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Original Research Article

Early and late outcomes of trans-abdominal pre-peritoneal and Lichtenstein repair for inguinal hernia, a comparative study

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ABSTRACT

Background: Surgical repair of inguinal hernia remains a common operation in general surgery. No consensus has been achieved on the best surgical technique of inguinal herniorrhaphy. Open repair has lower recurrence and complication rates. Laparoscopic approach has less postoperative pain, reduced recovery time, earlier return to activity and fewer wound complications but expose the patient to potential complications, mainly possibility of visceral injury. The aim was to compare early and late outcomes after TAPP and lichtenstein repair.
Methods: Three hundreds patients with inguinal hernia were enrolled in this study, divided into two equal groups: Group I managed by trans-abdominal pre-peritoneal laparoscopic repair (TAPP) and Group II managed by open lichtenstein repair (LR).
Results: The operative time was significantly lower in TAPP than LR (50±18.98 min and 75±24.54 min respectively). TAPP has a significant advantage to diagnose and repair contra-lateral inguinal hernia (11.5%) and to repair concomitant umbilical hernia (7.3%). No significant difference between both groups regarding intra-operative visceral injury, ileus, hospital stay or wound complications. TAPP significantly decreased post-operative pain and groin hypothesia, shorten the duration needed to return to activities (7±3 days and 16±5 days respectively). There was no significant difference between both groups regarding the recurrence (4.2% and 2% respectively).
Conclusions: TAPP technique is an excellent approach for treatment of inguinal hernia in comparison to LR either unilateral or bilateral, primary or recurrent inguinal hernia with low morbidity and recurrence comparable to that of LR with advantages of less post-operative pain and early return to activities.

Keywords: Hernia, Laparoscopy, Tension free repair

INTRODUCTION

Inguinal hernias are common and surgical repair of inguinal hernia remains one of the most common operations in general surgery. Since the original description of hernia repair by Bassini in 1889, hernia surgery underwent numerous refinements with the sole idea to reduce recurrence.[1] In 1984, Lichtenstein et al coined the term "tension-free hernioplasty" and advocated routine use of mesh for hernia repair.[2] With gaining experience in laparoscopic surgery, laparoscopic inguinal hernioplasty was first described by Ger.[3]

Despite a large number of clinical studies in recent years, no consensus has been achieved on the surgical technique of inguinal hernia repair for various reasons. Experts believe that their own preferred open methods have the lowest possible recurrence and complication rates. They

tend to attribute any negative results to other surgeon's poor skill rather than to the technique itself.[4]

Proponents of laparoscopic inguinal hernioplasty have claimed several advantages over open repair: less postoperative pain, reduced recovery time with earlier return to full activity, fewer wound complications, and improved cosmesis.[5] Furthermore, when repairing recurrent hernias, it does offer an advantage of dissection in a previously non-damaged area. Bilateral hernias are repaired without extra incisions and rapid recovery.[6]

However, laparoscopic hernia repair has not been embraced by the whole surgical community mainly because it requires increased skills and longer learning curve before operating time come down to or faster than that open procedures. The laparoscopic approach exposes the patient to potential complications, mainly possibility of visceral or vascular injury that not seen with the open approach.[7] Another disadvantage of laparoscopic approach, reported by some authors, is chronic inguinal pain.[8]

The aim of this study was to compare early and late outcomes after trans-abdominal pre-peritoneal laparoscopic repair (TAPP) and lichtenstein repair (LR).

METHODS

This study was conducted over 300 patients with inguinal hernia over a period extended to 4 years started from 2010-2014. They were divided into two groups: Group I, included 150 patients managed by TAPP and Group II, included 150 patients, managed by LR. The study was approved by the Institutional Medical and Ethics Committee. The patients were selected randomly through computer generated sequence. Diagnosis of inguinal hernia was established through history and complete clinical examination. Preoperative workup in the form of radiological and laboratory tests was done for all of the patients. Radiological examination includes chest X-ray and abdominal ultrasonography.

Surgical technique

TAAP procedure was done at this study according to the standard Stuttgart technique of TAPP described by Bittner et al with some modifications.[9] The patient lies supine and flat on the operating table with both arms placed by the side. For the first trocar, an incision of 1 cm needs to be made transversely superior to the umbilicus down to the umbilical base. Hasson technique was used for entrance of the peritoneal cavity and if suspected intra-abdominal adhesions from previous surgery, direct optical entry by a bladeless trocar was used, usually a 30° angle optic was used. After induction of pneumo-peritoneum, the patient was placed in a Trendelenburg position and turned at an angle of 10°-20° towards the surgeon to expose the inguinal area. The other two trocars 5 mm were placed under vision at the umbilical and mid-clavicular levels.

