ORIGINAL ARTICLE

SHORT-TERM OUTCOMES OF BILATERAL INGUINAL HERNIA REPAIR USING OPEN, LAPAROSCOPIC AND ROBOTICS

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Background: To compare the operative and postoperative outcomes in patients undergoing bilateral inguinal hernia repair using open, laparoscopic, and robotic techniques. **Methods:** A total of 51 patients with bilateral inguinal hernia were operated on from March 2023 to February 2024. These patients were randomly assigned into Group-A, undergoing open Lichtenstein repair, Group-B, undergoing laparoscopic transabdominal preperitoneal (TAPP), and Group-C, undergoing robotic TAPP. In open repair, a polypropylene mesh of 6×11cm was used while for laparoscopic and robotic, a mesh of 10×15 cm was used, and single suture, absorbable or non-absorbable tacker fixation was done. Patients were given Co-amoxiclav 1.2 gm intravenous, followed by oral co-amoxiclav 625 mg three times a day for 3 days. Injection Ketorolac 30 mg was given intravenously twice daily followed by oral Diclofenac 50 mg twice daily for 3 days. Postoperative pain score using VAS was done at 12 hours and 24 hours. Patients were discharged on the 1st postoperative day and called for follow-up on the 7th postoperative day for wound examination and VAS scoring, and stitch removal. Signs of infection, hematoma of the wound and scrotum were assessed on the 7th postoperative day. **Results:** A total of 51 male patients were included in the study and divided equally into three groups of 17 each. The age ranged from 41–65 years with mean age of 52.49±6.39. The mean body mass index was 21.25±2.86. Mean duration of surgery among open, laparoscopic and robotic was 76.47, 125.00 and 115.59 minutes, respectively ($p<0.0001$). Postoperatively, visual analogue score at 12 hours, 24 hours and at 7 days among the three groups was not significant. Postoperative complications including infection, hematoma, and urinary retention, among the three groups were comparable. **Conclusion:** The duration of surgery was significantly quicker in open surgery, while postoperative complications and length of stay were comparable among the three groups.

Keywords: Robotic TAPP; Laparoscopic TAPP; open Lichtenstein inguinal hernia repair

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INTRODUCTION

The surgical standard for inguinal hernia surgery is still open Lichtenstein repair using non absorbable mesh.[1,2] This creates a tension free repair with less than 1% chance of recurrence. Minimally invasive surgery using laparoscopic and robotic TAPP is indicated in bilateral and recurrent inguinal hernias but its use in unilateral hernias is growing rapidly.[1,2] It has a longer operating time as compared to open surgery, requiring a longer mesh, i.e., at least 10×15 cm as compared to open, which requires 6×11 cm mesh.[2,3]

There are other issues of port site hernias, chronic pain which may be due to use of staplers or injury to nerves in the posterior triangle, higher recurrence rates and seroma formation.[3] In cases of unilateral hernia, the opposite side can be visualized and repaired if a small hernia is found. The postoperative outcomes of minimally invasive surgery have benefit of early mobilization, less chances of numbness of the inguinal and scrotal area and higher patient satisfaction.[4] Robotic TAPP usually has similar outcomes as compared to laparoscopy. Due to the heterogeneity of the studies, i.e., no clear classification of inguinal hernias and surgeons' experience makes it difficult to evaluate the outcomes fairly.[2] An attempt was made to incorporate hernia classification as well as surgeon's experience to balance the discrepancy in the literature.

MATERIAL AND METHODS

After getting institutional review board permission and consent from the patients, a total of 51 patients with bilateral inguinal hernia were operated on from March 2023 to February 2024. These included primary or recurrent hernias with no obstruction or strangulation. Large inguinal hernias reaching up to the scrotum were excluded.

These patients were randomly assigned into group "A" undergoing open Lichtenstein repair, Group-B undergoing laparoscopic transabdominal preperitoneal (TAPP) and Group-C undergoing robotic TAPP. Surgeons were selected based on their case logs, i.e., 100, 50 and 50 for open, laparoscopic, and robotic surgery respectively in the last 3 years. The duration of surgery, i.e., in open surgery from incision to closure of external oblique, Laparoscopic TAPP after ports placement when the instruments are inside the abdomen to the closure of the peritoneal flap.

Similarly in robotic TAPP after placement of ports and docking of the patient cart when the instruments are inside the abdomen to the closure of the flap. In open repair a polypropylene mesh of 6×11 cm was used while for laparoscopic and robotic, a mesh of 10×15 cm was used and single suture or absorbable tacker fixation was done. Patients were given Co-amoxiclav 1.2 gm intravenous followed by oral co-amoxiclav 625 mg three times a day for 3 days.

