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Original Research Article

Comparative study between open versus laparoscopic inguinal hernioplasty

Rajesh K. N.[1], Manjunath A. P.[2]*, Pallavi H. R.[1], V. Harsha Jayaram[1]

[1]Department of General Surgery, Adichunchanagiri Institute of Medical Sciences, B. G. Nagara, Mandya, Karnataka, India
[2]Department of General Surgery, The Oxford Medical College Hospital and Research Centre, Bangalore, Karnataka, India

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***Correspondence:**
Dr. Manjunath A. P.,
E-mail: drmanjunathap@gmail.com

ABSTRACT

Background: Inguinal hernia repair is one of the commonly performed procedure and has undergone a paradigm shift from open to laparoscopic approach in the era of minimally invasive surgery but the superiority is still debatable. The aim was to compare open (Lichtenstein) versus laparoscopic transabdominal preperitoneal approach (TAPP) hernia repair techniques.
Methods: A total of 60 patients were enrolled in the study and divided into two equal groups (open versus laparoscopic) were compared.
Results: It was observed that laparoscopic repair (TAPP) has statistically significant superiority than open inguinal hernioplasty in terms of lesser post-operative pain (VAS score of 4.8±0.66, 3.67±0.66, 2.53±0.82 versus 6.7±0.92, 5.03±0.72, 3.83±0.65 at 24 hours, 48 hours and 72 hours post operatively, p value <0.001), shorter duration of hospital stay (3.1±0.71 days versus 5.83±0.75 days, p value <0.001) and early resumption to regular activities (10.57±2.28 days versus 12.2±1.52 days, p value 0.002). It also showed that incidence intra operative and post-operative complications was lesser in laparoscopic group but not statistically significant. Whereas duration of surgery was prolonged in laparoscopic group (104±27.49 min versus 61.5±17.08 min, p value <0.001).
Conclusions: Laparoscopic inguinal hernioplasty (TAPP) is superior to open inguinal hernioplasty in terms of lesser intra operative and post-operative complications, lesser post-operative pain, shorter duration of hospital stay with early resumption to regular activities having better subjective and objective cosmetic results in short term follow-up. However, duration of surgery was prolonged on comparison with Lichtenstein open inguinal hernioplasty.

Keywords: Inguinal hernia, Hernioplasty, Lichtenstein's repair, Trans abdominal pre peritoneal repair

INTRODUCTION

Hernia is defined as a protrusion of whole or a part of a viscus through an abnormal opening in the walls of the cavity containing it. The word hernia is derived from the Latin word meaning rupture.[1] Males are 25% more likely to develop groin hernia than females.[2] Inguinal hernia being the most common hernia which occurs in about 15% of adult population and inguinal hernia repair is one of the most commonly performed procedure in surgical practice.[3] More than 20 million groin hernia repairs are performed every year.[4] The first hernia repairs included large surgical exposures through scrotal incisions, dissection of sac and transection of spermatic cord with an orchidectomy followed by tissue repairs.[5,6]

The emphasis of Bassini's tissue repair was on suture reinforcement of posterior inguinal canal as well as high ligation of sac at the internal ring.[7-10] This led to a significant shift in lower recurrence rates and has been the

basis of open repair for over 100 years.[11] Inguinal hernia treatment has evolved to match the technological advancements in this field. Initially patch graft repairs using natural tissues, biological components and synthetic sheets were done to decrease the wound tension.[12] The incorporation of prosthetic materials to standard tissue repairs first in the form of polyester and poly tetra fluro ethylene (PTFE) sheets, then in woven or knitted sheets made of polyamide, polypropylene, and so forth has a significant impact on inguinal hernia repair.[13-17] The transabdominal extraperitoneal repair was introduced by Cheatle. Initially, a midline incision was used for the repair; however, this was eventually changed to a low transverse, or Pfannenstiel incision and prosthesis was positioned between the hernia defect and its contents.[18,19]

