

Laparoscopic Tapp Inguinal Hernia Repair: Mesh Fixation With Absorbable Tacks, Initial Experience

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Abstract

Background: Preliminary studies have indicated advantages of mesh fixation using fibrin glue in TAPP compared with tack fixation.

Objectives: We report the results of a prospective experience in fixing mesh during TAPP with absorbable tacks.

Patients and Methods: 50 consecutive men (who had bilateral inguinal hernia) were enrolled and followed up for at least 1 year. The primary measured outcome was pain experienced in day 1 of post-op. The secondary outcomes measured were postoperative scores of pain at rest, discomfort, and fatigue, foreign-body sensation, and hernia recurrence after 12 months. The outcomes were measured using a visual analogue scale, a verbal rating scale and numerical rating scales. A comparison was done within a historical group with the same demographic and hernia characteristics where the meshes have been fixed with fibrin glue.

Results: The group of tacks 'TAPP' showed good results concerning the level of pain, fatigue and foreign body sensation comparable with those of the historical group. There were significant differences concerning the length of surgery where absorbable tacks performed better. Regarding cost of surgery, the fibrin glue showed effective results.

Conclusions: The use of absorbable tacks during TAPP confers significant benefit regarding the operating time, however it is a disadvantage due to the cost when compared with fibrin glue.

Keywords: Minimally Invasive Surgery, General Surgery, Instruments, Laparoscopic Instruments

1. Background

The optimal surgical approach and technique for inguinal hernia repair is still widely debated. Transabdominal preperitoneal (TAPP) laparoscopic inguinal hernia repair is documented as an excellent choice in numerous studies, providing patients a good quality of life, especially when performed by an experienced surgeon (1-8).

Biomechanical properties such as weight, surface area, pore size and the structure of the mesh combined with its chemical properties, seem to influence the risk of mesh-related post-operative complications of shrinkage, migration, infection and nerve damage (9-12).

Stapling of the mesh has been often considered as the potential cause of chronic pain after hernia surgery. Fibrin glue seems to achieve both efficiency and security of mesh fixation, without the potential complication caused by stapling the mesh (13-24). In recent years, it has become possible to use absorbable tacks to fix the mesh and close the peritoneum (25). Shape of the new tack with its absorbable features together aimed to improve the early and late post-operative outcome after TAPP.

2. Objectives

In this report, we evaluate the early one year experience in fixing meshes with absorbable tackers during trans abdominal (TAPP) laparoscopic inguinal repairs prospectively, focusing the attention on feasibility of the technique (defined as the ratio between successful to total attempts primary endpoints) and the incidence of complications, especially the ones possibly related to the type of tackers implanted (minor complications were defined as those that did not influence the length of the post-operative hospital stay, while major complications were defined as those leading to mortality; those requiring conversion to "classical" laparoscopy/open surgery or reintervention, and those leading to prolongation of the hospital stay). Secondary endpoints were the evaluation of chronic groin pain, discomfort, fatigue and foreign body sensation following hernia repair with the TAPP technique and the implantation of a low weight (LW) mesh fixed with absorbable tackers. We also made a comparison with the data already published of our historical group where the same mesh has been fixed with fibrin glue (4).

3. Patients and Methods

Prior to written consent, 50 consecutive patients with bilateral inguinal hernia were enrolled into the study conducted at the presidio ospedaliero di Adria (RO), Italy over a 12 month period (January to December 2013). Inclusion criteria were age > 18 years, American society of anesthesiologists (ASA) score of I or II, and no contraindication to general anesthesia and laparoscopic surgery. Exclusion criteria included ASA III or IV, opium or alcohol addiction, prostatism, morbid obesity, emergency presentation and previous laparoscopic hernia repair. We also excluded patients with large scrotal hernia, because they are not performed as a day case and because there might be a request in some technical steps.