Injection Ketorolac 30 mg was given intravenous twice daily followed by oral Diclofenac 50 mg twice daily for 3 days. Postoperative pain score using VAS was done at 12 hours and 24 hours. Patients were discharged on 1st postoperative day and followed up on the 7th postoperative day for wound examination and VAS scoring and stitch removal. Signs of infection, hematoma of wound and scrotum will also be assessed on 7th postoperative day. Statistical analysis was done by statistical program of social sciences (SPSS) version 23. Descriptives were taken for age, BMI, and duration of surgery among 3 groups using one way ANOVA. Crosstabulation was done between VAS at 12 hours, 24 hours, and 7 days with the groups. Similarly, crosstabulation was done between postoperative complications like infection, seroma / hematoma, and urinary retention with the groups. *p*-value of <0.05 was taken as significant.

RESULTS

A total of 51 male patients were included and equally divided into 3 groups of 17 each. The age ranged from 41–65 years with mean age of 52.49±6.39. The mean body mass index was 21.25±2.86 with 15 patients who were underweight (BMI <18.5) and 7 patients were overweight (BMI 25-29.9). Demographics including age, body mass index (BMI), duration of surgery (DOS) and duration of stay in different groups are shown in table 1. Mean duration of surgery among open, laparoscopic and robotics was 76.47, 125.00 and 115.59 minutes respectively ($p<0.0001$).

Postoperatively visual analogue score at 12 hours, 24 hours and at 7 days among the three groups is shown in table 2. This did not show any statistical difference among the groups. Similarly postoperative complications including infection, hematoma, and urinary retention among the three groups did not show any difference (Table 3). On 7th postoperative day, 2 (11.76%) vs 13 (76.47%) patients experienced mild pain in open surgery group versus minimally invasive group (Group B and C) respectively (p=0.04).

Table-1: Demographics of the patients and surgery

		N	Mean	SD	*p*
Age	Open	17	54.88	3.77	0.121*
	Laparoscopic	17	52.18	6.70	
	Robotic	17	50.41	7.61	
BMI	Open	17	20.88	2.64	0.549*
	Laparoscopic	17	21.00	2.93	
	Robotic	17	21.88	3.08	
DOS	Open	17	76.47	5.80	<0.0001*
	Laparoscopic	17	125.00	13.22	
	Robotic	17	107.06	22.25	
Dis.	Open	17	1.00	0.00	0.120*
	Laparoscopic	17	1.18	0.39	
	Robotic	17	1.24	0.43	

* One way ANOVA. DOS= Duration of Surgery in minutes. Dis. = Duration of stay in days

Table-2: Visual Analogue score at 12 hours, 24 hours and 7 days postoperative.

	N	No pain	Mild pain (VAS 1-3)	Moderate pain (VAS 4-7)	Severe Pain (VAS 8-10)	*p*
VAS12h Open	17	0	5	12	0	0.165*
Lap.	17	0	5	10	2	
Robotic	17	0	3	9	5	
VAS24h Open	17	0	14	3	0	0.322*
Lap.	17	0	12	5	0	
Robotic	17	0	10	7	0	
VAS7d Open	17	15	2	0	0	0.138*
Lap.	17	11	6	0	0	
Robotic	17	10	7	0	0	

* Pearson Chi Square. VAS=Visual Analogue Score at 12hour, 24 hour and 7 day

Table-3: Postoperative complication among the groups

		N	Yes	No	*p*
Infection	Open	17	0	17	0.594*
	Laparoscopic	17	1	16	
	Robotic	17	1	16	
Hematoma	Open	17	3	14	0.883*
	Laparoscopic	17	3	14	
	Robotic	17	4	13	
UR	Open	17	3	14	0.891*
	Laparoscopic	17	4	13	
	Robotic	17	4	13	

* Pearson Chi Square. UR= Urinary retention

DISCUSSION

The duration of surgery is usually quicker in open surgery as compared to minimally invasive counterparts. This may be due to the larger area of dissection, mesh fixation and closure of flap.[4,5] In our study the duration of surgery in open repair was significantly shorter than laparoscopic or robotic TAPP ($p<0.0001$). In a systematic review and meta-analysis conducted by Nicola *et al*[6] and Solaini *et al*[7], robotic surgery had significantly longer time than laparoscopic and open mesh repair. Amjad Qabbani *et al*[8] also had longer operating time in robotic surgery compared to laparoscopy and open in their meta-analysis. We had a statistically significant shorter operative time in robotics as compared to laparoscopic group ($p=0.037$). This is in contradiction to the above studies quoted and may be due to the way we have defined the operative time, starting from when the ports have been inserted. Also, the wrist of the robotic instruments with 7 degrees of freedom makes it easier to suture the mesh and peritoneal flap. The duration of surgery may also impact the number of elected cases that can be kept on the list increasing patients waiting. This is important not only in the private sector where theatre time is charged but also in public sector government hospitals where the duration of elective theatres is usually limited. Keeping one patient of minimally invasive inguinal hernia repair versus 2–3 patients of open repair is difficult to justify.

