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Research Article

A prospective study of laparoscopic repair of inguinal hernia by intraperitoneal onlay mesh technique using fibrin glue

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ABSTRACT

Background: Inguinal hernia repair is one of the most commonly performed operations worldwide. Laparoscopic repair is rapidly becoming the procedure of choice with increasing availability of resources. The present work focuses on the advantages and benefits of the fibrin glue and IPOM procedure in hernia repair.
Methods: A total of 16 cases were included operated by a single surgeon. IPOM technique was adopted for hernia repair with use of fibrin glue for mesh fixation along with tackers. Patients with reducible hernia were included, while those with irreducible, obstructed or strangulated hernia were excluded.
Results: All the patients were male with right indirect inguinal hernia being the most common presentation. The post-operative complications were none on one year follow up, without any recurrence or obstructions. All patients returned to normal activity within one day. Patients showed better compliance with reduced complaint of post-operative pain, early return to activity and work and less sick day leave. Intra-operative risk of damage to vital structures was also greatly reduced with the use of fibrin glue.
Conclusions: Laparoscopic IPOM hernia repair is feasible, easy to learn, has a high patient acceptance rate, reduce operating time and low complication rate. Use of fibrin glue for mesh fixation lead to reduce post-operative pain, early return to activity and less intra-operative risk.

Keywords: Laparoscopic hernia repair, Inguinal hernia, IPOM, Fibrin glue

INTRODUCTION

Inguinal hernia repair is one of the most commonly performed operations worldwide.[1] The rapid changes that have been witnessed in open approach surgeries, prosthetic materials and laparoscopic surgeries has made hernia surgery, the most interesting field of endeavour that demands renewed discipline and dedication.[2]

Approximately 75% of all abdominal wall hernias are seen in the groin. Inguinal hernia is much more common in men than women. Age is a factor for incidence and type of inguinal hernia; incidence increases by age. Indirect hernia is more common in young and direct hernia in the elderly. Numerous repair techniques were described since Eduardo Bassini had published his first anatomy-based repair with great success in 1890. Different mesh techniques have been described to date. Single and double layer meshes, and plug repairs all have been reported with good results by their users and defenders. However, EHS Guideline has clearly stated that none of the alternative mesh techniques except for the Lichtenstein and endoscopic techniques has received sufficient scientific evaluation to be recommended.[3]

Laparoscopic IPOM repair provides very good results where surgeons have an easy learning curve. Use of fibrin glue for mesh fixation results in very low postoperative pain, fewer wound infection, and quick return to daily activity and working, along with no fear of damage to the nerves and vessels in the close vicinity of the lower border, where use of traumatic tacker can lead to unforeseen consequences.[4]

METHODS

The objective of this study was to evaluate the efficacy of IPOM technique with fibrin glue in laparoscopic inguinal hernia repair. And to evaluate the complication rate (early and late) of IPOM technique using fibrin glue in laparoscopic inguinal hernia repair. And to develop management protocols of IPOM technique for inguinal hernia.

Inclusion criteria

- Study included the patients of age group 20 to 50 years with small reducible inguinal hernia
- Study was conducted in an ante grade manner and only new cases
- Results include patients operated by a single surgeon.

Exclusion criteria

- All the patients other than inguinal hernia
- All the patients with irreducible, obstructed or strangulated inguinal hernia or recurrent cases
- All patients operated by different surgeons.

This prospective study was conducted in department of general surgery, Maharaja Yashwantrao Hospital and MGM Medical College, Indore, Madhya Pradesh, India. The study was conducted on 16 patients diagnosed with inguinal hernia registered between the time periods of August 2013 to July 2014. It included both direct and indirect hernia. After admission to the hospital detailed history was taken and thorough clinical examination was done.

Routine investigations like haemoglobin, total leucocyte count, differential leucocyte count, erythrocyte sedimentation rate, random blood sugar, renal function tests, chest x-ray were done in every case. Electrocardiogram was done on patients more than thirty-five years of age.

RESULTS

Laparoscopic IPOM is an efficient repair technique with an easy learning curve. Fixation of mesh using fibrin glue provided additional benefits. In our study all patients were discharged on the second day of surgery. In our study all patients were ambulated on the same day of the surgery. All patients returned to activity on same day. Patients returned to work on an average in 5 days and were advised no heavy weight lifting for 3 weeks. Incidence of right indirect inguinal hernia was highest and least was of left indirect inguinal hernia. Mean time span of surgery in our study was 42 minutes. At the end of procedure no patients complained of pain. Post-operative pain was seen in 3 cases after 3 days. There was no complication of seroma formation, superficial or deep infections, urinary retention etc. There was no recurrence in any case. Overall cost of surgery decreased, not in terms of OT, but indirect benefit in terms of economics because of early return to activity and work, less days of sick leave i.e. more productive time, low complication rate reducing medical expenditure.

