

Comparative results of hernia repair from surgeons with different approaches at a tertiary medical center

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ABSTRACT

Objective: At present, there is still no method that can be called the gold standard in hernia repair. The main objective of this study was to review the rates, including pain and recurrence, of the most important complications for patient dissatisfaction across different methods applied by different surgeons.

Material and Methods: Four hundred twenty one patients who were operated on by three surgeons were retrospectively reviewed with respect to the main complications of pain and recurrence. Self-adhesive mesh and Lichtenstein repairs were performed by the same surgeon, whereas Bassini and transabdominal preperitoneal (TAPP) repairs were performed by separate surgeons.

Results: In all repair types, there were a significant difference between visual analogue scale (VAS) pain scores on the first postoperative day compared to VAS scores at the one-month mark ($p < 0.001$). The difference between VAS scores in the first month according to repair types was statistically significant ($p < 0.001$). There was a significant difference between repair types and development of chronic pain ($p < 0.001$). Recurrence rates also showed a statistically significant difference amongst repair types ($p = 0.001$).

Conclusion: Although the Lichtenstein and laparoscopic methods are superior in terms of recurrence compared to the Bassini method, chronic pain complications from the Bassini method appear to be acceptable

Keywords: Postherniorraphy pain, Self-adhesive mesh, Bassini repair, Standard mesh, Postherniorraphy recurrence

INTRODUCTION

Choosing the optimal approach for herniorrhaphy is still a debatable subject. The preferred methods for herniorrhaphy are tension-free techniques because they have low recurrence and complication rates (1). Four different methods were conducted by three surgeons from different generations were compared for complication rates, including pain and recurrence. Opposed to recurrences, the prevalence of chronic postoperative groin pain (CPGI), also described as ongoing pain three months after surgery, is still a very important matter. CPGI rates range from 15% to 53%. Surgical approaches that prevent chronic herniorrhaphy pain are still discussed in detail, and avoiding CPGI has become a crucial point of interest in surgical studies that deal with inguinal hernia repair (2,3).

The main parameter for assessment in this study was pain. Pain is a personal experience, so it is, therefore, difficult to characterise it clearly. Pain has been described by the International Association for the Study of Pain as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Pain has also been described as discomfort that is unrelated to postoperative infection or previously present causes apart from surgery (4). Different studies have reported the prevalence of continuing pain following hernia repair to be between 10% and 30% based on established criteria (5).

This study also reviewed complications other than pain, including recurrence; wound infection, and seroma or haematoma formation, according to the different techniques used by the three surgeons. The main objective was to present the results and differences between the three generations.

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MATERIALS and METHODS

Four hundred twenty one patients who were operated on by three surgeons from different eras at the Yenimahalle research and training hospital located in the city of Ankara Turkey between 2016 and 2018 were retrospectively reviewed. All the hernia repair techniques mentioned in the study were performed using standard methods under either general or spinal anaesthesia, according to their type. Self-adhesive mesh and Lichtenstein repairs were performed by the same surgeon, whereas Bassini and transabdominal preperitoneal (TAPP) repairs were performed by separate surgeons. The following were obtained from each patient's record: age, gender, hernia side, hernia type, repair type, postoperative day one and one-month VAS scores, presence of chronic pain at the third month follow-up, wound infection, seroma, haematoma, and recurrence rates. Pain resistance to treatment was another parameter considered in this study. Pain levels on the first day of surgery were measured in the hospital, whereas pain levels at the first and third months were either assessed over the phone or during follow-up visits. Patients were asked to "scale" their "present" pain from 0 to 10 using the VAS. During follow-up visits, pain presence, severity using the VAS (if present), characteristics (including burning, stinging, and shooting), and localisation were reviewed. Pain seen in the first 24 hours was deemed acute postoperative pain, whereas pain with a VAS score ≥ 3 three months after surgery was deemed chronic pain. All patients were called for a follow-up examination by their surgeon on the seventh day after surgery to check for seromas, haematomas, and wound infections.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) for Windows 21.0 IBM SPSS Statistics. Parameters without a normal distribution and comparison of VAS scores with ordinal distribution according to repair type were assessed using the Kruskal-Wallis test. Statistically significant results were compared using the Mann-Whitney U test and evaluated using Bonferroni correction. For comparison of qualitative results related with repair types, the chi-square test or Fisher's exact test were used to assess the differences between the results. The Wilcoxon test was used to assess the statistical significance level of the differences within groups in each repair type for the first postoperative day and first month VAS scores. The confidence interval was set at 95% with a level of statistical significance of $p < 0.05$.