All the procedures of both groups were performed by a single consultant surgeon (AF), trained in advanced laparoscopic surgery and expert in laparoscopic TAPP hernia repair with a proven background of laparoscopic hernia repairs in excess of 1,000 procedures (4). An investigator was enrolled to record preoperative patient data and to collect the postoperative and follow up data. Data were measured on day 0 (6 h postoperatively), daily on day 1 - 7 (at 8.00 pm) and followed up at 3, 6 and 12 months. The subsequent outcomes were recorded on different scales: A 100-mm visual analogue scale (VAS) was used to measure pain when coughing and rest [endpoints labelled "no pain" (0 mm) and "worst possible pain" (100 mm)] as well as on a verbal rating scale (VRS) (pain during rest: no = 0, light = 1, moderate = 2, severe = 3). Discomfort was evaluated with VAS [endpoints labelled "very comfortable" (0 mm) and "very uncomfortable" (100 mm)]. A numerical rating scale (NRS) (1-10) was used for evaluating fatigue, where 1 = no fatigue and 10 = severe fatigue. Seroma and haematoma formation were registered on day 7 using VRS (no = 0, light = 1, moderate = 2, severe = 3), and foreign-body sensation in the groin was assessed using 0 = no and 1 = yes. A clinical examination aiming for hernia recurrences was performed by one of the investigators at 3, 6 and 12 months. The historical group was a same sample of patients, with the same demographic and hernia characteristics, operated consecutively from January to December 2012, which have been already followed up and whose results belong to data which has been already published (4).

3.1. Technique

The adopted surgical technique was similar to the standard TAPP laparoscopic procedure (2, 4). After an injection of local anesthetic (bupivacaine 2.2 mg in 10 mL of), we established the pneumoperitoneum with direct trocar introduction technique DTI. A 5mm optical port is inserted above the umbilicus and 30-degree optics is used.

Two 5mm ports are positioned lateral to the rectus muscles on the transverse umbilical line to facilitate the approach and to enhance the control of both inguinal areas. A medial peritoneal incision is made near the umbilical artery residue, followed by inferior dissection of the peritoneum. The intra-abdominal pressure in this phase helps to divide the peritoneum from the underlying abdominal wall. Aiming for the Cooper's ligament as a medial landmark, a conical incision with the apex on the peritoneal incision and the base in the inguinal area is made. The most crucial step in TAPP procedure is the accurate preparation of the external borders of the peritoneal flap. This allows the mesh to be perfectly positioned on the inguinal area, medially, laterally, and in femoral and obturator areas. A 10 × 15 cm lightweight partially absorbable monofilament mesh (polypropylene/poliglecaprone 25) (Ultra-pro™ mesh, Johnson-Johnson International, Diegem, Belgium), is shaped to guarantee medial and lateral overlap and fixed into the position with three tacks (Ethicon Securestrap™, Ethicon LLC, Guaynabo, Puerto Rico, USA): medially and laterally of the epigastric vessels and one above the Cooper's ligament. The peritoneum is thereby closed with 4/5 tacks carefully avoiding the epigastric vessels area. Paracetamol (1 g orally) and dexamethasone (8 mg orally) were given 1 hour before operation. A single-dose antibiotic prophylaxis of IV cefoxitima 2,000 mg was injected preoperatively. Ten minutes before the end of procedure, ketorolac (30 mg) was given intravenously. Analgesic treatment was started at post-anesthesia care unit (PACU) immediately after operation and consisted of paracetamol 1 g orally three times daily. Four hours after analgesia premedication, patients were advised to continue four days of pain relief treatment with paracetamol. Concerning the technique in the historical group, it has been the same as the one reported above except this point that the mesh was fixed with a fibrin sealant 2 mL each single side (Tisseel, Baxter, AG, Vienna, Austria) and that the peritoneum was closed with a 2/0 monofilament absorbable suture, with intra-abdominal knots.

In Table 1, the baseline demographics and surgical details of all the patents are reported. While in Table 2, the operative data are reported. In Table 3 the 3 and 12 months main outcomes are reported.

4. Results

All procedures were performed as day cases. All the patients were discharged before 8 pm in surgery day. No intra-operative complications or mortalities have been registered. All the patients have been followed up for at least 1 year after surgery. In making a comparison with our historical group, there were no significant differences in

Table 1. Baseline Demographics and Main Surgical Details for Included Participants-Data are Median (Range)^a

Value	Absorbable Tacks, n = 50	Historical Group, n = 50	P Value
Age, y	51 (27 - 73)	55 (30 - 77)	≥ 1
BMI, kg/m ²	26 (22 - 35)	27 (21 - 37)	≥ 1
ASA I:II	45:5	42:7	≥ 1
Bilateral hernia	50	50	NS
Hernia type, (lateral/median)	42/8	49/11	≥ 1
Operation time, min	35 ± 12	43.5 ± 13.2 (P = 0.03)	0.001
Fixation (No. of tacks)	8 (6 - 10)	Fibrin glue 2 mL each side	-
Cost, euros	360	190	0.001

^aValues are expressed as mean ± SD or No.

