

Original Research Article

Open and laparoscopic transabdominal preperitoneal approach for inguinal hernia: our single institution experience

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ABSTRACT

Background: Trans abdominal preperitoneal (TAPP) a novel approach for inguinal hernia was introduced by Arregui (1991) and Dion in early 1990's has brought the revolutionary change in the era of hernia surgery over open preperitoneal inguinal hernia repair procedure introduced by Stoppa. Based on this we have done single institution retrospective study of TAPP and open preperitoneal procedure for inguinal hernia.

Methods: This study was single institution retrospective study, where we have analyzed the data of 93 male and 7 female patients out of which 50 underwent standard TAPP procedure and 50 patients who underwent open preperitoneal procedure for inguinal hernia, with median 1 year of follow up. Their data analyzed for demographics, surgical site occurrence and short terms recurrence.

Results: 100 patients with mean age of 55 years, median ASA of 1, ratio of left: right: bilateral for open 18:30:2 and for laparoscopic 26:20:4. Mean time for surgery was 102.3 min for open and 142.4 mins for TAPP. There was surgical site infection in 3 patients operated by open procedure and 2 patients in TAPP procedure. 4 patients from open procedure group and no one with TAPP group developed seroma which were managed conservatively and resolved at 6 weeks and 8 weeks. One recurrence in TAPP group patient at the 1 week follow.

Conclusions: Open preperitoneal repair is hence a technique as effective as laparoscopic hernia repair with a minimal learning curve, ability to be performed under regional anaesthesia and cost effective. It can hence be used to carry out inguinal hernia repairs effectively in rural areas.

Keywords: Inguinal hernia, Laparoscopy, TAPP

INTRODUCTION

Inguinal hernia repairs are one of the most common operations in general surgery. The most commonly used laparoscopic techniques for inguinal hernia repair are transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair. Laparoscopic repair is technically more difficult than open repair and there is evidence of a "learning curve in its performance."¹ A systematic review found no statistically significant differences in recurrence rates between TAPP and open

mesh repair.² The disadvantage of laparoscopic repairs is the potential for major complications longer learning curve and significantly increased costs.³⁻⁵ The presence of such conflicting reports prompted this study which aims to define clearly which procedure- open or laparoscopic pre-peritoneal mesh repair is superior for the repair of inguinal hernias. The majority of the published studies, which aimed to compare the open with the minimal invasive operations for inguinal hernia repair, are non-randomized. Previous meta-analyses, which included the existed randomized controlled studies, provided

insufficient differentiation between specific surgical techniques and patient characteristics.⁶⁻⁹

Objectives of study to compare benefits between open versus laparoscopic preperitoneal mesh repair for inguinal hernia, in terms of intraoperative factor like time required for surgery, early (surgical site infection, hematoma, surgical emphysema, scrotal edema, mesh infection, seroma formation) and late (recurrence, pain) postoperative complication, duration of hospital stay, time taken to full recovery and return to work and economic aspects.

METHODS

Study of comparison between open preperitoneal mesh repair and laparoscopic repair of inguinal hernia, carried out at G.S.M.C. and KEM hospital, a tertiary care centre, in department of surgery from January 2018 to December 2019. Inguinal hernia patients were included in the study after they fit the inclusion criteria and after a formal written, informed consent.

Inclusion criteria

Healthy patients (American Society of Anaesthesiology (ASA) group 1 or 2) 30 to 80 years male, primary or first-recurrence inguinal hernia, direct, indirect or bilateral inguinal hernia.

Exclusion criteria

Patients with irreducible hernia, obstructed hernia, needed emergency surgery, more than one recurrence, Patients with complicating diseases resulting in ASA group 3 or 4, contraindications to laparoscopic hernia repair (e.g., known adhesions), former major lower abdominal surgery, giant hernia, benign prostatic hypertrophy (BPH) grade 2 and 3.

A total of 100 patients were included in the study. Patients were randomly allocated to the two study groups. 50 patients were included in the open preperitoneal group (group A) and 50 patients were included in the laparoscopic repair group (group B).

Laparoscopic hernia repair was done through a trans-abdominal pre-peritoneal approach using three ports (10, 5, and 5 mm). The peritoneum was incised above the hernia sac and dissected free, and a large polypropylene mesh graft (Prolene) measuring 10×12 cm was placed pre-peritoneally and attached to Cooper's ligament and the transverse fascia with titanium staples (EMS Hernia Stapler, Ethicon). No staples were placed below the ilioinguinal tract lateral to Cooper's ligament. The mesh covered both direct and indirect inguinal and femoral openings and went well below the ileopubic tract. The

peritoneum was closed with a continuous, resorbable suture or metal staples, aiming at complete peritoneal coverage of the mesh.

