick leave and the associated economic burden. Thus, a modest improvement in the surgical outcome has a significant impact on the surgical practice.

In terms of recurrence and complication rates, tension-free repairs are the most commonly preferred operative techniques. Lichtenstein method and it's modifications such as Gilbert and Rutkow–Robbins are known to be tension-free anterior approaches which have been found to produce considerably low recurrence and complication rates [11,12]. Moreover, the fact that those operations can also be performed under local anesthesia instead of general or spinal anesthesia provides yet another advantage. In the present study, we aimed to compare the Lichtenstein technique with Rutkow–Robbins and Gilbert double layer techniques in inguinal hernia repair with regard to operation length, postoperative pain, early and late complications, recurrence rates, length of hospital stay and time required to return to work.

Methodology

Present study was conducted on 120 patients admitted to the General Surgery Department of NIMS Medical College & Hospital. The patients were randomly allocated to three groups (using table of random numbers):

Group A: Lichtenstein operation

Group B: Rutkow–Robbins

Group C: Gilbert double layer

The cases with co-existing systemic diseases, such as immune system deficiency, diabetes mellitus, cirrhosis, as well as Gilbert type 7 and 8 hernia [13], were excluded from the study.

All the patients' hemogram count, liver function tests, renal function tests, EKG, chest radiography, and pre-operative coagulation were performed. In Lichtenstein method, polypropylene mesh of 6×11 cm size was fixed inferiorly to the ligamentum inguinale and superiorly to the fascia transversalis with a 2/0 polypropylene suture. While applying Rutkow–Robbins onlay method, premade Rutkow plug hernia sac was prepared and placed into the abdomen before being sutured to the internal ring on which the onlay graft was fixed inferiorly to the ligamentum inguinale and superiorly to the fascia transversalis with a 2/0 polypropylene suture. In double layer Gilbert repair, for direct and indirect hernias, hernial sac was prepared and the lower layer of the graft was placed into the Bougras area by descending down to the Cooper ligament. Upper layer was fixed inferiorly to the ligamentum inguinale and superiorly to the fascia transversalis with a 2/0 polypropylene suture. We have applied drain with suspected cases of bleeding. Postoperatively, the patients were evaluated in terms of drain placement, early and late complications, and recurrence rates within 1 year. Preoperative pains of the cases were assessed at 1, 7, and 30 days with visual analog scale.

Statistical Analysis

Kolmogorov–Smirnov test was used to evaluate whether the distribution of variables were normal. Therefore, one-way ANOVA was used to compare the age, BMI, operative time and time to return to work among study groups. Kruskal–Wallis analysis of variance was used to compare the hospitalization time and VAS among same groups separately for first, seventh, and 30th days. Friedman analysis of variance was comparing the VAS values among first, seventh, and 30th days separately for Lichtenstein, Rutkow–Robbins, and Gilbert groups.Pearson's chi-square test was used to compare the categorical variables among three groups. The continuous variables were presented as the mean and standard deviation. The categorical variables were presented as the frequency and percentage. A p value <0.05 was considered significant. Analyses were performed using commercial software (SPSS ver. 17.0).

Results

None of the three methods showed a statistically significant difference regarding age, BMI, hospitalization time and return to normal activities ($p > 0.05$). There was a statistically significant difference between the groups regarding operation lengths ($p < 0.05$) (Table 1).Drain was used in 15 (13%) patients in total and there was no statistically significant difference between the groups ($p = 0.2$). Similarly no significant difference was noted between the groups on the basis of early or late complications ($p > 0.05$) (Table 2).None of the patients demonstrated a urinary retention in the postoperative early period follow-up. Postoperative hematoma was observed in nine (8%) patients in total. While there was only one (3%) hematoma case in the Lichtenstein group, five (13%) and three (8%) patients exhibited hematoma in the Rutkow–Robbins and Gilbert groups, respectively ($p = 0.033$). None of the patients showed early period superficial incisional surgical site infection, deep incisional surgical site infection, organ-space infection. Moreover, none of the patients displayed an early period recurrence.Late period follow-ups of the patients revealed 16 (13.33%) cases with numbness in the incision sites and medial aspect of thighs. This complication was determined in five (13%) patients in the Lichtenstein group, four (10%) patients in the Rutkow–Robbins group, and seven (18%) patients in the Gilbert group. However, no statistically significant difference was found between the groups ($p = 0.896$). None of the patients exhibited a recurrence within the follow-up period.VAS analysis showed no statistically significant difference between any of the groups at Day 1, 7, and 30 ($p = 0.14$, $p = 0.7$, $p = 0.56$) (Table 3).