The pre-peritoneal space is then entered by incising the peritoneum transversely from the region of the medial umbilical ligament laterally and anterior to the hernial defect. Peritoneal flaps are then developed. Direct sacs and small indirect sacs are fully reduced. Larger indirect sacs are partially dissected and freed from the cord structures posteriorly and then circumcised. The distal part of a large sac is left in-situ. The anatomy is then defined and the posterior flap fully developed, the dissection going at least 5 cms posterior to the internal ring. Medially the dissection is carried to the symphysis pubis.

A 15 x 10 cm prolene mesh is then fashioned and inserted. The medial border of the mesh is adjacent to the symphysis pubis and the posterior part is placed well behind the internal ring. When the mesh is satisfactorily placed, it is stapled in place, staples being applied to the pubic bone and Cooper's ligament. Further staples are placed into the muscle layers anteriorly but none into the ileo-pubic tract or posterior to it. If the hernia is bilateral, the same procedure is performed on the contra-lateral side, a second mesh was used. The peritoneum is then reconstituted by stapling and the operation completed by closing the linea alba at the site of optical port and placing subcutaneous sutures to the skin.

The objective of the study was to compare TAPP and LR in terms of operative time, intra-operative finding, operative complications and length of hospital stay. Early post-operative outcomes were also compared and included post-operative pain score, wound and scrotal complications, return to activities. Late post-operative outcomes were also recorded and included: chronic groin pain, hernia recurrence and development of another hernia. The duration of follow up for the patients to assess late outcomes extended up to 2 years.

Oral intake was started immediately in LR group and after 6 hours in TAPP group. Patients were discharged either on the day of operation or on the second day, some patients stayed in hospital longer if there were medical disease that needed longer admission or development of complications. Patients were instructed to take pain reliever if their pain score was above 3. Also patients were instructed that if they are pain free they can resume their daily activities and light sports but not high-frequency movements or lifting heavy weights.

All patients were reviewed in the clinic every 3 days for two weeks post-operatively and any complications were recorded. After that, patients were audited by direct interview and examination or by telephone and were asked about any pain or hernia recurrence and any patient with a complaint was examined clinically and if hernia recurrence, ultrasonography examination was done.

Postoperative pain was measured qualitatively using visual scale analogue and was graded into no-pain, no discomfort during daily life activities (VSA = 0), mild pain, occasional discomfort but not affecting the quality of life (VSA =1 - 3),moderate pain, pain hampering patient's qualityof life including inability to take part in sports(VSA = 4 - 7), and sever pain, the presence of constant or intermittent pain debilitating the patient or interfering with activities of daily living (VSA = 8-10).[10] All the collected data were recorded and analyzed. The statistical analysis of data was done by using Excel and the SPSS program (Statistical Package for Social Science). The description of data was done in the form of mean and SD. The analysis of data was done to test statistical significant difference. The Student's t test was used to compare between two groups. The p value was considered significant if equal or less than 0.05 at the 95% confidence interval.

RESULTS

Demographic data and clinical presentation of both groups are listed in Table 1 with no significant difference between both groups.

Hospital outcomes

The operative time was significantly lower in TAPP than LR. The operative time was calculated from the start of surgery till end of surgery and not including the anesthesia time. TAPP also has a significant advantage to diagnose and repair occult contra-lateral inguinal hernia or to repair concomitant umbilical hernia without adding other incision to the abdominal wall.

No significant difference between both groups regarding intra-operative visceral injury, cardiac arrhythmia, starting oral intake, post-operative ileus or duration of hospital stay (Table 2).

Table 1: Demographic data and clinical presentation of both groups.

		Group I n = 150	Group II n = 150
Age	Min in years	23	21
	Max in years	72	68
	Mean±SD in years	38±12.7	41±13.4
Sex	Male	149	148
	Female	1	2
Site	Unilateral	144	145
	Bilateral	6	5
Type	Oblique	117	124
	Direct	33	26
Recurrent		8	5
Associated umbilical hernia		11	7
Co-morbidity	DM	21	19
	Cardiac	5	7
	COPD	2	3

During early follow up of both groups, there was higher non-significant incidence of wound complications as seroma, hematoma and / or infection with LH than TAPP. But there was a higher significant incidence of scrotal complications as edema or hematoma in LR group. The duration needed to return to work was significantly lower in TAPP group than in LR group (Table 3).

Table 2: Hospital outcome in both groups.

		Group I	Group II	P value
Operative time	Min	40 min	65 min	0.043
	Max	115 min	145 min	
	Mean± SD	50±18.98 min	75±24.54min	
Diagnosis of occult contra-lateral hernia		17 (11.5%)	0	S
Repair of concomitant umbilical hernia		11 (7.3%)	0	S
Conversion to open		4(2.6%)	0	
Visceral injury		0	1(0.7%)	0.062
Cardiac arrhythmia		1(0.7%)	0	
Start oral intake		6±4.5 hours	2±2.5hours	
Ileus		2(1.4%)	0	
Hospital stay in days		1±0.43	1±0.74	

Table 3: Results of early follow up in both groups.