Open hernia repair with a mesh graft was performed using the pre-peritoneal approach through a split incision. If necessary, to reduce hernia sac contents, the peritoneum was opened. The hernia sac was either excised or reduced and left in situ. A preperitoneal space was created using blunt finger dissection through the deep ring and a large polypropylene mesh graft (Prolene, Ethicon, Somerville, NJ) measuring 10 x 12 cm was inserted through it and attached to Cooper's ligament and to the transverse fascia with interrupted non-reabsorbing monofilament sutures. The mesh covered both direct and indirect inguinal and femoral openings and went well below the ileo-pubic tract. No sutures were allowed below the ilioinguinal tract lateral to Cooper's ligament. The wound was closed with interrupted or continuous sutures in the fasciae and interrupted sutures for skin closure.

Operative time was measured from start of the skin incision to the complete closure of all incisions. Intensity of postoperative pain was measured using a visual analogue pain Scale which consisted of a 10 cm line, 0 representing no pain and 10 representing the most severe pain. Patients were then asked to mark on the line representing the level of pain they experienced at 4 hours, 3 days and 1 week after surgery. This pain score was calculated at 8 week and 12 months follow up visit also. Pain score was calculated by assigning 1 point to each cm marked on the visual analogue scale by the patient. Time taken to ambulation by the patient after surgery was grouped into three categories of <2 hrs, <6 hrs and <24 hrs. Other parameters measured were incidence of complications such as surgical site infection, scrotal oedema, surgical emphysema, seroma/hematoma formation, paraesthesia / chronic pain and recurrence. Patients were discharged when they could move easily and had no evidence of any complications. On discharge they were advised to resume their usual activities and to return to work as soon as they felt comfortable. Patients were followed up at 1 week, 8 weeks and 12 months after surgery.

RESULTS

The results were derived from pooled data derived from 100 patients of inguinal hernia, which were randomly allocated equally to one of two treatment arms- Group A (open pre-peritoneal repair) and Group B (laparoscopic inguinal hernia repair), each group containing 50 patients. The polypropylene mesh was placed in the preperitoneal space hence both groups were comparable in that aspect. This study was conducted as a randomized prospective trial over the period of two years.

Table 1: Observations.

Parameter	Open	Laparoscopic	Significance
Number of patients	50	50	
Age (years)			
Range	30-78	30-75	
Mean	55.92	53.2	NS, p=0.7993
Side of hernia			
Left	18	26	
Right	30	20	
Bilateral	2	4	
Type of hernia			
Direct	21	20	
Indirect	29	30	NS, p=0.806958
Duration of surgery (min)			
Range	60 - 180	75 - 240	
Mean	102.3	142.4	S, p=0.001013
Pain score 6 hours after surgery			
Range	3 - 7	3 - 7	
Mean	4.8	4.26	NS, p=0.01626
Pain score 48 hours after surgery			
Range	0-4	0-4	
Mean	1.7	1.36	NS, p=0.09869
% reduction in pain score			
Range	33.33-100	33.33-100	
Mean	66.02	68.02	NS, p=0.6071
Pain score 1 week after surgery			
Range	0-3	0-2	
Mean	0.52	0.28	NS, p=0.09836
Pain score 8 week after surgery			
Range	0-1	0-0	
Mean	0.16	0.08	NS, p=0.2224
Pain score 12 months after surgery			
Range	0-1	0-0	
Mean	0.06	0	NS, p=0.828
Duration of hospital stay (days)			
Range	1-3	1-3	
Mean	2.04	2.02	NS, p=0.8801
Duration of ambulation			
<2 hours	8	0	S, p=0.005770
<6 hours	34	27	NS, p=0.2184
<24 hours	8	23	S, p=0.002184
Seroma formation	4	0	
Scrotal oedema	5	1	NS, p=0.642019
Surgical emphysema	0	3	NS, p=0.063931
Surgical site infection (superficial)	2	2	NS
Surgical site infection (deep)	1	0	NS
Mesh removal	1	0	NS
Paraesthesia	3	1	NS, p=0.6173
Recurrence at 1week	0	1	NS, p=0.408451
Recurrence at 8week	0	0	
Recurrence at 12 months	0	0	

NS- Not significant, S- Significant, p- p value.