RESULTS

There were a total of 421 patients in this study. The surgeon who graduated before 1990 (considered the old generation) and still preferred the Bassini technique operated on 114 patients. The second surgeon who graduated in the 2000s (considered the middle generation) operated on 115 patients using regular mesh and 144 patients using self-adhesive mesh techniques.

The third surgeon who graduated after 2010 (considered the new generation) operated on 48 patients with the TAPP technique. The median age was 46 years old, with the youngest patient being 19 years old and the oldest being 74 years old. Three hundred eighty-six patients were male, while the remaining 35 were female. Two hundred thirty-five patients had right-sided hernias, 158 had left-sided hernias, and 28 had bilateral hernias. Eighty-three patients had scrotal hernias. The median hospitalisation period was one day, except for one TAPP patient who was followed up for seven days as hematoma developed due to bleeding during surgery. **Table 1** shows the descriptive statistics of the patients according to their repair types.

VAS scores in total and according to repair type on the first day and first month of surgery are presented in **Table 2** and **Table 3**.

Twenty-six out of 421 developed treatment-resistant pain. There was a significant difference in developing treatment-resistant pain according to repair type ($p = 0.008$). Paired group comparisons revealed a significant difference between standard mesh and self-adhesive mesh repair ($p = 0.006$).

In all repair types, there was a significant difference between postoperative day one and one-month VAS scores ($p < 0.001$). One-month VAS scores were significantly lower for all repair types.

There was also a significant difference in postoperative day one VAS scores according to repair type (**Table 2**). Paired comparisons for repair types showed significant differences (except for the Bassini-standard mesh repair comparison, $p = 0.014$).

The difference between one-month VAS scores according to repair types was found to be statistically significant ($p < 0.001$) (**Table 3**). Paired comparisons for repair types revealed significant differences between the Bassini and self-adhesive mesh techniques ($p = 0.001$), Bassini and TAPP techniques ($p = 0.001$), and regular repair and TAPP repair ($p < 0.001$).

Thirty-four out of 421 patients developed chronic pain. There was a significant difference between repair types and the development of chronic pain ($p < 0.001$). Paired comparisons showed a significant difference between the Bassini and standard repair techniques ($p = 0.008$), standard repair and TAPP repair ($p = 0.008$), and the standard repair and self-adhesive mesh repair ($p < 0.001$).

Recurrence rates also showed a significant difference amongst repair types ($p = 0.001$). Paired comparisons revealed a significant difference between Bassini and self-adhesive mesh repair ($p = 0.002$) and Bassini and standard repair ($p = 0.001$). No statistically significant difference was found between repair types in terms of postoperative complications ($p = 0.45$).

Table 1: General Features

	Bassini Repair n= 114	Self-Gripping Mesh (PROGRIP™) Repair n=144	Lichtenstein Repair n= 115	Laparoscopic TAPP Repair n=48
Age (Range)- year	46 (19-74)	47 (22-74)	47(23-72)	49(25-68)
Gender (M/F)				
Male (386/100%)	106(27.5%)	135(35%)	100(25.9%)	45(11.7%)
Female (35/100%)	8(22.9%)	9(25.7%)	15(42.9%)	3(8.6%)
Total (421/100%)	114(27.1%)	144(34.2%)	115(27.3%)	48(11.4%)
Hospitalization time (day)	1 (1-3)	1 (1-2)	1 (1-2)	1 (1-7)
Hernia Type				
Direct hernia	54(47.4%)	54(37.5%)	59(51.3%)	3(6.3%)
Indirect hernia	54(47.4%)	86(59.7%)	50(43.5%)	18(37.5%)
Bilateral hernia	5(4.4%)	2(1.4%)	2(1.7%)	12(25%)
Femoral hernia	1(0.9%)	2(1.4%)	4(3.5%)	1(2.1%)
Recurrent hernia	0	0	0	14(29.2%)
Hernia Side				
Right hernia	70(61.4%)	76(52.8%)	77(67.0%)	12(25.0%)
Left hernia	44(38.6%)	68(47.2%)	38(33.0%)	8(16.7%)
Bilateral hernia	0	0	0	28(58.3%)
Recurrences				
Yes	15(13.2%)	4(2.8%)	2(1.7%)	4(8.3%)
No	99(86.8%)	140(97.2%)	113(98.3%)	44(91.7%)
Treatment Resistant Pain				
Yes	9 (7.9%)	4(2.8%)	13 (11.3%)	0
No	105 (92.1%)	140(97.2%)	102(88.7%)	48(100%)
Complications				
Hematoma	11(9.6%)	4(2.8%)	9(7.8%)	1(2.1%)
Seroma	11(9.6%)	24(16.7%)	19(16.5%)	11(22.9%)
Wound Infection	8(7.0%)	0	6(22.9%)	0