Table1: Inguinal hernia-demographics.

Inguinal hernia	N
Indirect	09
Left Indirect	01
Right direct	03
Left direct	03

Table 2: Complications.

Age	Seroma	Wound infection	Recurrence
20-29	0	0	0
30-39	0	0	0
40-49	0	0	0
50-59	0	0	0

Table 3: Post-operative pain.

Age	N	Within 12 hours	At 3 days
20-29	04	00	00
30-39	07	03	02
40-49	04	01	00
50-59	01	01	01

DISCUSSION

The Lichenstein tension free mesh repair is currently one of the most popular open inguinal hernia repair technique by using non absorbable polypropylene sutures mostly.

We gave a thought of using fibrin glue for mesh fixation. There is still no consensus about the type of mesh used and use of fixation device. Fibrin glue is a blood-derived product that is absorbable, relatively easy to use, and can be kept at room temperature or in a refrigerator. Fibrin glue is a biological tissue adhesive which imitates the final stages of the coagulation cascade when a solution of human fibrinogen is activated by thrombin (the two components of fibrin glue). Fibrin glue includes a fibrinogen component and a thrombin component, both prepared by processing plasma. It can be prepared at a blood transfusion centre or from patients own blood or obtained as a commercially available preparation. When it is derived from individual volunteer donations, it may have a low concentration of fibrinogen. The

commercially available products are produced from pools of plasma, usually contain high yields of fibrinogen and, consequently, produce firm coagulum. Unlike cyanoacrylate glue, fibrin glue forms a smooth seal along the entire length of the wound edge and thereby provides greater postoperative comfort to the patient with fewer complications.

Mechanism of action

When human tissue is injured, bleeding ensues and then ceases due to formation of a blood clot. This is the initial mechanism of natural wound closure. Clot is formed as a product of the final common pathway of blood coagulation. Fibrin glue mimics this coagulation cascade resulting in its adhesive capability.

Once the coagulation cascade is triggered, activated factor X selectively hydrolyses prothrombin to thrombin. In the presence of thrombin, fibrinogen is converted to fibrin. Thrombin also activates factor XIII (present in the fibrinogen component of the glue), which stabilizes the clot, by promoting polymerization and cross linking of the fibrin chains to form long fibrin strands in the presence of calcium ions. This is the final common pathway for both the extrinsic and intrinsic pathways of coagulation in vivo, which is mimicked by fibrin glue to induce tissue adhesion.

There is subsequent proliferation of fibroblasts and formation of granulation tissue within hours of clot polymerization. Clot organization is complete two weeks after application. The resultant fibrin clot degrades physiologically.

By this time the mesh is permanently fixed due to fibrosis and thereby sealing the defect of hernia.

There is no national system of audit for follow up, and the overall low reported complications following inguinal hernia repair makes it difficult to determine which procedure is best. However, outcomes should not be judged only in terms of complication, but also quality of life, patient satisfaction, length of hospital stay and cost.

Procedure should be of high quality and cost effective, easily reproducible. The ideal method of hernia repair is one that causes minimal discomfort to the patient during and after the surgery. It should be technically simple, and would have a low rate of complications and recurrence. Several randomized control trials have been done for laparoscopic hernia repair; however none gives a conclusive result of the best intervention for hernia repair.

Several retrospective and randomized control trials have shown that laparoscopic repair provide the best clinical and economic benefits to patients.[5-7] In spite of all these benefits, the use of laparoscopy in inguinal hernia surgery has not been established among surgeons on a wide scale. The absence of recurrence and any complications due to lack of aggressive dissection could be a good reason to extend the indication of Laparoscopic IPOM inguinal hernia repair. However, these preliminary results should be confirmed by longer follow-up.

In our setting also we are looking forward to perform majority of hernioplasty under laparoscopic repair using fibrin glue. The use of fibrin glue reduces rate of post-operative pain and haemorrhage (haematoma, ecchymosis) as it was a non-invasive fixation device, required minimum tissue handling and reduced intra-operative risk of damaging vital structures. Several studies in various hernia repairs both open and laparoscopic using fibrin glue have shown promising results.[8,9] This is further authenticated by our study.

As day care surgery

Day care surgery has been recently gaining popularity owing to the increasing constraints on public-sector health care resources.

In our study surgery performed in morning hours, all 16 patients were discharged on next day of surgery, i.e. within 24-36 hours.

In our setting some patients requested to stay, not because of pain or discomfort but because of ignorance (fear of complication, concerned about need of IV drip and medication). But they were counseled properly and discharged.

