



## RESEARCH ARTICLE

### LAPAROSCOPIC E-TEP TECHNIQUE FOR VENTRAL HERNIAS

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## INTRODUCTION

Ventral Hernia is a bulge through an opening in the abdomen. The ventral hernia can occur at previous incision site called incisional hernia. Incisional hernia is one where peritoneal sac herniates through an acquired scar in the abdominal wall, usually caused by a previous surgical operation or an accidental trauma. Incisional ventral hernia incidence is up to 28% after surgery through incision sites and the optimal treatment for ventral hernia is still on the table for debate (1). Ventral hernia may be umbilical, paraumbilical, Epigastric, incisional, Spigelian, parastomal, and lumbar. Sometimes this term creates confusion, because in Europe the term "Ventral hernia" is used for incisional hernia, while in USA this term is used for abdominal wall hernia, other than groin hernias (2). Daily in the world millions of surgeries are being performed by both open or conventional and laparoscopic techniques, with 3–20% incidence of incisional hernia. Primary abdominal hernia can occur spontaneously at any area of natural weakness of abdominal fascia and muscles. Ventral (incision) hernia is a common complication after open abdominal surgeries with an incidence of approximately 10% (3). The reported incidence of incisional hernia after midline laparotomy is 3–20% and becomes doubled if the wound gets an infection (4). Usually 50% of incisional hernias are detected within 1 year of surgery, but they can occur several years after surgery, with a subsequent risk of 2% per year (5).

Every year in the world, millions of abdominal surgeries are performed for different indications, and incisional hernia is one of the major complications of these surgeries, resulting in an increased morbidity and putting burden of cost on patients. It is estimated that each year approximately 10,000 repairs are performed in the UK, and 100,000 are performed in the USA (6). Ventral hernia occur through anterolateral abdominal wall; the structure of this wall consists of many layers including the skin, fat, fascia, muscles, and peritoneum. The order of abdominal wall layers change at different location. Above the arcuate line (imaginary line between the umbilicus and pubic symphysis), the fascia of internal oblique aponeurosis envelopes the rectus sheath. The external oblique aponeurosis always lays anterior to the internal oblique aponeurosis and the transversus abdominis aponeurosis always posterior to it. Below the arcuate line, all three layers of aponeurosis become anterior to the rectus muscle and it is no longer enveloped. The only fascial layer below the rectus is the transversalis fascia which is separated from the transversus abdominis aponeurosis (7, 8). These layers work together to give strength to the abdominal wall and prevent the intestine, omentum, and other tissues from bulging out. Causes of ventral hernia may be congenital (Ehler Danlos syndrome, Marfan's syndrome, etc.) or acquired (surgery, trauma). If patient developed abdominal hernia having no previous surgery at the hernia site, these are often due to weakness in the abdominal wall present at birth. As the patient becomes older or injured, this weakness can worsen, leading to hernia. Other risk factors are pregnancy, obesity, history of previous

hernia or abdominal surgeries, injuries of abdominal wall, family history of hernia, frequently lifting or pushing heavy objects, chronic cough, straining during defecation or micturition, some medicines such as steroids, incisional hernia (ventral) can occur after any abdominal surgery, but they are more common in some patients, such as in old patients, obese patients, diabetics, Patients using steroid, lung disease, smoking, surgical site infection, postoperative repeated vomiting, postoperative abdominal distension (intestinal obstruction). All these have been related to increased incisional hernia rate. This occurs most often after a long incision in the middle of the abdomen, but they can occur through incisions anywhere on abdomen (9). Over the time this can decrease the strength of tissue, predisposing patient to develop hernia. Tissue strength following surgery can only achieve an 80% tensile strength of previous healthy tissue; this is an additional effect in the formation of incisional hernia. In this way after second midline laparotomy the maximum tissue strength would be 80% of 80%, which will be 64%, and this 80% predicted.

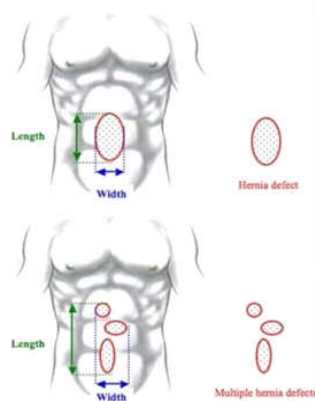
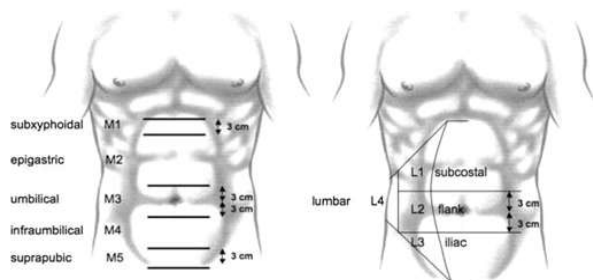
If these conditions are present, the chance of incisional hernia formation further increases. Until now it is thought that incisional hernia results mainly from a technical failure in the surgical closure of the abdominal wall. However it is known that, there are complex patients, surgical and post-operative, variables influence incisional hernia development. In 2009, European hernia society classification 10 for both primary and incisional abdominal wall hernias was published. Localization and size of hernia were used as two variables for defining and describing hernia sac.