Table 2: Postoperative 1. day VAS

Hernia Repair type	VAS (Visual Analog Score)						
	VAS2	VAS3	VAS4	VAS5	VAS6	VAS7	VAS8
Bassini Repair	0	2(2.1%)	6(6.3%)	41(43.6%)	53(58.9%)	11(45.8%)	1(33.3%)
Self-Gripping Mesh (PROGRIP™) Repair	14(77.8%)	77(80.2%)	50(52.1%)	2(2.1%)	1(1.1%)	0	0
Lichtenstein Repair	0	3(3.1%)	22(22.9%)	42(44.7%)	34(37.8%)	13(54.2%)	1(33.3%)
Laparoscopic TAPP Repair	4(22.2%)	14(14.6%)	18(18.8%)	9(9.6%)	2(2.2%)	0	1(33.3%)
Total	18(100%)	96(100%)	96(100%)	94(100%)	90(100%)	24(100%)	3(100%)

Table 3: Postoperative 1. month VAS

Hernia Repair Type	VAS (Visual Analog Score)					
	VAS0	VAS1	VAS2	VAS3	VAS4	VAS5
Bassini Repair	7(63.6%)	13(18.6%)	36(19.5%)	28(26.2%)	21(53.8%)	9(100%)
Self-Gripping Mesh (PROGRIP™) Repair	1(9.1%)	19(27.1%)	85(45.9%)	35(32.7%)	4(10.3%)	0
Lichtenstein Repair	3(27.3%)	16(22.9%)	47(25.4%)	36(33.6%)	13(33.3%)	0
Laparoscopic TAPP Repair	0	22(31.4%)	17(9.2%)	8(7.5%)	1(2.6%)	0

DISCUSSION

This study is one of the rare studies comparing the methods of 3 different generations of surgeons. This study compares the older bassini hernia repair with self-adhesive mesh repair, standard mesh repair, and, currently, the more commonly used laparoscopic hernia repair. Although there are studies that compare the two previous methods, we have a surgeon in our clinic from the older generation who still uses the Bassini technique, even though newer generations of surgeons don't use it, so we were able to compare four different methods and their outcomes.

The main objective parameters were pain and recurrence. We evaluated long-term comparative results for pain as recommended by the European Hernia Society (6), and found a treatment-resistant pain rate of 6 %. Most patients localised their pain within the pubic tubercle. Postoperative inguinal pain is one of the most important complications seen in hernia repair surgery today (7). The main reason for groin pain is either injury or irritation to the genitofemoral, ilioinguinal, or iliohypogastric nerves which innervate the structures within the inguinal channel (8).

Post-herniorrhaphy pain can be acute or chronic. Acute pain is frequent in almost all hernia surgeries and changes from light to moderate severity during rest and movement (9). Chronic postoperative treatment-resistant pain rates have been reported as 3% and 10–12% (10). Current evidence suggests the aetiology of CPGI may be perioperative nerve damage, postoperative fibrosis, or mesh-related fibrosis.

Self-adhesive materials were manufactured to prevent the damage caused by invasive equipment, such as sutures and staples (3). We think the main cause of postoperative chronic pain is nerve damage which can happen during dissection of the hernia sac from the cord elements in the Bassini technique and during mesh fixation in standard or self-adhesive mesh repairs. However, as standard mesh repairs require more sutures, nerve damage can be more frequent in those techniques. Likewise, this study found a significant difference between standard and self-adhesive mesh repairs in terms of developing treatment-resistant pain. As self-adhesive mesh repairs require fewer sutures and have a lower risk of pain due to nerve damage, self-adhesive mesh repairs had a lower complication rate. Chronic pain results were also similar.

Self-adhesive mesh, like other materials with self-fixation and semi-absorption properties, is minimally invasive towards abdominal tissues and has satisfactory results in both open and laparoscopic repairs (1, 11). This is consistent with our study results and explains the lower complication rates.

Chronic post-herniorrhaphy pain can have a major impact on both quality of life and medical costs. No treatment has shown effective results for this condition, so it is essential to make a detailed analysis of potential risk factors and outcomes of different surgical techniques for prevention (12, 13).