Early post-operative mobilization results in lesser morbidity and, hence, early discharge from hospital. Studies comparing the recovery profiles of open and laparoscopic repair show that laparoscopic repair is ideal for day care surgery.[10]

Laparoscopic repair provides increased safety for patients, better postoperative pain control, and shorter recovery period with reduced duration of hospital stay; hence laparoscopic repair is acceptable and safe technique for inguinal hernia surgery. Laparoscopic IPOM has an added benefit of easy learning curve, less operative time and better control due to less tissue handling.

Technique

All patients under study were operated comfortably, comfort for both patient and surgeon, and successfully. One of the findings of this study was that significantly more patients would recommend for Laparoscopic repair with fibrin glue to someone else.

From August 2014 to July 2015 we performed 16 laparoscopic hernia procedures on selected patients with simple small inguinal hernia with an IPOM technique combining the ultrapro mesh 15 cm X 15 cm and fibrin

glue (tissel) and tacker combined technique for its fixation. The glue was diluted to increase fixation time and applied once the mesh was primarily fixed with tacker to positioning on the hernia defect. Procedure is done under general anesthesia in the following sequence.

- Inserting a standard 10 mm trocar at umbilicus using semi-open technique.
- Inserting only one 5 mm working port for tackier and tissue fibrin glue applicator.
- Intra peritoneal anatomical landmarks involved in inguinal hernia repair were identified; triangle of doom or square of doom, symphysis pubis, cooper ligament, iliopubic tract and anterior superior iliac spine. There was no dissection of the peritoneum carried out.
- The upper half of mesh is fixed with auto suture protack at the level of 2 cm above transverses abdominis arch, medially at abdominal midline, laterally near anterior superior iliac spine and the middle at between the medial and lateral ligament. Use of tacker is done on the tough structures, taking care of the nerves and vessels which are on the lower aspect.
- One tacker was also fixed over cooper ligament which was nicely identified before putting the mesh by tactile feedback of tip of tacker.
- Fixation of the lower half of the mesh was done by using fibrin glue. This was done to prevent injury to the major vessels and nerves in the region of triangle of doom and triangle of pain, which could get damaged with the use of metal tackers. The fibrin glue being non-traumatic, non-penetrating does not endanger us with damage to vital structures.
- Care was taken not to place hernia tacker at triangle of doom

Mesh and suture used

In our study 13x6 cm mesh used which was optimum for average built Indian patients.

We used absorbable fibrin glue to fix mesh and there was no increased recurrence rate with fibrin glue in our study. Recurrence was not seen even in a single case (0%). None of the cases complained or showed any signs of obstruction or adhesions.

Complications

Urinary retention, Infection and seroma- urinary retention or infection was not found in any patients postoperatively (0%). No infection was observed either superficial or deep mesh infection during follow up (0%). There was none patient in which seroma developed (0%). Rate of recurrence in our study was nil (0%).

Time span of operation

Operative time was recorded from infiltration of anesthetic to skin closure. In present study the mean operative time was 43.18 minutes.

Return to work- patients returned to work on an average of 5 days.

Post-operative pain

Post-operative pain was seen in 3 cases after 3 days. However longer follow up showed no complaint of constant pain or discomfort in routine work.

All patients returned to work on an average in 5 days. However, all returned to activity on same day.

Economics inguinal hernia results in a barrier to a job for a significant and productive percentage of the population, jeopardizing the patients and their dependents, burdening the State and causing disorder to clinics of hospitals in comings and goings and waiting in lists that can take time.

Laparoscopic operation can be performed with general anesthesia in a safe and economic way, postoperative analgesics and length of hospital stay are less than open hernia repair cases.[11]

This will reduce total hospital cost of hernia repair, and even better where bed patient ratio is below optimum.

Quality of life

In our study improvement in quality of life was significant with fewer rates of complication, reduced patient discomfort and early return to work.

CONCLUSION

The study was conducted with an intention to evaluate the efficacy and complication rate, day of return to activity and work, quality of life with laparoscopic IPOM inguinal hernia repair using fibrin glue.

It was intended to establish the use of fibrin glue as choice of mesh fixation and IPOM as procedure of choice as day care surgery.

Now to conclude our study,

- Most of the inguinal hernia surgery can be carried out smoothly via laparoscopic IPOM, as day care surgery.
- Patients with comorbidity operated under laparoscopic IPOM had faster recovery without any increased risk by surgical/anesthetic procedure. It makes laparoscopic IPOM choice of procedure also in patients with comorbidity.

- All patients returned to normal activity within 1 day and to work also earlier.
- There is no increased recurrence after using fibrin glue to fix the mesh. The intra-operative complications of damage to blood vessels and nerves traversing the lower end is nullified with the use of glue as it is non-penetrating and non-traumatic, as well a natural acting adhesive device.
- Overall cost of surgery decreased, not in terms of OT, but indirect benefit in terms of economics because of early return to activity and work, less days of sick leave i.e. more productive time, low complication rate reducing medical expenditure.

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