Discussion

Inguinal hernia operations are still one of the most commonly encountered procedures in the lifetime of a general surgeon. In hernia surgery, the best indicator of the success of the operation is the recurrence which is totally based on objective criteria. While recurrence rates in tension operations of inguinal hernia vary depending on the applied method, it is reported to be about 5–10 % among primary cases and 5–30 % in cases of recurrence[14-16]. The common target in tension-free inguinal hernia repairs is to apply a totally tension-free support with a reliable prosthetic material implantation and to achieve long-term reinforcement of posterior wall of inguinal hernia or possible hernia sites. Currently, particularly the recurrences at early period (first 2 years) are recognized to arise from the tension of the suture line [14,16]. First, physicians tried to use relaxing incision, but then it was found to have no effect over the problem. The idea to totally and permanently reinforce the posterior wall of the inguinal canal has become popular with Lichtenstein[17,18]. Lichtenstein reported a 0 % recurrence rate in his study (1989) in which 1,000 cases were treated with onlay method. The results obtained by other clinics that apply the Lichtenstein onlay method show consistency with the results of Lichtenstein [19].Recurrences after inguinal hernia repairs are categorized in two groups as early (mechanic, within first postoperative 2 years) and late (metabolic, many years after the operation) period recurrences. While the tension in the reinforced line is held responsible for the early recurrences, disruptions in the collagen metabolism of transverse fascia and similar structures are held accountable for late recurrences [20,21]. Several complications have been reported in the literature (although not frequently) for Rutkow–Robbins procedures due to less dissection such as orchitis and nerve damage. It is possible disadvantages are pubic recurrence because of applying a graft that does not run over the pubis and problems about reinforcement of the posterior wall due to shrinkage of the unsutured onlay graft. In the present study, hematoma was observed in the patients as an early complication. No other early period complications were found. Hematoma showed the highest incidence in the Rutkow–Robbins group and the lowest in the Lichtenstein group. We believe that the reason behind that significant difference was the higher amount of drain usage among patients of Lichtenstein group. The most common complication in the late period follow-up of the patients was numbness in the surgical incision site and

medial portion of the thigh. Isemer et al. determined the incidence of numbness in the thigh area as 2.4 % after Rutkow–Robbins operation [22]. Forte et al. conducted a study and following Lichtenstein operation, the incidence of numbness in the thigh area was found to be 4.3 % [23]. In our series, 14 (11.6%) patients showed this complication in total. Five (13%) patients in the Lichtenstein group displayed this complication, whereas four (10%) and five (13%) patients showed it in the Rutkow–Robbins and Gilbert groups, respectively. However, no significant difference was found between the groups.As known, the length of operation depends on many factors such as surgeon's experience, obesity, and use of premade mesh. Therefore, various studies report different operation lengths. While Zeybek et al. report the mean length of operation as 48 min, Karatepe et al. report that length as 50 min [24,25]. However, Janu P.G. et al. performed a study by applying Lichtenstein method and found the mean operation length as 111 ± 2 min. Isemer et al. conducted Rutkow–Robbins operations in which the mean operation length was 37.8 ± 15.85 min [21,22]. Turculet et al. carried out Gilbert double layer operations among which the mean operation length was 65 min [26]. In the present study, our results were consistent with the literature. The operation length of Gilbert group was found to be longer than those of Rutkow–Robbins and Lichtenstein groups. However, the mean length in Rutkow–Robbins group was lower than that of Lichtenstein group. We believe that higher BMI index of Lichtenstein group may be the reason behind this difference.Gilbert double layer repair differs from the other two techniques with longer operation length and higher intraoperative pain in operations under local anesthesia [27]. In light of the results of our study that includes a limited number of cases, we believe that spinal anesthesia may be a better choice instead of local anesthesia in Gilbert double layer operations. However, patients subjected to Lichtenstein repair under local anesthesia are reported to suffer less postoperative pain and earlier mobilization [28].Regarding length of hospital stay, C. S. Huang et al. conducted a study and compared the patients treated with Prolene and plug in which the hospital stay was found to be $1.31 + 1.00$ days for Prolene patients and 1.45 ± 1.43 for plug patients [29]. Isemer et al. determined the length of hospital stay as 2.09 ± 1.35 [22]. In the present study, our results showed consistency with the literature.