DISCUSSION

The average age of the patients in group A was 55.92 years and in group B was 53.2 years. This difference was not statistically significant ($p=0.7993$). Both groups were thus comparable with respect to age and there was no bias of the results with respect to age. The average age in Johansson B et al. study was 58.8 years in open group and 55.9 years in laparoscopic group. 10 of the patients in the study, 7 out of the 100 subjects were female whereas the remaining 93 were male. Male:female ratio in group A was 50:4 and in group B was 50:3. Tanphiphat et al study also showed male predominance in both the groups, with a ratio of male: female of 55:5 (laparoscopic hernia repair) and 51:9 (open hernia repair).¹¹

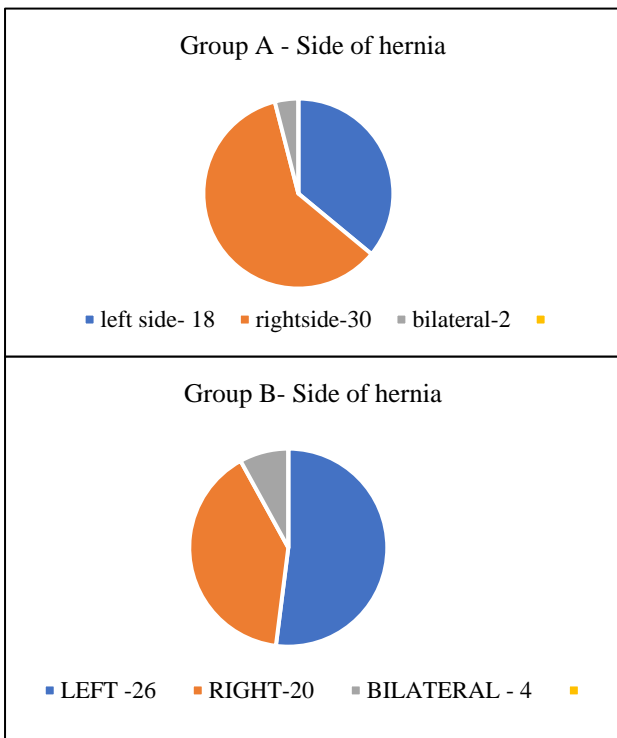


Figure 1: Side of hernia.

The side of hernia in group A was in the ratio of left: right: bilateral as 18: 30: 2 and that in group B was 26: 20: 4. Tanphiphat et al study had a predominance of right sided hernia as compared to left with a right: left ratio of 31:25 for laparoscopic hernia repair and 35: 24 for open hernia repair.¹¹ In group A the ratio of direct:indirect hernia was 21:29 whereas it was 20:30 in group B. This difference was not statistically significant. Johansson B et al study showed a preponderance of indirect inguinal hernia with 62% of patients in the open group and 61% in the laparoscopic group being indirect inguinal hernias, although both groups were comparable in their distribution of direct and indirect hernias. The Comparison of these pre-operative factors show that both the study groups were comparable in terms of pre-operative factors, thus minimizing the potential for selection bias in the results.

In group A, 10 out of 50 patients were operated under local inguinal block anaesthesia and 40 were operated under spinal anaesthesia. In group B all 50 patients were operated under general anaesthesia. In the Johansson B et al. study, 75% of the open preperitoneal repairs were carried out under local or spinal anaesthesia, as per the patient's preference.¹⁰ In group A the duration of surgery ranged from 60 to 180 minutes with a mean duration of 102.3 minutes. The duration of surgery in group B ranged from 75 to 240 minutes with a mean duration of 142.4 minutes. This shows that the operating time for laparoscopic hernia repair is significantly longer than that for open preperitoneal repair ($p=0.001013$). In the Johansson B et al. study the mean operating time for laparoscopic inguinal hernia repair group (65 minutes) was significantly higher than that required in the open hernia repair group (38 minutes).¹²

There were few operative complications in either surgical group, although, in common with earlier studies, this trial was not powered to detect differences in serious but rare complications.¹³⁻²⁰ Local neurovascular complications occurred mainly in the open repair group, and this is reflected in the increased incidence of postoperative numbness and pain in addition to the two cases of testicular atrophy. The risk of injury to nerves and vessels constitutes a valid indication for laparoscopic repair of recurrent hernias as the old wound and its associated scarring is avoided. Post-operative pain score was analysed by the visual analogue scale. Pain scores of patients in group A and B ranged from 3 to 7 6 hours after the surgery. The mean pain scores of the patients in group A and B were 4.8 and 4.26 respectively. This difference was not statistically significant ($p=0.01626$). Pain scores of patients in both groups 48 hours after surgery ranged from 0 to 4 in both groups. The mean pain scores of the patients in group A and group B were 1.7 and 1.36 respectively. This difference was not found to be statistically significant ($p=0.09869$).

