

# Laparoscopic TAPP Inguinal Hernia Repair: Mesh Fixation & Peritoneal Closure by Sutural Technique

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## Abstract:

**Background:** The laparoscopic transabdominal preperitoneal (TAPP) inguinal repair is an evolving technique associated with well-known advantages of a minimally invasive approach. This prospective study was conducted to evaluate the feasibility, safety and effectiveness of laparoscopic TAPP using sutural mesh fixation & peritoneal closure. Intracorporeal sutural technique needs steep learning curve.

**Methods:** Between May 2018 to December 2019, a total of 41 inguinal hernias underwent TAPP repair in 37 adults under general anesthesia. All the patients scheduled for elective inguinal hernia repair were offered the choice of the laparoscopic TAPP repair under general anesthesia. A detailed explanation of the procedure was given to all patients and informed consent was obtained. We used 2/0 vicryl for mesh fixation & peritoneal closure which took only 6.80 US Dollar in comparison to Protack from Covidien which is 167.80 US Dollar. Intraoperative & postoperative variables were recorded in pre structured proforma.

**Results:** The 41 hernia includes 34(82.92%) direct, 07(17.08%) indirect. Unilateral hernia were 33(89.19%),

& bilateral were 4(10.81%). Mean operating time for unilateral cases was 122 minutes & for bilateral 210 minutes. Mean operating time in the cases using 3D-4K image system was 70 minutes. Mean duration of hospital stay was 2.9 days. There was no conversion in this study. Postoperative complications included scrotal seroma 2(5.40%), hematoma 1(2.70%), port site infection 2(5.40%) & mesh infection 1(2.70%). Assessment of intensity of postoperative pain was evaluated according to VAS. 05 patients complained of mild pain: pain on the visual analog score (VAS) = 1-3 during one month follow-up. No patient reported with chronic pain & recurrence during the follow-up period.

**Conclusion:** TAPP inguinal hernia repair with sutural mesh fixation & peritoneal closure is a feasible & safe technique with minimum postoperative morbidity and maximum patient's satisfaction.

**Key words:** TAPP (Transabdominal preperitoneal), 3D (Three dimensional), Intracorporeal suturing.

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## Introduction:

A hernia, an abnormal protrusion of an organ or tissue through a defect in its surrounding wall is a very common surgical problem.<sup>1</sup> Various sites of the body

are vulnerable to the occurrence of hernia, but the abdominal wall particularly the inguinal region is most commonly involved region.<sup>2</sup> Inguinal herniorrhaphy is one of the most common operations that general surgeons perform.<sup>3</sup> Following laparoscopic revolution, laparoscopic hernia repair has become one of the commonest laparoscopic operation. Several studies have demonstrated a definite advantage over open repair with respect to reduced postoperative pain and earlier return to work and normal activities.<sup>4,5</sup> Laparoscopic hernia repair is widely used nowadays for groin hernia and it is considered as gold standard for recurrent and bilateral inguinal hernias. There are two standardized techniques of laparoscopic inguinal hernia repair: transabdominal preperitoneal (TAPP) repair, described by Arregui et al.<sup>6</sup> in 1992, and totally extraperitoneal repair, described by Mckernan and Lawa<sup>7</sup> in 1993. TAPP

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is relatively easy to learn but has the disadvantage in that the peritoneal cavity is breached. One of the difficult parts of the operation is mesh fixation and peritoneal closure. At present, various mesh fixation and peritoneal closure method in TAPP exist, including tacks, staples, fibrin glues, sutures etc.<sup>8</sup> Which method to choose depends on many factors such as personal belief, local habits and dogmas, postoperative pain factor and cost effectiveness. Fixation of mesh with metal staples, apart from increasing cost, may lead to new postoperative groin pain which even becomes chronic in small percentage of patients. Fibrin glue though not causes postoperative pain but it is not cost effective. Sutures are low cost item, causes less postoperative pain but usually require expertise in laparoscopic suturing & longer operating times. Using 3D-4K image system can makes this difficult procedure easier. A recent clinical study by Baum et al. stated that significant advantages were found in suturing and cutting of anatomical structures when using 3D visualization.<sup>9</sup> Sahu et al. stated that the 3D group had a distinct advantage with significantly shorter time periods for the operations. The physicians cited the superior image quality particularly in respect to depth perception as the decisive factor for the more rapid procedure.<sup>10</sup>

