

A Comparison of Open Hernia Repair and Laparoscopic (TAPP Mesh Repair) Outcomes

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Abstract

Objectives: The aim of the current study is to assess laparoscopic and open hernia repair outcomes, including pain, surgical duration, recurrence, post-surgery complications, and hospital stay duration.

Methods: The study took place at Govt. Medical College in Chittorgarh, Rajasthan, India, for one year (2022-2023) and involved 100 patients equally bifurcated into group A (open surgery) and group B (TAPP repair). The exclusion criteria were patients with complex hernias needing urgent medical intervention, individuals with psychological disorders, and those unfit for general anaesthesia.

Results: The patients in Group A (open-repair) patients experienced significantly higher postoperative pain levels compared to Group B (laparoscopic group) on the pain rating scale. The average surgical time for patients treated by open surgery was 43.5 minutes, significantly shorter than those treated by laparoscopic (TAPP) procedure which was estimated to be 59.07 minutes ($p=0.0001$). Superficial wound infections, hematoma, and seroma occurred exclusively in the open hernioplasty cohort, rather than the TAPP hernioplasty cohort. The TAPP surgery treated patients presented no serious complications, with only 2 cases of recurrence (rare), and orchitis (3 cases). In contrast, the cohort that underwent open surgical procedure exhibited 2 cases of orchitis, 3 hematoma cases, and 2 wound infections. Group B patients resumed routine activities faster, and pain disappeared within 14 days of surgery.

Conclusion: The study's findings support the safety and preference for laparoscopic TAPP repair over open hernioplasty in patients belonging to diverse age groups. In this study, the TAPP approach for hernia treatment proved to be an effective alternative to traditional open surgery, with benefits like reduced post-surgery pain, shorter hospital stays, and quicker return to daily activities. However, it was also associated with some potential drawbacks, including a higher recurrence rate, longer surgery times, increased costs, and the risk of complications like intestinal obstruction due to abdominal cavity entry.

Keywords: Hernia, Laparoscopic Surgery, Open Hernia Surgery, Surgical Complications.

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Introduction

Hernias, particularly the abdominal hernia, is the projection of intestine or other organs through the gap or weakness of the abdominal wall [1]. It poses a significant health concern and presents as a medical challenge to even most experienced surgeons. Hernias of the inner groin (inguinal) affects everyone, but are more prevalent in males, as they make up around 90% of surgically treated patients [2]. The lifetime prevalence rate of hernia in both surgically treated and untreated men up to 75 years of age is 47% [3]. Men have a higher risk of undergoing hernia repair at about 27% unlike women who show a 3% risk [4]. Due to the high incidence of this condition, inguinal hernioplasty

accounts for about 10 to 15% of all general surgeries [5, 6].

Laparoscopic inguinal hernia surgery is a minimally invasive procedure that is typically performed in two ways: Totally Extraperitoneal (TEP) herniorrhaphy procedure and the transabdominal pre-peritoneal (TAPP) hernia surgery. Both the techniques can be distinguished by the manner in which the access to the peritoneal space is obtained. The risk of vascular or visceral surgery with laparoscopic surgery is around 0.3% [7].

The TAPP hernioplasty facilitates entry to the avascular extraperitoneal space after cutting the

serous membrane lining the abdominal cavity to create room for placing a mesh large enough to surround the openings of the hernia. On securing this, the peritoneum is then affixed again by stapling or suturing it in place. This approach offers the privilege of locating other femoral or direct hernias that may have been missed earlier, or those in the heterolateral groin. In the pre-mesh era, studies reported an approximate 15% recurrence rate, along with postoperative pain and disability [8, 9].

The widespread use of hassle-free surgical repair using meshes made of a polymer called polypropylene, a drop in the rate of hernia recurrence was documented (< 5%) [9]. Moreover, the emergence of the techniques ranging from laparoscopic procedure to mesh repair in the later period, further cemented its usage when numerous control studies proved its tenacity to lower rates of hernia recurrence and shorter hospitalization [10, 11]. Nonetheless, due to the requirement of anaesthesia, laparoscopic surgery is linked with more surgical adverse effects than open hernioplasty [12, 13]. The objective of the current study lies in comparing the outcomes of laparoscopic hernioplasty (TAPP method) and open hernioplasty in pain, surgery time, hernia recurrence, post-surgery adverse effects, and duration of stay in the hospital.