Table 2. Main Operative Data^a

Value	Absorbable Tacks (n:50)	Historical Group (n:50)	P Value
Intraop Complications	0	0	NS
DS	50	50	NS
In hospital VAS pain when coughing	27 ± 19	28 ± 15	≥ 1
In hospital VRS pain at rest	1	1	NS
In hospital VAS discomfort	11.9 ± 9.5	10.7 ± 8.8	≥ 1
In hospital NRS fatigue	0	0	NS
Seroma	0	0	NS

^aValues are expressed as mean ± SD.

incidence of pain, nausea, discomfort and fatigue between two groups. Tacks group showed significant differences in terms of operating time (35 ± 12 minutes vs. 43.50 minutes ± 13.2 minutes) and fibrin glue group in terms of cost (190 vs. 360 euros). In both groups, all patients returned to full daily activities in 14 days. Up to now, no recurrences have been registered in the tacks group.

5. Discussion

Laparoscopy has gained widespread acceptance as a diagnostic and therapeutic tool (1, 2, 4, 10). Since 1999, laparoscopic inguinal hernia repairs TAPP were performed in our

unit with 5 mm trocars, under the supervision of a competent dedicated laparoscopic surgeon (AF) (2, 4). The main indications for a laparoscopic approach to inguinal hernias are the bilateral and recurrent hernias (2, 4). We opted to do the TAPP procedure rather than extra-peritoneal approach (TEP) mainly because of our familiarity with that technique. Moreover, we experienced that TAPP provides a better view of the anatomy when compared to the extra-peritoneal approach. Also, the TAPP is reproducible, can be applied to most inguinal hernias and it does not require any other specific laparoscopic equipment. Moreover, the trans-abdominal laparoscopic approach has a stepwise learning curve that develops through several skills: preparation of the peritoneal flap, isolation of the hernia, intestine manipulation, mesh positioning and fixing and suturing the peritoneum (2-5, 10, 12, 14). In our experience, the TAPP procedure operating time has progressively improved accordingly to surgeon's and staff experience with an average operative time of 40min in bilateral hernias. Fibrin glue has proven to be both efficient and secure in mesh fixation and currently is recommended by Several International guidelines (15-17, 19-24).

Despite the previous non-absorbable tacks which were associated to a high incidence of nerve or muscular entrapment causing pain, para-esthesia and other chronic complications, the new U-shaped absorbable device may reduce pain or not result in it at all (15-17, 19-24). Conversely, the tacks can be used to close the peritoneum reducing operating times and technical difficulties. In this prospective observational study, the tacks group showed good results comparable with our previous historical group in terms of early and late complications (namely pain and relapsing rates). In the tack group, although an experienced surgeon performed the procedures, the operating time was improved of 10 minutes. Moreover using absorbable tacks facilitates the peritoneal closure which is, according to our experience, one of the most tricky steps of the operation.

Regarding the cost-effectiveness of the compared techniques, there is an obvious benefit in using fibrin glue as its cost is 190 Euros versus the 360 Euros for the absorbable tacks. However the 10 minute improvement in operating time may not justify the cost-difference.

5.1. Conclusions

The data obtained in this study revealed that mesh fixation and peritoneum closure with absorbable tacks are associated with considerably less operative time and equal early and late complication rate in comparison with fibrin glue. Moreover, as the tacks disposer device is not cost-effective as the fibrin glue, it might be considered as an efficient alternative in some technically difficult circumstances. Prospective randomised studies are needed in

Table 3. Three and 12 Months Main Outcomes^a

Value	Absorbable Tacks, n = 50 Follow up 3 Months	Historical Group, n = 50 Follow up 3 Months	Absorbable Tacks, n = 50 Follow up 12 Months	Historical Group, n = 50 Follow up 12 Months	P Value
Recurrences	0	0	0	0	NS
VAS	13 ± 3	12 ± 2	6 ± 3	5 ± 5	≥ 1
VAS(discomfort)	0	0	0	0	NS
NRS (fatigue)	0	0	0	0	NS
INFECTION	0	0	0	0	NS
Hematoma	0	0	0	0	NS
Seroma	0	0	0	0	NS
Orchitis	0	0	0	0	NS
(% of patients returning to work after 14 days	100	100			

^aValues are expressed as mean ± SD.

order to examine the real value of fixing mesh with absorbable tacks during TAPP.

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Footnote

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