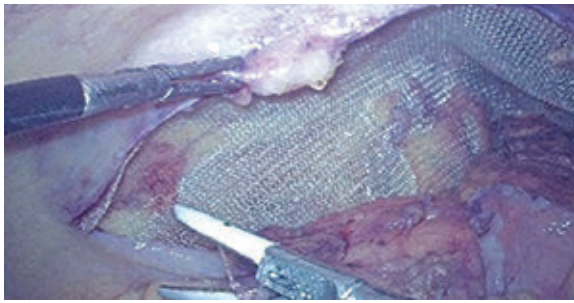
Today, surgeons are adopting the recent trends of laparoscopic methodologies with respect to reduced postoperative pain, earlier return to work and normal activities.<sup>4,5</sup> The current study was designed to validate the performance of TAPP repair of inguinal hernia with mesh fixation and peritoneal closure by intraperitoneal suture technique as cost-effective approach. The study also focused the feasibility and safety of performing TAPP inguinal hernia repair in-terms of duration of surgery, Mean duration of hospital stay was 2.9 days & return to normal activities in 5 days, intra & postoperative complications, postoperative pain by visual analogue scale (VAS), and recurrence.

### Patients and methods

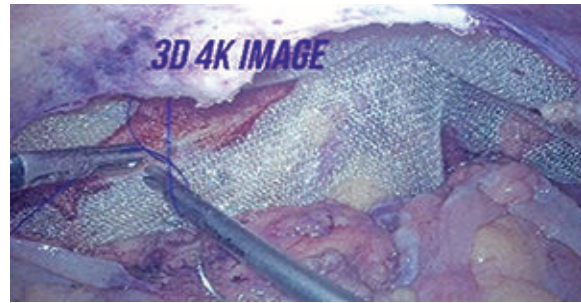
**Patients:** This prospective observational study was carried out in Cumilla Medical College Hospital & Surgicare hospital(private), Cumilla, Bangladesh from May 2018 to December 2019. A total of 37 patients were included in the study with preoperative diagnosis of

direct, indirect, pantaloon, bilateral and recurrent inguinal hernia. The patients from either sex above 18 years of age were selected. Exclusion criteria included large scrotal hernia, complicated cases, history of pelvic surgery and medically unfit for general anesthesia. All the patients scheduled for elective inguinal hernia repair were offered the choice of the laparoscopic TAPP repair under general anesthesia. A detailed explanation of the procedure was given to all patients and informed consent was obtained. A broad-spectrum antibiotic was given intravenously as prophylaxis with induction of anesthesia. Urinary catheterization was performed with Foley catheter in all patients.

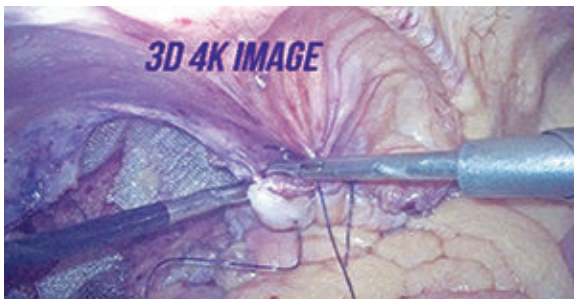
**Surgical Technique:** The procedure was performed with the patient under general anesthesia. The patient was placed in the supine position. A standard 10mm trocar was placed 2 cm above the umbilicus for pneumoperitoneum and insertion of the laparoscope. Pneumoperitoneum from 12 to 15mmHg was reached with CO<sub>2</sub>. Two additional 5 mm trocars were placed 7.5cm away from primary port following baseball diamond concept. Trendelenburg position achieved. The contents of the hernia were reduced into the abdomen. The peritoneum was incised starting 1 cm above the anterior-superior iliac spine, extending transversely medially until the medial umbilical ligament to enable the formation of peritoneal flaps. Inferiorly, the peritoneal flap was dissected to identify the cord structures, triangle of doom, and psoas major muscle. After the dissection, a polypropylene mesh measure 15×12cm was tailored, rolled, and introduced through the 10 mm port into the created space. The mesh was then unrolled to cover the entire myo-pectineal orifices on the affected side (covering the direct, indirect and femoral orifices) (Fig 1). The mesh was anchored to cooper's ligament, superomedially to rectus and superolaterally (Fig 2) to conjoint muscle with 2/0 vicryl round body needle. Because of the potential nerve injury, suturing not applied to inferolateral region. The peritoneal defect was closed with 2/0 vicryl round body needle (Fig 3). No tack, staples or glue applied in this series. 10 mm port closed using port closure device (Fig 4). 3D-4K image technology used in 10 cases for better depth perception & superior image quality to reduce the time of the procedure.