Methods

The present study was conducted at Govt. Medical College Chittorgarh, Rajasthan, India, for a period of one year between 2022 to 2023. A total of 100 patients were enrolled for this study and bifurcated into 2 treatment groups. The first group (Group A) consists of 50 hernia-affected individuals who were enlisted for treatment by underwent open inguinal hernia surgery (Lichtenstein repair), while the second group (Group B) comprising the remaining 50 patients were treated by laparoscopic TAPP repair of hernia.

In Group A, the 50 patients comprised 40 individuals with unilateral hernias, and 10 individuals with bilateral hernias, all of whom were treated using the open Lichtenstein approach. In Group B, laparoscopic TAPP approach was used to treat the patient cohort including 50 patients, of which 36 individuals had unilateral hernias, and 14 individuals had bilateral hernias.

After the surgical procedures, post-operative monitoring was conducted to identify any complications. Patients were also followed up regularly for approximately 6 months in the outpatient department (OPD) after their discharge to detect any potential complications. The intensity of pain experienced by the patient was assessed using a pain rating scale called visual analogue scale (VAS).

Inclusion Criteria: This study included hospitalized patients afflicted with inguinal hernia and have subsequently undergone elective surgeries for open Lichtenstein repair and laparoscopic TAPP repair.

Exclusion Criteria: This study excluded patients with complicated hernias who require immediate medical assistance or emergency surgery, individuals with psychological issues, patients with a prior history of significant gastrointestinal surgeries, pregnant individuals, and those unsuitable for general anaesthesia.

Surgical Procedure for Open Hernia Repair: In Group A, 50 patients underwent surgery with spinal anaesthesia, while the 50 patients in Group B received general anaesthesia before the surgery. Additionally, catheterization was done beforehand for all 50 patients in the second group who underwent TAPP hernioplasty.

Prior to the surgical incision, the entire patient cohort received 1-gram ceftriaxone (an antibiotic) through intravenous route of administration, which was then continued after surgery. In all cases, an inguinal incision was made, extending from the area above the inguinal ligament - mid-inguinal point, to the tuberculum pubicum on same side, and in between the groin ligament and deep inguinal ring (DIR).

This surgical dissection continued through the hypodermis and Scarpa's fascia. The canalis inguinalis was exposed after dissecting aponeurosis and external oblique muscle via superficial inguinal ring. A series of sharp and blunt dissections was then made to mobilize the spermatic cord, a cord suspending the testis in the scrotum, at the tuberculum pubicum. Following this, the separation of the cremasteric muscle within the spermatic cord from the cord structures lying beneath it was carried out.

Individuals afflicted with indirect hernia were subjected to sac dissection to the region of DIR after separating it from the nearby cord structures. It was then opened, examined, and ligated to the base using a suture made of a polymer called, vicryl suture 2-0 RB. The residual sac ultimately underwent relocation to the peritoneal cavity after incision.

For direct hernias, the sac was directly translocated to the peritoneal cavity without opening it. A polypropylene mesh with prolene 3-0 RB was fixed between the interior oblique and aponeurosis of the external oblique. The polymer-based mesh was affixed at 3 fixation points; the interior oblique (posterior), the Gimbernat's ligament (superior), and inguinal ligament (inferior). Vicryl 2-0 RB was finally employed to suture the aponeurosis of the external oblique while prolene 2-0 RC was used to suture the skin.

Surgical procedure for laparoscopic hernioplasty (TAPP): Prior to the surgical procedure and after surgery, the patient cohort received 1-gram ceftriaxone administered by the intravenous route. After preparing and draping the area, a pneumoperitoneum was established by inserting a Veress needle at Palmers point, following which the pressure within the abdomen was affixed to 13 mmHg.

In midline of the supraumbilical region, the area for accommodating a 30-degree scope was generated by inserting a single 11 mm port. Two additional ports, dimensions being 11 mm and 5 mm in size respectively, were fixed 5 to 7 cm apart in the same region of the supraumbilical port.

The surgical procedure began with exploration of the abdomen followed by a diagnostic laparoscopy. Subsequently, a peritoneal flap was established by making a peritoneal incision transversely just 2 cm beyond the internal ring. This flap extended from the outermost region of the homolateral umbilical ligamentous structure (medial) to the innermost area of the iliac spine (superior) located anteriorly. Further dissection towards the symphysis pubis situated medially exposed the antero-vesical space, where the suspensory ligaments of Cooper characterized by its shiny white appearance was identified.

The hernial sac was then carefully separated from within the spermatic cord's other structures. Following this, a polypropylene-based mesh (15x11cm dimensions) got inserted via a 11mm right trocar into the abdominal cavity after rolling. Following this, mesh unrolling was performed for spanning it over the myopectineal opening, including the femoral ring areas, indirect space, and the Hesselbach's triangle. To cement the mesh in place, an endoscopic multifire tucker for hernia was employed. Finally, the peritoneal flap was closed using the tucker, and the port sites were closed as well.