Hernia repair has undergone a paradigm change from open to laparoscopic approach in the era of minimally invasive surgery.[20] The surgical techniques for laparoscopic inguinal hernia repair are trans abdominal preperitoneal approach (TAPP) and totally extraperitoneal approach (TEP). Many randomized trials have compared laparoscopic with open surgical method. Following introduction of mesh for hernia repair, newer measures focus on post hernioplasty pain syndrome, quality of life and return back to daily activities. Although duration of laparoscopic repair is more, proven advantages are the significant lesser post-operative pain, earlier return back to daily activity and lesser wound complications.

METHODS

A prospective study conducted during January 2022 to June 2023 on patients admitted on regular basis for the management of uncomplicated inguinal hernias in the department of surgery, Adichunchanagiri Hospital and Research Centre, B. G. Nagara. The study included a total of 60 patients between 20–75 years of age who presented with uncomplicated unilateral inguinal hernias who were divided in two comparative groups. Of these, 30 patients were operated by Lichtenstein's open mesh repair technique and another 30 patients with laparoscopic TAPP mesh repair technique.

Inclusion criteria

All cases of uncomplicated unilateral, direct/ indirect/pantaloon hernia who get admitted and are willing for surgical management were included.

Exclusion criteria

Patients with complicated inguinal hernia (irreducible/obstructed/strangulated inguinal hernia), pregnancy, and medically unfit patients were excluded.

Procedure for collection of data

Prior consent was taken for the purpose of the study and data was collected on a pre-tested proforma which included patient particulars, presenting complaints with duration, detailed history of presenting illness, clinical examination and diagnosis, laboratory/radiological investigations, surgical intervention with intra operative complications, post-operative complications, post-operative pain, duration of stay in hospital, and duration required to get back to normal activities.

All patients were subjected to routine investigations which included complete blood count**,** blood grouping and Rh typing, coagulation profile, renal function test, serology profile, urine routine, chest X-ray, electrocardiography (for >50 years), USG-inguino scrotal region, abdomen and pelvis.

All open procedures were performed by 'Lichtenstein's tension free open mesh repair'. All laparoscopic procedures were performed by TAPP method. The study groups were assessed and compared with operative time required for surgery, incidence of intra operative complications in terms of neurovascular injury, bowel injury and bladder injury, incidence of post-operative complications in terms of hematoma formation, seroma formation and wound infection). Post-operative pain was assessed and compared between the study groups using visual analog scale (VAS) at 24 hours, 48 hours and 72 hours before administration of analgesics. The scale score ranges from 0 to 10, with score of 0 being no pain and score of 10 being worst pain.

Statistical methods

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on mean±SD (min-max) and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance. The following assumptions on data is made.

RESULTS

Age distribution among study population

Among 60 patients under study, 30 of them underwent open inguinal hernioplasty and rest 30 of them underwent laparoscopic inguinal hernioplasty. Of 30 patients who underwent open inguinal hernioplasty majority, that is 17 (56.7%) of them were aged above 50 years. Other 30 patients who were subjected to laparoscopic inguinal hernioplasty, 12 (40%) of them were aged above 50 years. Mean age of patients under study overall was 47.92 years. Mean age of patients in open inguinal hernioplasty group was 48.9 years and laparoscopic inguinal hernioplasty group was 46.9 years (Table 1).

Comparison of incidence of side of hernia among study population

Among 30 patients who underwent open inguinal hernioplasty, 18 (60%) of them had right sided hernia and

other 12 (40%) of them had left sided hernia. Other 30 patients undergoing laparoscopic inguinal hernioplasty, 17 (56.7%) had right sided hernia and other 13 (41.7%) of them had left sided hernia (Table 2).

Table 1: Comparison of hernia repair types with age.