Though no difference was observed between the three groups, but the time required to return to work have been found to be longer in our study than in previous studies. Isemer et al. found the time required to return to work as 15.3 ± 12.42 days in their study [25]. In a study conducted by Sven Bringman et al., it was 16.5 days in the group treated with Prolene, whereas 16 days in the Vypro group [30]. Return to work takes longer in our country due to sociocultural reasons.In the past, postoperative pain following tension repairs was an important and a frequently encountered problem. Particularly after tension-free operations performed with mesh, postoperative pain, return to normal activity, and chronic pain incidence have been found to display decreases [31]. While E. Prieto-Díaz-Chávez et al. reported more frequent and prolonged analgesic usage in the conventional hernioplasty than in tension-free operations, on the contrary, another study underscored the absence of difference between the aforementioned two groups[32,33]. The factors leading to postoperative pain after inguinal hernia repair have been investigated in the previous studies. It is commonly encountered as a result of the nerve entrapment caused by the mesh and is observed in 12 % of the patients. Ilioinguinal nerve entrapment causes pain in the hernia region and scrotum [34]. In the current study, according to the results based on visual analogue scale, there was no statistically significant difference between the three groups at days 1, 7, and 30 with regard to postoperative pain.

Conclusion

Lichtenstein operation is more advantageous than others due to its lesser hospitalization time, lower complication rate and early resumption of daily activities. Therefore, Lichtenstein technique is recognized as the most advantageous method in inguinal hernia repairs.

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TABLES

Table 1. Comparison of Quantitative parameters between groups

Variables	Group			p- value
	A	B	C	
Age (years)	51.2 ± 12.1	52.3 ± 11.9	49.9 ± 10.5	0.33
BMI (Kg/m2)	25.5 ± 4.6	24.9 ± 4.1	25.2 ± 3.7	0.421
Operative time (mins.)	51.6 ± 12.1	51.2 ± 11.9	59.9 ± 13.3	< 0.01
Hospitalization Time (days)	2.05 ± 0.7	2.1 ± 0.69	2.07 ± 0.73	0.94
Return to Time (days)	23.5 ± 2.7	25.2 ± 2.8	24.7 ± 2.73	0.1

Table 2. Comparison of Categorical parameters between groups

Variables	Group						p- value
	A		B		C		
Males	33	83%	36	90%	34	85%	**0.68**
Early Complications	1	3%	5	13%	3	8%	**0.033**
Late Complications	5	13%	4	10%	5	13%	**0.94**
Drain	8	20%	3	8%	4	10%	**0.2**

Table 3. Comparison of VAS between groups

VAS	Group			p- value [a]
	A	B	C	
Day 1	1.5 ± 1.3	1.9 ± 1.1	2.4 ± 1.8	**0.14**
Day 7	0.7 ± 1.1	0.8 ± 0.9	1.1 ± 1.5	**0.74**
Day 30	0.2 ± 0.5	0.08 ± 0.25	0.3 ± 0.7	**0.56**
p- value[b]	**< 0.01**	**< 0.01**	**< 0.01**	
[a]The comparison among three terms (Friedman analysis of variance)				
[b] The comparison among three groups (Kruskal–Wallis analysis of variance)				