Pain after inguinal surgery could be due to skin incisions, nerve damage, dissection of parietal peritoneum in laparoscopic and robotic TAPP, presence of mesh, fixation methods, i.e., absorbable versus non absorbable, number of fixations, and complication like hematoma and infections.[9–11] In a study by Amjad Qabbani *et al*[8] there was no significant difference in pain between robotic and open and robotic and laparoscopic group. In our study there was no statistical difference in the postoperative pain scores among the three groups at 12 hours, 24 hours and at 7 days postoperatively. However, at 12 hours postoperatively, severe pain was present in 11.76% and 29.41% patients in laparoscopy and robotic group respectively while it was absent in open surgery group ($p=0.43$). On the 7th postoperative day as much as 11.76%, 35.29% and 41.17% patients had mild pain in open, laparoscopy and robotics group respectively.

The presence of pain not only adds to the patient's discomfort but also hinders smooth recovery and early discharge. In addition, the use of additional medications to control pain including use of sedatives may also increase the duration of stay leading to bed occupancy and increase waiting for the next patient.

Use of fixation methods may also play a role in postoperative and chronic pain. In a study by Tish *et al*[12] atraumatic mesh fixation (no fixation, self-fixation mesh and glue) gives better outcomes in terms of quality of life including pain as compared to traumatic fixation methods (tackers, staples, suture).

In addition, there was no statistical difference between the different mesh fixation techniques in the early postoperative period. In this study three methods (prolene suture, absorbable tacker, metallic tacker) were employed for the mesh fixation in the minimally invasive group depending upon the surgeon's preference. Except for one patient the rest with severe pain at 12 hours postoperatively had metallic tacker ($p<0.0001$). Although this could not be established at 7th postoperative day, where there was no significant difference between the fixation method and pain. This may signify that metallic tacker can have an initial increased pain score as compared to other methods though this settles with time. Also, the use of metallic tackers has significantly declined and the more popular absorbable and non-traumatic fixation devices like glue or self-gripping mesh are favoured.[12]

Inguinal hernia surgery is a clean surgery; the chances of infections are less than 1%. The infection may occur because of breech of sterilization, hematoma formation etc.[13,14] There were only 2 cases of infections in this study. One was a superficial infection at the port site in the laparoscopy group while another was deep seated mesh infection in the robotic group, requiring removal of mesh. In a national database review by Pokala *et al*[10], the rate of postoperative infection in open surgery was highest at 8.33% and as compared to laparoscopic 0.56% and 0% in robotic.

There is approximately 1.9–11.7% chance of seroma formation following minimally invasive inguinal hernia surgery[15]. This may resolve spontaneously, usually within 6-8 weeks, but is a source of discomfort and apprehension for the patient. One of the reasons cited in the literature is the presence of distal sac and open transversalis fascia. In a study by Zhu *et al*[16] there were significantly lower chances of seroma formation following barbed wire closure of fascia transversalis. Another study by Ng *et al*[15] found seroma formation to be lower in the non-closure of fascia transversalis. In a study by Ruze *et al*[17] there were lower chances of seroma formation in patients where the sac was completely dissected. In this study there was no closure of fascia transversalis and distal sacs were left intact for large hernias. There was no difference in terms of seroma formation between the groups. Obesity increases the risk of surgery and underlying complications due to associated hypertension and diabetes. However, many studies including Park *et al*[18] reported no statistical difference in terms of post operative complications when compared to normal weight patients. In this study there were only 2 patients with postoperative infection and 10 patients with postoperative seroma formation. Overall, 28.6% and 24.1% developed complications in the overweight group and normal weight group respectively. This was not statistically significant in our study (p=0.901). Since this is a short-term study the frequency of recurrence and chronic pain could not be ascertained. This is also the limitation of the study.

CONCLUSION

The duration of surgery was significantly quicker in open surgery while post operative complications and length of stay were comparable among the three groups.

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AUTHORS' CONTRIBUTION

SG: Design of the work, analysis and interpretation of the data, drafting, literature search, write-up. AAL: Analysis and interpretation of the data, drafting, proof reading. EK, RF: Literature search, write-up, proof reading. FI: Dta analysis and interpretation, proof reading.

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