		Group I	Group II	P value
Wound	Seroma and /or hematoma	2 (1.4%)	7 (4.6%)	0.071
	infection	1 (0.7%)	3 (2%)	
Scrotum	Edema	2 (1.4%)	12 (8%)	0.038
	Hematoma or ecchymosis	1 (0.7%)	9 (6%)	
Return to work (Mean±SD)		7±3 days	16 ±5 days	0.041

Table 4: Pain results in both groups.

		Group I	Group II	P value
Immediate post-operative pain score Mean ±SD		4±2.3	8 ±1.9	0.045
Early follow up post-operative pain score Mean ±SD		2±2.7	7±1.8	0.034
Chronic pain	Number	5 (3.4%)	7 (4.7%)	0.092
Score of chronic pain	Mild	3 (2%)	3 (2%)	
	Moderate	2 (1.4%)	4 (2.7%)	
	Severe	0	0	
Permanents hypothesia		2 (1.4%)	14 (9.3%)	0.021

Table 5: Recurrence rate in both groups.

		Group I	Group II	P value
Duration of follow up	1 year	124	129	0.256
	2 years	26	21	
	Mean ±SD	1±0.7	1±0.6	
Recurrence		4 (2.6%)	2 (1.4%)	0.089
Port site hernia or other hernia		2 (1.4%)	1 (0.7%)	
Total		**6 (4.2%)**	**3 (2%)**	

Immediate post-operative assessment of pain showed that the score of post-operative pain on VSA was significantly lower in TAPP than LR. During early follow up period, still TAPP had significant lower pain score than LR. Regarding chronic groin pain, no significant difference between both groups. In LR, there was significant higher incidence of permanent hypothesia at the groin and upper part of the thigh than TAPP (Table 4).

During the period of follow up which was extended in most of patients to 2 years, 4 patients in TAPP group developed recurrent hernia while in LR group, 2 patients developed recurrent hernia. Regarding development of another hernia: in TAPP group, 2 patients developed umbilical port hernia and one patient in LR group developed incisional hernia after repair of recurrent inguinal hernia at the lateral part of the wound (Table 5).

DISCUSSION

The ideal method of hernia repair should be simple to perform, easy to learn, have a low rate of complications and recurrence, cause minimal discomfort to the patient during the postoperative period and require a short period of convalescence.[11] Early with introduction of TAPP, studies recorded some disadvantages of TAPP in comparison to open repair as longer operative time, visceral injury, vascular injury, delayed oral intake and possibility of post-operative ileus and possibility to convert to open repair. All these drawbacks may add morbidity to the patient.

In the present study, operative time was significantly lower in TAPP than LR either unilateral or bilateral inguinal hernia repair. This result is similar to the results of Ridings et al and Neumayer et al who reported in their studies shorter operative time for TAPP than LR.[7,12] On the other hand, other studies as Elwan et al and Kumar et al reported that the operative time to perform unilateral primary inguinal repair has frequently been observed to be longer for laparoscopic repair compared with open repair.[11,13]

It was reported that 10-25% of patients are found to have an occult hernia on the contra-lateral side.[14] In this study, the rate of detection of occult contra-lateral hernia during TAPP was 11.5% of patients. TAPP approach allows assessment and treatment of the contra-lateral side during the same operation without need for further surgical incisions, very little further dissection and minimal additional postoperative pain and avoided another exposure to anesthesia to repair this hernia later on. This advantage is not possible in open repair. Another advantage of TAPP is that if the patient had umbilical hernia (7.3% of the patients), pneumo-peritoneum was induced through umbilical hernia defect and after finishing TAPP, repair of umbilical hernia was done without adding any incision with minimal increase in the operative time.

This finding is similar to the finding of Ridings et al who did over 200 simultaneous bilateral inguinal hernia repairs and the operation has been well tolerated with no increase in morbidity and low levels of post-operative pain.[7] Conversion to open repair was done (in 3 patients) due to severe adhesions at the hernia site from previous surgery. Only one patient developed cardiac arrhythmia during induction of pneumo-peritoneum so the procedure

was converted to open procedure. In LR group, only one patient had urinary bladder injury during dissection of sliding hernia. No significant difference between both groups regarding intra-operative complications or post-operative ileus.

These results could be explained by the following: early in the laparoscopic era, there were lower experience skills in the laparoscopic approach in comparison to pre-existing familiarity with open hernia repair. Also due to advancement and refinement in laparoscopic instrument that made imaging of the operative field, dissection, control of bleeding and mesh fixation easier and faster. That could be added to the rapidly increasing learning curve in different laparoscopic procedures especially inguinal hernia repair. All this factors helped much to decrease the operative time for TAPP and much decrease in the previously recorded complications of TAPP.