Age in years	Open inguinal hernioplas-ty (%)	Laparoscopic inguinal hernioplas-ty (%)	Total (%)
<30	0 (0)	3 (10)	3 (5)
30-40	8 (26.7)	8 (26.7)	16 (26.7)
41-50	5 (16.7)	7 (23.3)	12 (20)
>50	17 (56.7)	12 (40)	29 (48.3)
Total	30 (100)	30 (100)	60 (100)
Mean± SD	48.93±9.87	46.9±11.83	47.92±10.85

Samples are age matched with p=0.473, student t test

Table 2: Comparison of hernia repair types with side of hernia.

Side of hernia	Open inguinal hernioplasty (%)	Laparoscopic inguinal hernioplasty (%)	Total (%)
Right	18 (60)	17 (56.7)	35 (58.3)
Left	12 (40)	13 (43.3)	25 (41.7)
Total	30 (100)	30 (100)	60 (100)

P=1.000, not significant, Chi-square test

Comparison of type of hernia among study population

Among 30 patients who underwent open inguinal hernioplasty, 19 (63.3%) of them had direct hernia, 8 (26.7%) of them had indirect hernia and rest 3 (10%) of patients had pantaloon hernia.

Among 30 patients who underwent laparoscopic inguinal hernioplasty, 13 (43.3%) of them had direct hernia, 13 (43.3%) of them had indirect hernia and rest 4 (13.3%) of patients had pantaloon hernia (Table 3).

Comparison of operative time with hernia repair types

Among 30 patients who underwent open inguinal hernioplasty, 19 (63.3%) had an operative time of 40-50 minutes, 3 (10%) of them were operated in 51-60 minutes and rest 8 (26.7%) had duration longer than 60 minutes. Mean operating time in open inguinal hernioplasty group was 53.5 minutes.

Among 30 patients who underwent laparoscopic inguinal hernioplasty, it took longer than 60 minutes for all the patients 30 (100%) for the procedure. Mean operating time in laparoscopic inguinal hernioplasty was 71.17 minutes which was statistically significant (p≤0.001) (Table 4).

Table 3: Comparison of hernia repair types with type of hernia.

Direct/ indirect	Open inguinal hernioplas-ty (%)	Laparoscopic inguinal hernioplasty (%)	Total (%)
Direct	19 (63.3)	13 (43.3)	32 (53.3)
Indirect	8 (26.7)	13 (43.3)	21 (35)
Pantaloon	3 (10)	4 (13.3)	7 (11.7)
Total	30 (100)	30 (100)	60 (100)

P=0.326, not significant, Fisher exact test

Table 4: Comparison of hernia repair types with operative time (min).

Operative time (min)	Open inguinal hernioplas-ty (%)	Laparoscop-ic inguinal hernioplas-ty (%)	Total (%)
40-50	19 (63.3)	0 (0)	19 (31.7)
51-60	3 (10)	0 (0)	3 (5)
>60	8 (26.7)	30 (100)	38 (63.3)
Total	30 (100)	30 (100)	60 (100)
Mean±SD	53.5±9.02	88.83±7.03	71.17± 19.54

P≤0.001**, significant, student t test

Comparison of intra operative complications with hernia repair types

Among 30 patients who underwent open inguinal hernioplasty 2 (6.7%) of them had neurovascular complications (injury to ilioinguinal nerve) and none of the patients had neurovascular complications who underwent laparoscopic inguinal hernioplasty. None of the patients in both the groups had bowel or bladder complications intra operatively (Table 5).

Comparison of post-operative complications with hernia repair types

Hematoma was seen 1 (3.3%) case operated by open inguinal hernioplasty. None of patients had post-operative surgical site infection. Seroma was seen in 3 (10%) cases operated by open inguinal hernioplasty and 2 (6.7%) cases operated by laparoscopic inguinal hernioplasty. P value was not found to be statistically significant (Table 6).