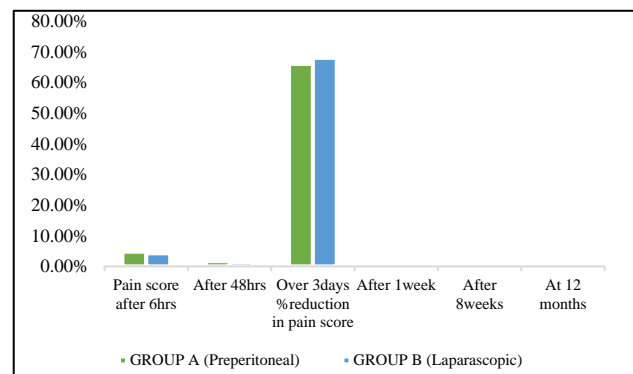


Figure 2: Operative complications.

The percentage reduction in pain score was a variable derived from the preceding two scores as a measure of decline in immediate post-operative pain over 3 days. The percentage reduction in pain score ranged from 33.33% to 100% in both groups. The mean percentage

reductions in pain score in group A and group B were 66.02% and 68.02% respectively. This difference was not statistically significant ($p=0.6071$). This finding shows that both open preperitoneal and laparoscopic techniques are comparable with respect to early post-operative pain.

Pain scores were analysed 1 week after surgery and ranged from 0 to 3 in group A and 0 to 2 in group B. The mean pain score after 1 week was 0.52 in group A and 0.28 in group B. Although the mean pain score in the laparoscopy group is less, the difference is not statistically significant ($p=0.09830$). The pain scores analysed at 8 weeks and 12 months after surgery were also comparable in the two groups. At 8 weeks after surgery the pain scores in group A ranged from 0 to 1 whereas the pain scores in group B were 0-1. The mean scores in group A and B were 0.16 and 0.08 respectively. This difference was not statistically significant ($p=0.2224$). At 12 weeks after surgery the pain in group A ranged from 0 to 1 and those in group B were 0. The mean pain score in group A was 0.06 and the mean pain score in group B was 0. This difference was not statistically significant ($p=0.0828$). The Neumayer L et al study compares the outcomes of laparoscopic hernia repair and open mesh technique.²¹ In this trial on the day of surgery, the difference in the mean score on the visual analogue scale was greatest (10.2 mm 95 percent confidence interval, 4.8 to 15.6), but the score decreased to 6.1 mm (95 percent confidence interval, 1.7 to 10.5) by the time of the two-week assessment. The two treatment groups were similar with respect to all pain assessments by the time the three-month visit took place.

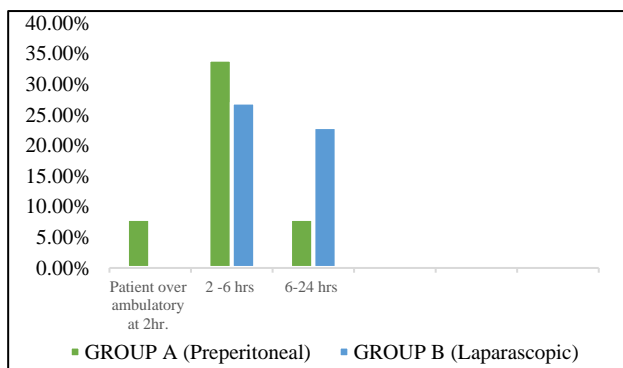


Figure 3: Pain scores.

The duration of stay in the hospital of patients in group A ranged from 1 to 3 days with a mean of 2.04 days whereas that in group B ranged from 1 to 3 days with a mean of 2.02 days. This difference in the duration of stay was not statistically significant ($p=0.8801$). In the James Wellwood et al. study, significantly more patients in the open repair group (191) than in the laparoscopic repair group (177) went home on the day of the operation ($X=6.7$; 1 df; $P=0.01$).²² Cox's proportional hazards model fitted to the length of stay, with additional adjustment made for whether or not it was planned for the patient to be kept in hospital, showed a significant increase in the

time until discharge for the laparoscopy group compared with the open group ($X=44.7$; 1 df; $P<0.01$).