Post-Surgery Management: Following the surgical procedures in both groups, patients received careful postoperative monitoring. On the evening of the first day after surgery, patients

subjected to TAPP repair operation underwent a procedure to remove the Foley's catheters. Intravenous administration of 1 gram of antibiotic was continued until the patients were discharged.

For pain management, patients were given paracetamol 1gm tablets every 12 hours, and their pain levels were noted using a VAS on sequential days after surgery. Individuals were encouraged in the early days after surgery to start moving and to transition to a soft diet on the same day's evening itself.

Within 8 to 12 days of the surgery, the sutures were removed. Patients underwent evaluations on day 1, day 14, date of discharge; one, three, and six months after the surgery to assess for postoperative pain, superficial wound infections, seroma formation, recurrence, signs of recurrence of hernia, and swelling. In these aftercare appointments, the scars were also examined and contrasted between the two cohorts, both prior to and after the operation.

Statistical Analysis: This collected data was inputted into SPSS version 20 software for analysis. The findings were presented using graphs, diagrams, and tables. To assess significance, a distribution free test was performed, with significance set as $p < 0.05$.

Results

From the 100 study participants in this current study, the 50 patients of first group were treated with open Lichtenstein hernia repair, while the remaining 50 patients of second group were treated with laparoscopic TAPP repair.

Collected data was organized into tables and presented as statistical values and percentages. The statistically significant probability value (p value) for this study was set to be less than 0.05. The participants age varied, in the range of 20 to 65 years, with mean age being 52.1 yrs in first group and 47.7 yrs in second group. Both groups primarily consisted of male patients, with 96.7% in each group and only 3.3% being female as shown in Table 1.

Table 1: Characteristics of 100 patients enrolled for the hernia surgery

Variable	Category	Open repair (Group A) n=50	TAPP repair (Group B) n=50
		N (total number)	N (total number)
Age (yrs)	Average	52.2	47.8
Gender	Men	48 (96.7%)	48 (96.7%)
	Women	2 (3.3%)	2 (3.3%)
Hernia classification	Unilateral/One-sided hernia	40 (80%)	36 (73.3%)
	Bilateral/Double-sided hernia	10 (20%)	14 (26.7%)
Inguinal hernia type	Direct hernia	15 (30%)	20 (40%)
	Indirect hernia	30 (60%)	25 (50%)
	Pantaloon hernia	5 (10%)	05 (10%)

Regarding the type of hernias, in Group A, unilateral hernia cases comprised 40 patients, while bilateral hernia cases covered just 10 patients. In Group B, the number of unilateral hernia patients were 36, and that of bilateral hernia was 14. In Group A, 30% of cases were direct hernia (15 patients), 60% were indirect hernias (30 patients), and 10% were pantaloon hernias (5 patients). In Group B, 40% were afflicted with direct inguinal hernias (20 patients), 50% were afflicted with indirect inguinal hernias (25 patients), and 10% afflicted by pantaloon hernias (5 patients).

The average surgical time for open hernioplasty was 43.5 minutes, while for laparoscopic

hernioplasty, it was 59.07 minutes. A statistically significant difference in average surgical time amongst the two approaches was noted ($p = 0.0001$).

Post-Operative Complications

The postoperative pain in patients who underwent laparoscopic surgery was significantly less when compared to those who had open hernioplasty (Table 2). This reduction was particularly evident in the early period after surgery, after which the pain gradually diminished in intensity. It is worth noting that in the 2 cohorts, there was tolerable pain which was of mild severity, eventually disappearing entirely.

Table 2: Post-surgery VAS score of hernia afflicted individuals treated with open surgery and TAPP surgery procedure

Pain rating scale (VAS)	Open hernia surgery cases N (total number percentage)	Laparoscopic/ TAPP cases N (total number percentage)
1 to 2	25 (50 %)	48 (96.7 %)
3 to 4	23 (46.7 %)	2 (3.3 %)
5 to 6	2 (3.3 %)	0 (0 %)
7 to 8	0 (0 %)	0 (0 %)
9 to 10	0 (0 %)	0 (0 %)

Instances of superficial wound infections, hematoma, and seroma were observed exclusively in the group that underwent open hernia repair, but were absent in the TAPP hernia repair group. There were only two recorded cases of recurrence, three of orchitis in Group B while Group A had only two cases of orchitis. Both the cohorts did not display any signs of retention of urine or atrophy of testicular gland (Table 3). In terms of hospital stay duration, patients who underwent open hernia

repair had an average stay of 2.16 days, while those who had laparoscopic hernia repair stayed for an average of 1.08 days, making it a statistically significant difference (p -value=0.00001). With regards to the time required to return to normal routine, laparoscopic surgery demonstrated a shorter time with an average of 8.64 days unlike open hernia repair group, with an average 9.32 days (p -value=0.00025).