Comparison of post-operative pain with hernia repair types

Among 30 patients who underwent open inguinal hernioplasty, pain was assessed at 24 hours, 48 hours and 72 hours using VAS pain score and mean score being 6.7±0.92, 5.03±0.72 and 3.83±0.65 respectively.

Among 30 patients who underwent laparoscopic inguinal hernioplasty, pain was assessed at 24 hours, 48 hours and

72 hours using VAS pain score and mean score being 4.8±0.66, 3.67±0.66 and 2.53±0.82 respectively.

Hence it can be inferred that those operated by laparoscopic inguinal hernioplasty had lesser post-operative pain when compared to those who were operated by open inguinal hernioplasty. P value was found to be statistically significant (Table 7).

Comparison of duration of hospital stay with hernia repair types

Among patients operated by open inguinal hernioplasty, all 30 of them were discharged after 5 days of hospital stay. Mean duration of hospital stay in this group was 5.83 days.

Among 30 patients operated by laparoscopic inguinal hernioplasty, 5 (16.7%) of them were discharged after 1-2 days of hospital stay, 24 (80%) of them were discharged in 3-4 post-operative days and 1 (3.3%) patient was discharged after 5 days. Mean duration of hospital stay in this group was 3.1 days.

Hence it can be inferred that those operated by laparoscopic inguinal hernioplasty had short duration of hospital stay when compared to those who were operated by open inguinal hernioplasty. P value was found to be statistically significant (Table 8).

Comparison of return to work among study population

Among patients operated by open inguinal hernioplasty, mean duration required to return to work was 12.2 days whereas in those patients operated by laparoscopic inguinal hernioplasty was 10.5 days.

Hence it can be statistically proven (p value=0.002) that patients who underwent laparoscopic inguinal hernioplasty were able to return to their work earlier when compared with patients who underwent surgery by open inguinal hernioplasty (Table 9).

Comparison of variables with hernia repair types

Mean age in years among open inguinal hernioplasty group was 48.93 years and in laparoscopic inguinal hernioplasty group was 46.9 years.

Mean operative time in open inguinal hernioplasty group was 53.5 min and in laparoscopic inguinal hernioplasty group was 88.8 min. P value was found to be statistically significant. Operating time via laparoscopic repair took longer than open repair.

Post-operative pain was higher in open inguinal hernioplasty group.

Duration of hospital stay in those patients who were treated by laparoscopic inguinal hernioplasty group was statistically lesser than patients who underwent laparoscopic inguinal hernioplasty.

Patients operated by laparoscopic inguinal hernioplasty were able to return to work earlier than patients who got operated by laparoscopic inguinal hernioplasty (Table 10).

Table 5: Comparison of hernia repair types with intra operative complications.

Intra op complications	Open inguinal hernioplasty (%)	Laparoscopic inguinal hernioplasty (%)	Total (%)	P value
Neurovascular				
No	28 (93.3)	30 (100)	58 (96.7)	0.491
Yes	2 (6.7)	0 (0)	2 (3.3)	
Bowel				
No	30 (100)	30 (100)	60 (100)	1.000
Yes	0 (0)	0 (0)	0 (0)	
Bladder				
No	30 (100)	30 (100)	60 (100)	1.000
Yes	0 (0)	0 (0)	0 (0)	
Total	30 (100)	30 (100)	60 (100)	

Chi-square test/Fisher exact test

Table 6: Comparison of hernia repair types with post-operative complications.

Post op complications	Open inguinal hernioplasty (%)	Laparoscopic inguinal hernioplasty (%)	Total (%)	P value
Hematoma				
No	29 (96.7)	30 (100)	59 (98.3)	1.000
Yes	1 (3.3)	0 (0)	1 (1.7)	
Surgical site infection				
No	30 (100)	30 (100)	60 (100)	1.000

Continued.