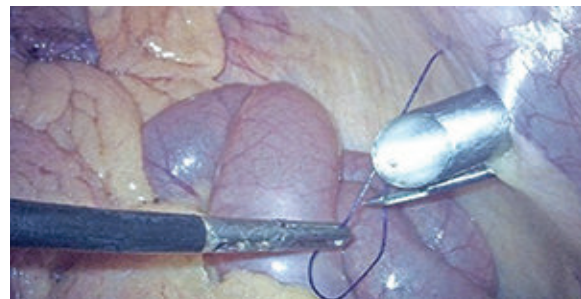
**Fig.-1:** Mesh placement. 3D image



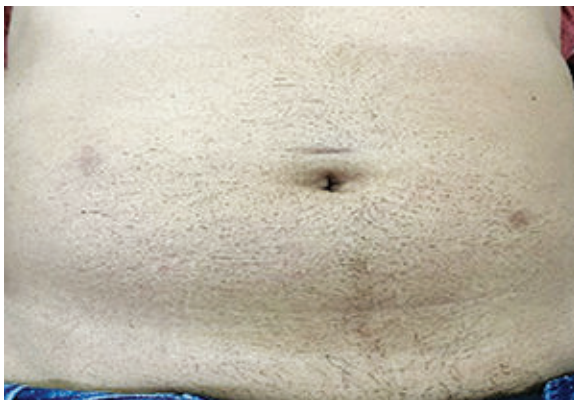
**Fig.-2:** Superolateral fixation



**Fig.-3:** Peritoneal closure by 2/0 vicryl



**Fig.-4:** 10 mm port closure view. 3D image



**Fig.-5:** Port scar view after 1 month

**Evaluation:** The operating time and the duration of the hospital stay were recorded. All the patients were followed up postoperatively to detect early complications such as scrotal seroma, hematoma, orchitis and port site infection. To evaluate chronic discharging sinus, delayed abscess or mesh infection, chronic pain in the groin or thigh and recurrence, patients were routinely assessed as outpatient basis or were contacted by telephone 1,3,6,12 and 24 months postoperatively. Assessment of intensity of postoperative pain evaluated according to the visual

analogue scale (VAS). This scoring system is graded from 0 to 10, where 0=none or no pain, VAS 1-3=mild pain, VAS 4-6=moderate pain, and VAS 7-10=severe pain.

### Results

A total of 37 patients (36 male and 1 female; mean age 38 years; age range 20-75 years) who underwent TAPP hernia repair with mesh fixation & peritoneal closure by sutural technique were studied. The 41 hernia includes 34(82.92%) direct, 07(17.08%) indirect. Unilateral hernia were 33(89.19%), & bilateral were 4(10.81%). The demographic data are shown in Table 1.

**Table-I**

<i>Demographic and types of hernia</i>	
Patients	N=37
Age in years mean/range	38/20-75
Male/female	5/01
Direct hernia (%)	34(82.92%)
Indirect hernia (%)	07(17.08%)
Unilateral hernia (%)	33(89.19%)
Bilateral hernia (%)	04(10.81%)

Low cost item 2/0 vicryl used for mesh fixation & peritoneal closure instead of costly tacks (Table 2).

**Table-II**

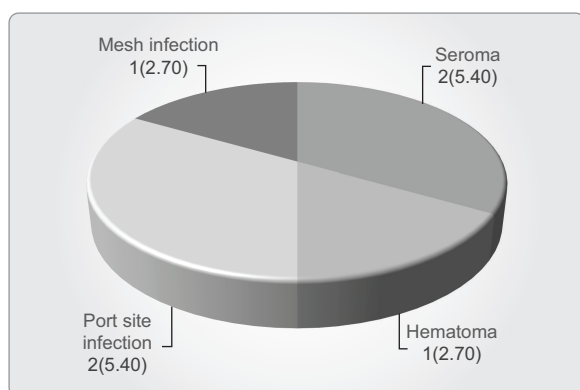
<i>Cost of fixation item</i>	
Fixation item	Cost
2/0 Vicryl	6.80 US Dollar
Protack from Covidien	167.80 US Dollar

Mean operating time for unilateral hernia was 122 minutes and for bilateral hernia was 210 minutes. Mean operating time in 3D case was 70 minutes (Table 3). No conversion was needed in our series. Mean duration of hospital stay was 2.9 days & return to normal activities in 5 days.

**Table-III**

<i>Mean operating time</i>	
Procedure	Mean operating time
Unilateral cases	122 minutes
Bilateral cases	210 minutes
Unilateral cases(10 cases) by 3D-4K image	70 minutes

Postoperative complications included seroma 2, hematoma 1, port site infection 2 and mesh infection in 1 case (Chart 1)). No discomfort, fatigue, foreign body sensation, seroma abscess, orchitis, ileus or recurrence observed in this series.



**Fig-1:** Postoperative complications

Assessment of intensity of postoperative pain was evaluated according to VAS. 05 patients complained of mild pain: pain on the visual analog score (VAS) = 1-3

during one month follow-up. No patient reported with chronic pain & recurrence during the follow-up period.