In the present study, although there was shorter hospital stay in TAPP than open repair but patients with open repair could start oral intake earlier than patients in TAPP group. This results are similar to the results recorded by Erhan et al who found shorter but no significant difference in duration of hospital stay between laparoscopic (mean 2.6 days) and open repair (mean 3 days).[15] Other studies observed a significantly shorter hospital stay in the laparoscopic arm of hernia repair surgery.[7-9,11,12]

Scrotal or operative site bruising, edema or wound seroma are significant problems and occurred in patients with large inguino-scrotal hernias. In this study, TAPP could reduce these complications in comparison to LR as there were lager wounds, much dissection of the abdominal wall layers and at the neck of scrotum while in TAPP, the dissection is at the peri-peritoneal space with low amount of fat and the dissection was done blunt with minimal usage of the diathermy and if seroma was formed, it will be absorbed by the peritoneal space. The perceived advantages of the laparoscopic hernia repair over the open repair, is the reduction of post-operative pain and an early return to normal activities. Several studies and this study using pain scores have validated this advantage with low levels of pain.[11,16,17,18]

Lower post-operative pain and no major complications were recorded beside the patients started oral intake within hours, all these factors helped decrease duration of hospital stay and to perform TAPP as day care procedure. Also TAPP patients returned early to their activities due to less pain, lower wound complications and minimal surgical trauma. Chronic pain after inguinal hernia repair was variable, some studies reported higher incidence up to 30% of the patient with 2-9% reported as severe pain.[19] Others reported lower incidence:18% after open and 6% after laparoscopic repair with a clinically significant effect on daily activities. On comparing open repair with laparoscopic repair after a 5-year follow-up, 1.9% of patients who had undergone laparoscopic repair continued to report moderate or severe pain compared with 3.5% of those in the open repair group.[20] The incidence of chronic groin pain in this study was lower among the patients who underwent TAPP (3.3% in TAPP and 6.7% in LR) although this difference is not significant yet it gives an advantage to TAPP over LR. This result was similar to the results reported by Mccormack et al. who found that the incidence of chronic pain with TAPP technique was more than 5% lower than for the examined open repairs.[21] Another well conducted, large, randomized controlled multicenter trial found 10% incidence of chronic pain after laparoscopy and 14% after open surgery in 1983 patients ($P < 0.05$).[22]

Another post-operative problem after hernia repair is numbness or hypothesia at the groin. This may be due to injury to cutenous nerve supply. In this study, there was a higher significant incidence of groin hypothesia with LR (9.3%) than TAPP (0.7%). Grant et al also found chronic pain or numbness to be less after laparoscopic repair than after open repair. The cause for that may be surgical trauma and /or direct nerve injury which is higher with open than laparoscopic approach.[23]

Studies that compared the recurrence rates of inguinal hernia concluded that reduced hernia recurrence was related to the use of the mesh rather than the method of mesh placement.[24] In a big clinical trial involving 2164 patients from 14 centres found that the recurrence rate was higher in the laparoscopic group than the open group (10.1% vs. 4.1% respectively).[12] However, further detailed review of the same study demonstrated that experienced surgeons who had performed more laparoscopic repairs had only a 5% recurrence rate which shows learning curve role. Causes of hernia recurrence after TAPP may be insufficient mesh size, incorrect placement, immediate or very early displacement by folding or lifting by a hematoma.[18] In this study, the mesh size that was used was 15X10 cm size to reduce the recurrence rate, generous dissection of pre-peritoneal space was done for proper placement of the mesh to cover the whole myopectineal orifice. So the recurrence rate in this study was 3.3% with TAPP and 1.7% with LR with no significant difference between both techniques. In the study of Mostafa et al, there was a low recurrence rate (4.3% in TAPP and 2.4% in open repair).[25]

Port site hernia is another drawback in laparoscopic surgery including TAPP. When reusable or disposable ports with pyramidal trocars were used, 7.7% of patients developed port site hernias. However, since early in 1997, with the use of dilating tip ports with a linear blade the incidence of this complication has diminished to 3.25%.[26] In this study the incidence of port site hernia was 1.4%. although this incidence is law it could be reduced if meticulous closure of the fascia, avoidance of unnecessary wound extension, the use of non-absorbable sutures for larger port wounds and repair of any pre-existing para-umblical or umbilical hernia at the time of port site closure.

CONCLUSION

Depending on the results in this study, TAPP technique, if done with strict application of a standardized technique and experienced hands, is an excellent approach for treatment of inguinal hernia in comparison to LR either unilateral of bilateral, primary of recurrent inguinal hernia with low morbidity and recurrence comparable to that of LR with all advantages of laparoscopic surgery as less post-operative pain and early return to activities.

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