Post op complications	Open inguinal hernioplasty (%)	Laparoscopic inguinal hernioplasty (%)	Total (%)	P value
Yes	0 (0)	0 (0)	0 (0)	
Seroma				
No	27 (90)	28 (93.3)	55 (91.7)	1.000
Yes	3 (10)	2 (6.7)	5 (8.3)	
Total	30 (100)	30 (100)	60 (100)	

Chi-square test/Fisher exact test

Table 7: Comparison of hernia repair types with post-operative pain.

Post op pain (hours)	Open inguinal hernioplasty	Laparoscopic inguinal hernioplasty	Total	P value
24	6.7±0.92	4.8±0.66	5.75±1.24	<0.001**
48	5.03±0.72	3.67±0.66	4.35±0.97	<0.001**
72	3.83±0.65	2.53±0.82	3.18±0.98	<0.001**

P≤0.001**, significant, student t test

Table 8: Comparison of hernia repair types with duration of stay (days).

Duration of stay (days)	Open inguinal hernioplasty (%)	Laparoscop-ic inguinal hernioplasty (%)	Total (%)
1-2	0 (0)	5 (16.7)	5 (8.3)
3-4	0 (0)	24 (80)	24 (40)
≥5	30 (100)	1 (3.3)	31 (51.7)
Total	30 (100)	30 (100)	60 (100)
Mean±SD	5.83±0.75	3.1±0.71	4.47±1.56

P≤0.001**, significant, student t test

Table 9: Comparison of hernia repair types with return back to work.

Return to work (days)	Open inguinal hernioplasty (%)	Laparoscop-ic inguinal hernioplasty (%)	Total (%)
1-7	0 (0)	2 (6.7)	2 (3.3)
8-14	29 (96.7)	27 (90)	56 (93.3)
>14	1 (3.3)	1 (3.3)	2 (3.3)
Total	30 (100)	30 (100)	60 (100)
Mean±SD	12.2±1.52	10.57±2.28	11.38±2.09

P=0.002**, significant, student t test

Table 10: Comparison of hernia repair types with mean baseline variables.

Variables	Open inguinal hernioplasty	Laparoscopic inguinal hernioplasty	Total	P value
Age in years	48.93±9.87	46.9±11.83	47.92±10.85	0.473
Operative time (min)	53.5±9.02	88.83±7.03	71.17±19.54	<0.001**
Post op pain (hours)				
24	6.7±0.92	4.8±0.66	5.75±1.24	<0.001**
48	5.03±0.72	3.67±0.66	4.35±0.97	<0.001**
72	3.83±0.65	2.53±0.82	3.18±0.98	<0.001**
Duration of stay (days)	5.83±0.75	3.1±0.71	4.47±1.56	<0.001**
Return to work (days)	12.2±1.52	10.57±2.28	11.38±2.09	0.002**

P≤0.001**, Significant, student t test

DISCUSSION

The aim of our study is to compare open versus laparoscopic hernia repair types. A total of 60 patients were enrolled in the study who presented with uncomplicated unilateral inguinal hernias. Of these, 30 patients were operated by Lichtenstein's open mesh repair

technique and rest 30 patients with laparoscopic TAPP mesh repair technique.

In our study on comparison of age among the two groups. Of 30 patients who underwent open inguinal hernioplasty majority, that is 17 (56.7%) of them were aged above 50 years, 12 (40%) of them were aged above 50 years in laparoscopic group with mean age in open and laparoscopic groups being 48.9 years and 46.9 years respectively. There was no significant difference between age distribution among two comparative groups. These findings were consistent with a randomized multicentric trial which showed that occurrence of hernia was in patients with above 45 years.[21]

Our study was restricted to men only to rule out variations in anatomy which can interfere with analysis of operative and post-operative parameters and results without gender difference and also due to incidence of hernia being more common in males than females.[22]