The Bassini technique for herniorrhaphy was widely used in some Europe countries, including at Maastricht University Medical centre in the Netherlands as the standard procedure during the 1990s (14). Although this technique is rarely used today, we have a surgeon in our clinic who graduated in the 1990s and still uses it. We reviewed the results of his surgeries and compared the results with the techniques used by middle- and new-generation surgeons. The comparison revealed no significant difference between the Bassini technique and standard mesh repair and the Bassini technique and self-adhesive mesh repair terms of developing treatment-resistant pain. A study by Bay-Nielsen et al. of 2612 patients reported no significant difference in pain between standard mesh repair and tensioned repair without mesh (13). Modern guidelines do not recommend using larger volume mesh in herniorrhaphy due to risks of erosion and chronic pain (15). This can be considered an advantage of the Bassini technique over mesh repair in terms of chronic pain development risk, which was observed in the current study.

The VAS was used for pain severity assessment after one month. When paired comparisons were made, there were significant differences in all of the following: Bassini repair vs TAPP repair, Bassini repair vs self-adhesive mesh repair, self-adhesive mesh repair vs standard mesh repair, self-adhesive repair vs TAPP repair, and standard mesh repair vs TAPP repair. The only comparison with no significant difference was standard mesh repair vs Bassini repair. Pain and analgesic use were reportedly lower during the early

postoperative period in laparoscopic repairs compared to Bassini repair (14, 18). Although most mesh supporters argue that tension-free repair causes less pain during the acute postoperative period, there is no clear evidence that supports this claim (19). In accordance with our study results, a study from 2016 reported less postoperative pain with ProGrip mesh repair than with standard mesh repair (18). However, laparoscopy requires the patient to be under general anaesthesia. Most conventional hernia repair methods can be performed under local or regional (epidural or spinal) anaesthesia (16). We believe the main reason for the increased VAS pain scores on the first day of surgery is its Bassini repair characteristic. The surgeon who chooses Bassini repair has no laparoscopic experience, and even though he can use standard mesh techniques, he prefers the Bassini method. It is highly likely that he is very well-versed in this technique and can carry it out with ease. Since there is no gold standard for herniorrhaphy, it is reasonable to use this technique. The VAS was used to assess pain severity at the end of the first month. The results showed that pain subsided over time in all groups, regardless of the technique used, which is consistent with the literature (7, 19). There was no significant difference in first-month VAS scores for Bassini repair vs standard mesh and self-adhesive repair vs standard mesh repair. Similarly, a study by Bay-Nielsen et al. reported no significant difference in first month results between repairs with or without mesh (13). Another study found no significant difference in VAS scores between Bassini and laparoscopic repairs six weeks after surgery (14).

The gold standard for hernia repair cannot be determined until a technique that prevents recurrence is clearly defined. In this study, the recurrence rates were 13% for Bassini repair, 8% for TAPP surgery, 3% for Self-adhesive mesh repair, and 2% for standard mesh repair. The reason why these recurrence rates are relatively higher when compared to the literature is that we followed up our patients for complications for more than two years. The literature reports that a three-year follow-up period is required to make a clear assessment of recurrences (13). There was a significant difference between the four groups when recurrence rates were compared. Paired comparisons between the groups found a significant difference for Bassini repair vs self-adhesive mesh repair and standard mesh repair in terms of recurrence rates. Standard mesh repair is more common than Bassini repair because of its lower recurrence rate. Self-adhesive mesh causes less fibrosis formation, so it may potentially cause higher recurrence rates. However, prospective and meta-analysis studies comparing ProGrip with conventional mesh techniques cannot confirm different recurrence rates (20-21). In our study, we were also unable to find a statistically significant difference for ProGrip vs standard mesh repair, with the recurrence rate being slightly higher with the ProGrip technique, which is consistent with the literature. We reported a recurrence rate of 13% for the Bassini technique, which is similar to the literature (22).

Another curious finding in our study is that, there was no statistically significant difference in recurrence rates between Bassini and laparoscopic repairs. These results might be explained by the fact that the laparoscopic surgeon had just finished his surgical training. No matter which technique is used, our study once again demonstrated the importance of experience in hernia repair.

CONCLUSIONS

Laparoscopic repair requires an experienced surgeon in order to reduce herniorrhaphy-related complications, which include pain and recurrence. However, other hernia repair techniques are still used in clinical practice today, and there is no clear gold standard for herniorrhaphy types. The combined approach of the Bassini and Lichtenstein techniques shows promising results in terms of reducing recurrences (23). Our study results that compare four techniques used by three surgeons from different eras could be beneficial in choosing a hernia repair type for reducing pain and recurrence complications.

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