The number of patients in group A who were ambulatory at 2 hours after surgery were 8/50 whereas no patients in group B were ambulated under 2 hours after surgery. This difference was statistically significant. This difference could mainly be seen in patients who were operated under inguinal block anaesthesia. The number of patients in group A who were ambulatory between 2-6 hours after surgery were 34 whereas in group B were 27. This difference was not statistically significant. The number of patients who became ambulatory between 6-24 hours after surgery were 8 in group A and 23 in group B. This difference was statistically significant. Both groups are comparable in this respect and the difference is not statistically significant ($p=0.114564$). In the Neumayer et al. study, the time to the resumption of daily activities was significantly shorter among those undergoing laparoscopic repair (median time, four days) than among those undergoing open repair (five days) (adjusted hazard ratio for a shorter time to return to normal activities, 1.2; 95 percent confidence interval, 1.1 to 1.3).²¹

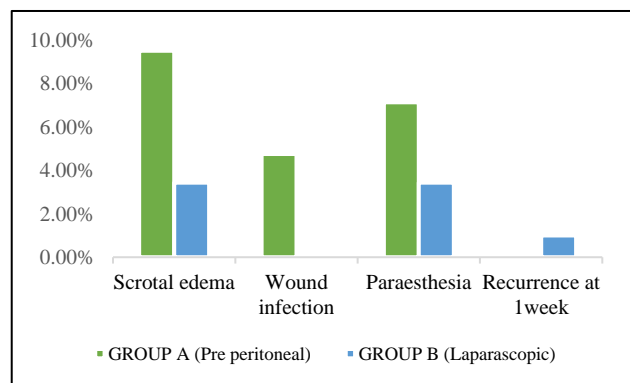


Figure 4: Ambulatory after surgery.

Scrotal oedema was observed in 4 patients out of 42 in group A and in patient out of 29 in group B. This difference was not statistically significant ($p=0.642019$). Surgical emphysema was not seen among the patients in group A but was observed in 1 patient out of 29 in group B. This difference was not statistically significant ($p=0.063931$). In the Johanssen et al study the mean time to full recovery was significantly less in the TAPP group (18.4days), compared both with the open mesh group (24.2 days, $p<0.001$) and the conventional group (26.4 days, $p<0.001$).¹⁰

Superficial surgical site infection was seen in 2/ 50 patients in group A and 2/50 patients in group B. This difference was not statistically significant. In the Neumayer et al study open and laparoscopic groups were comparable in respect to wound infection with 1.4% of patients developing wound infection in the open group and 1% patients developing wound infection in the laparoscopic group.²¹ There was one incidence of deep Infection in the open preperitoneal group with infection

of the mesh. This was managed by surgical exploration, debridement and removal of the mesh. The hernia defect was then closed with the Shouldice technique. Paraesthesia were seen in 3/50 patients in group A and in 1/50 patients in group B. This difference was not statistically significant. In the Neumayer et al study, 14.3% patients had persistent pain or neuralgias in the open group as compared to 9.8% in the laparoscopic group.²¹

There was only one recurrence seen in the entire study which occurring group B at 12 months after surgery. The difference was not statistically significant ($p=0.408451$). There were no other recurrences seen in either group at 8 weeks or 12 months after surgery. In the Johanssen B study, the total number of recurrences during the first year was 19 (3%). Ten of the recurrences (8/11 open mesh and 2/4 TAPP) occurred during the first 6 months. These differences were not statistically significant. In the Neumayer L study the intention-to-treat analysis showed that at two years, recurrences were more common in the laparoscopic group (in which there were 87 recurrences among 862 patients (10.1 percent) than in the open group (in which there were 41 recurrences among 834 patients (4.9 percent); odds ratio, 2.2; 95 percent confidence interval, 1.5 to 3.2).

CONCLUSION

Open preperitoneal repair of inguinal hernia is an easy technique of inguinal hernia repair that allows the advantage of preperitoneal placement of mesh as in laparoscopic repair without the attendant risks of general anaesthesia, lengthening duration of surgery or the potential for major vascular or visceral injuries. Laparoscopic repair having advantage of early ambulation. The pain is less in the laparoscopic group comparable to the open preperitoneal group in short term. Open preperitoneal repair is hence a technique as effective as laparoscopic hernia repair with a minimal learning curve, ability to be performed under regional anaesthesia and cost effective. It can hence be used to carry out inguinal hernia repairs effectively in rural areas.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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