Table 3: Adverse effects after surgery using open and TAPP method

Post-surgery adverse effects (complications)	Group A N (percentage)	Group B N (percentage)
Seroma/serous fluid accumulation	3 (6.6%)	0 (0%)
Hematoma/lesion	3 (6.6%)	0 (0%)
Infection of wound	2 (3.3%)	0 (0%)
Pain in the thigh and inguinal region	17 (33.3%)	10 (20%)
Pain in scrotal sac	8 (16.6%)	0 (0%)
Testicular atrophy	0 (0%)	0 (0%)
Retention of urine	0 (0%)	0 (0%)
Recurrence/relapse of hernia	0 (0%)	2 (3.3%)
Orchitis/testis inflammation	2 (3.3%)	3 (6.6%)

Discussion

Various techniques are available for repairing inguinal hernias, which can be categorized as conventional (open surgery) or minimally invasive procedures. Global studies have consistently indicated that laparoscopic approaches result in reduced postoperative pain and decreased analgesic usage by patients [12-14]. Our study aligns with

these findings: patients treated with laparoscopic (TAPP) surgery experienced reduced pain values after surgery, used reduced number of analgesics, and had a shorter period of pain in contrast to the patient sample treated with open surgery method.

Furthermore, a quicker healing period, a faster return to daily routine, and reduced length of stay are all linked to laparoscopic hernia repair [15].

Moreover, it offers improved cosmetic outcomes and the opportunity to identify and repair an inguinal defect in the contralateral region during the same procedure [15, 16]. However, it is important to acknowledge that laparoscopic surgery has its drawbacks, including the necessity for anaesthetization, longer periods of surgery, a learning curve for surgeons, and the requirement for more costly instruments [15, 16].

In our present study, a remarkable reduction in pain after surgery was observed in patients who underwent laparoscopic hernioplasty over those subjected to open hernioplasty, particularly during the initial days. Subsequently, the pain remained of mild intensity and was tolerable until it completely resolved within a fortnight. These findings align with the results reported by Helmy et al., who noted that less analgesics were required for laparoscopically treated bilateral hernia patients when compared with those treated using open procedures, although no significant difference observed in cases of unilateral hernias [17]. Similar results were inferred from Koju et al., and Garg et al., who depicted that TAPP group experienced lower pain scores than the open surgery cohort [18, 19].

In the current study, our group observed manifestation of post-surgery complication like superficial wound infection, hematoma, and seroma in the open surgery group only. These were treated using conservative methods. The findings of this study are consistent with those of Koshariya et al, according to which open surgery was more prone to result in superficial wound infection unlike laparoscopic surgery [20]. These findings also agree with the study by Rathod et al., in which postoperative adverse effects like urinary retention, infection of wound, and seroma as well as hematoma were more prominent in open hernioplasty than the laparoscopic surgery group [21].

However, our results differ from some of the previous studies. For instance, Faisal et al reported that wound infection occurred in 2 (11.1%) patients of the open surgery group, while 5 (27.8%) patients of the laparoscopic surgery group [22]. In another study, Koju et al observed two cases of wound infections and one patient with seroma in the open surgery group, while three cases of recurrences, and one conversion were observed in the TAPP group [19]. Contrastingly, Garg et al. found 2 seroma cases only in the open group, and a conversion of TAPP surgery to open repair in one patient due to anatomical difficulties [18].

Conclusion

The comparison of the outcomes/results of laparoscopic (TAPP) surgery and open hernioplasty in this study has demonstrated that the TAPP approach to inguinal hernia treatment is a safe and efficacious method when compared to traditional open surgery methods. This method offers several advantages, including reduced post-surgical pain, shorter hospitalization after surgery, fewer post-surgical adverse effects/complications, and a quicker resumption of daily routine. However, the TAPP method also comes with its set of cons, such as a potentially higher recurrence rate, longer operative times, increased cost, the need to breach the abdominal cavity, and adverse effects, such as intestinal obstruction resulting from peritoneal cavity entry.

Limitations: The present study comparing the outcomes of laparoscopic (TAPP) surgery and open hernioplasty had limitations, including a small patient cohort from a single centre. To establish more reliable conclusions, additional research with a larger patient sample.

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