30 patients were operated by open inguinal hernioplasty and other 30 of them underwent laparoscopic inguinal hernioplasty.In our study on comparison with side distribution of hernia with hernia repair types it was found that in open inguinal hernioplasty group, 18 (60%) of them had right sided hernia and other 12 (40%) of them had left sided hernia. Laparoscopic inguinal hernioplasty group had 17 (56.7%) right sided hernia and other 13 (41.7%) of them had left sided hernia. These findings were also consistent with studies done in India and Nepal.[23,24]

In our study among open inguinal hernioplasty group, 19 (63.3%) of them had direct hernia, 8 (26.7%) of them had indirect hernia and rest 3 (10%) of patients had pantaloon hernia and in laparoscopic inguinal hernioplasty group, 13 (43.3%) of them had direct hernia, 13 (43.3%) of them had indirect hernia and rest 4 (13.3%) of patients had pantaloon hernia. However, studies done in India and Nepal showed that indirect inguinal hernia being more common.[23,24]

In our study it was found that mean operating time in open inguinal hernioplasty group was 53.5 minutes and mean operating time in laparoscopic inguinal hernioplasty group was 71.17 minutes showing significant difference between the two comparison groups. In this study, duration of surgery was limited to unilateral hernia repair and excluded the duration for concomitant hernia repair on opposite side if found intra operatively and this finding was in accordance with other studies which showed a longer operative time in laparoscopic group.[25-27]

However, a Roman study showed that there was no significant difference between the two methods in duration of surgery.[28]

In our study it was observed that in open inguinal hernioplasty group 2 (6.7%) of them had neurovascular complications (injury to ilioinguinal nerve) and none of the patients had neurovascular complications who underwent laparoscopic inguinal hernioplasty. None of the patients had bowel or bladder complications. This finding was consistent with study done in Rome showing lesser intraoperative complications in laparoscopic group.[28]

In our study it was observed that there was no significant difference in post op complications among the study groups. None of patients had post-operative surgical site infection. Hematoma was seen in 1 (3.3%) case operated by open inguinal hernioplasty. Seroma was seen in 3 (10%) cases operated by open inguinal hernioplasty and 2 (6.7%) cases operated by laparoscopic inguinal hernioplasty. Even though the incidence of hematoma and seroma was higher in open hernioplasty group, p value was not found to be statistically significant. This finding was consistent with study done in Egypt and Rome showing lesser post-operative complications in laparoscopic group.[25,28]

In our study post-operative pain was assessed at 24 hours, 48 hours and 72 hours using VAS pain score before administration of analgesics and was observed that that those operated by laparoscopic inguinal hernioplasty had lesser post-operative pain when compared to those who were operated by open inguinal hernioplasty. P value was found to be statistically significant. Mean score being 6.7±0.92, 5.03±0.72 and 3.83±0.65 respectively in open inguinal hernioplasty group and mean score being 4.8±0.66, 3.67±0.66 and 2.53±0.82 at 24 hours, 48 hours and 72 hours in laparoscopic inguinal hernioplasty group. This finding was consistent with other studies having significantly shorter post-operative pain.[25,29]

In our study it was observed that duration of hospital stay was higher in open inguinal hernioplasty group. Mean duration of hospital stay was 5.83 days and 3.1 days in open and laparoscopic inguinal hernioplasty groups respectively. The values observed were statistically significant and consistent with other studies.[25,30]

In our study it was also observed that mean duration required to return to work was 12.2 days and 10.5 days in open and laparoscopic inguinal hernioplasty groups respectively which was statistically significant and consistent with other studies.[31,32]

Limitations

Limitations being shorter duration of study period and hence long term outcomes and recurrences were not assessed.

CONCLUSION

To conclude our study has shown that laparoscopic inguinal hernioplasty (TAPP) is superior to open inguinal hernioplasty in terms of lesser intra operative and post-operative complications, lesser post-operative pain, shorter duration of hospital stays with early resumption to regular activities and better subjective and objective

cosmetic results in short term follow-up. However, duration of surgery was prolonged on comparison with Lichtenstein open inguinal hernioplasty.

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