### Discussion:

We designed this study to assess the feasibility and safety of TAPP inguinal hernia repair using sutural fixation of mesh & closure of peritoneum. Laparoscopic hernia repair has got a steep learning curve. This is due to difficulty in various steps of operation. They are preperitoneal space creation, sac dissection, spreading of mesh, mesh fixation & closure of peritoneum. Mesh fixation & peritoneal closure are more highlighting steps of this study. There are different types of mesh fixation & closure of peritoneum technique currently followed. The cost-effective method is sutural technique, used in the present study. The suturing technique is expertise dependent, time consuming but it is reliable. Closure of peritoneum done by continuous suturing. Sealing ensured after the procedure in order to avoid intestinal adhesion, obstruction or preventing peritoneal fluid entering the preperitoneal space. The other easy methods are fixing the mesh with synthetic tackers and glue but these methods are not cost-effective.<sup>11</sup> Cyanoacrylate glue can cause allergic reactions in some patients. Due to its cost-effective issue, low socioeconomic group might be benefited much with this technique.

The mean operating time in current study was 122 minutes for unilateral hernia, 210 minutes for bilateral & 70 minutes for unilateral cases done by 3D-4K image. The operating time for unilateral hernia was 61.60(±27.40) minutes & was 82.52(±22.73) mints for bilateral hernia in the study done by Eisa A et al.<sup>12</sup> More operating time in our study was due to sutural technique. 3D-4K image technology used in 10 unilateral cases where operating time reduced considerably owing to superior image quality & depth perception.

5 patients of this study complained of mild pain (pain on the visual analog score (VAS) = 1-3) during one month follow-up. No patient reported with chronic pain. Studies reported that about 10% patients experience severe chronic pain causing impairment of everyday activities.<sup>13,14,15</sup> In two meta-analysis comparing open anterior repair with laparoscopic repair, laparoscopy seemed to be advantageous because it is associated with less postoperative pain, earlier recovery, and less absence from work.<sup>16,17</sup> These advantages of

laparoscopic repair may be explained by the preperitoneal location of the mesh far from the inguinal sensory nerves. We attempted to avoid chronic pain by avoiding tacks & applying loose knot. Fixation of mesh with tacks or staples, apart from increasing cost, may lead to new postoperative groin pain which becomes chronic in small percentage of patients.

Current study presents only a few early postoperative complications like seroma 2(5.40%), hematoma 1(2.70%), port site infection 2(5.40%) and mesh infection 1(2.70%) case. Seroma & hematoma were self-limiting. Port site infections managed by regular dressing and antibiotics. Mesh infection case of our series underwent incision & drainage of pus through inguinal approach & regular dressing with antibiotics, alright after 2 months. Generally infected mesh compelled removal but this lucky patient was an exception. Still he is our telephonic follow-up. A report of 3017 cases showed the incidence of seroma and hematoma was 8%. Most seromas were self-limiting, however, some patients required aseptic puncture and aspiration.<sup>18</sup> Incidence of seroma reported 1.9 to 11% in a study done by Lepere M et al.<sup>19</sup> 1 out of 60 patients of TAPP reported port site infection in a study done by Nawaz et al.<sup>20</sup> Mesh infection is generally the most challenging postoperative complication. Scheuermann U et al reported 3 cases of mesh infection out of 316 TAPP cases in their study.<sup>21</sup> Mesh infection mostly requires a re-operation to remove the infected mesh. Studies have shown that prophylactic use of antibiotics in high risk populations can significantly reduce the risk of mesh infection.<sup>22</sup>

Recurrence is the most important end point of any hernia surgery. It requires proper & thorough knowledge of anatomy and proper technique to keep the recurrence in endoscopic repair to a minimum.<sup>23</sup> The factors leading to recurrence includes surgeons inexperience, inadequate image quality, inadequate dissection, insufficient prosthesis size, insufficient prosthesis overlap of hernial defect, improper fixation, prosthesis folding, missed hernias and mesh lifting secondary to hematoma formation.<sup>24</sup> The reported incidence of recurrence after TAPP was around 0-3% in the study done by Weiser HF et al.<sup>25</sup> In our series we did our best to avoid recurrence moreover sutural mesh fixation is more secured. Recurrence not reported in our study still.

### Conclusion:

Sutural mesh fixation & peritoneal closure in TAPP is cost effective but needs surgeon's expertise in intracorporeal suturing. Useful for the patients of low socioeconomic class. Of-course it is time consuming. World latest 3D-4K image technology makes this difficult procedure easier & duration of surgery lowered to a considerable level. We recommended further studies to find out the feasibility of this technique.

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