#### Primary abdominal wall hernia classification

- Midline: Epigastric and umbilical.
- Lateral: Spigelian and lumbar.
- Diameter: small (<2cm), medium (2-4cm), large (>4cm).

#### Incisional hernia classification

- Midline: subxiphoidal (M1), Epigastric (M2), umbilical (M3), Infraumbilical (M4), suprapubic (M5).
- Lateral: subcostal (L1), flank (L2), iliac (L3), lumbar (L4).
- Width: W1 (<4cm), W2 (4-10cm), W3 (>10cm).
- Recurrent incisional hernia. (46)



EHS			
Incisional Hernia Classification			
Midline	subxiphoidal	M1	
	epigastric	M2	
	umbilical	M3	
	infraumbilical	M4	
	suprapubic	M5	
Lateral	subcostal	L1	
	flank	L2	
	iliac	L3	
	lumbar	L4	
Recurrent incisional hernia? Yes <input type="radio"/> No <input type="radio"/>			
length: cm		width: cm	
Width	W1	W2	W3
	<4cm	≥4-10cm	≥10cm
cm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#### AIMS AND OBJECTIVES

Management of outcome of eTEP in ventral hernia with following objectives:

- Feasibility of eTEP.
- Cost
- Duration of surgery.
- Postoperative Complications
- Recurrence rate.

#### MATERIAL AND METHODS

After obtaining the ethical clearance from the Institutional Ethical Committee, the present study was conducted over a period of two years in the Postgraduate Department of General Surgery, Government Medical College, Srinagar at S.M.H.S. Hospital, as a part of single centre prospective observational study. The study was undertaken to evaluate short term outcome of Extended View Totally Extra peritoneal repair for ventral hernia.

#### Inclusion criteria

Patients diagnosed with ventral abdominal wall hernia.

#### Exclusion criteria

- Poor skin condition.
- Sinus tract.
- Previous retro rectus mesh replacement
- Defect width >12cm

#### METHODOLOGY

Patients included in the study, who were to undergo eTEP for Ventral hernia, were admitted one day before surgery from the outpatient department. Following admission, a detailed history and physical examination was performed after gaining informed consent. Investigations performed were: Complete Blood Count, Kidney Function Tests, Liver Function Tests, X-Ray Chest, 12 lead ECG, Radiological imaging (Ultrasound or CT scan). CT investigation is to be done for knowing the defect size, contents of sac, and abdominal wall anatomy. Further relevant investigations were advised depending on the clinical situation. An intravenous antibiotic was administered one hour before surgery in all cases.

#### LAPAROSCOPIC E-TEP REPAIR FOR VENTRAL HERNIA OPERATIVE TECHNIQUE

**POSITION OF PATIENT AND PORTS:** The patient is placed in the supine position with both arms tucked and extended at the hips to enable instrumentation without hindrance from the pelvis and thighs. The procedure is performed under general anaesthesia. For umbilical, infra-umbilical and suprapubic hernias, the TV monitor is placed at the foot end. For supraumbilical, Epigastric hernias, the TV monitor is placed at the head end.

**ENTERING THE RETRORECTUS SPACE:** A 15-mm incision is given below the left costal margin at the left mid-clavicular line. A 10-mm telescope is inserted into this space. Retro-rectus space is created with a Telescopic dissection that is further dissected with an energy source. The dissection proceeds caudally until the pubic bone is completely visualised. The lateral limit of the dissection is carefully maintained keeping medial to the linea semilunaris to prevent any inadvertent injury to the neurovascular bundle.

**CROSSING THE MIDLINE:** Two more 5-mm ports are made in the retro-rectus space medial to the linea semilunaris at the midclavicular line at a distance of 5 cm from each other. The telescope is shifted to the lower port to visualise the cranial end of the space and the left posterior rectus sheath is incised at its medial

margin with a diathermy hook or scissors. The yellow pad of fat is seen that represents the falciform ligament. This is dissected down from the roof to cross the midline and visualise the right posterior rectus sheath. A right retro-rectus space is created and another port is placed in this space. The camera is shifted to the right upper port for further dissection. The left upper ports are then used as working ports.

**For Epigastric and subxiphoidal hernias:** Initial entry is from a left paraumbilical port. In these cases, we cross the midline from below. This is technically easier since the extraperitoneal space blends into the retro-rectus spaces cranially.

#### ENTERING THE PERITONEAL CAVITY AT THE DEFECT

The dissection is continued caudally until we reach umbilicus. The peritoneum is opened with an energy source at a safe distance from hernia sac to enter the peritoneal cavity. The contents are inspected and dissected down carefully with sharp dissection and judicious use of energy source, especially in the presence of a bowel.

**CLOSURE OF THE LINEA ALBA:** The defect is closed at a lower insufflation pressure with a 45-mm taper cut 1 polypropylene or a 1-0 or 2-0 barbed non-absorbable sutures. The posterior rectus sheath is closed with absorbable barbed suture or 2-0 PDS.

**PLACEMENT AND FIXATION OF MESH:** The mesh size depends on the defect size and the space created. Generally, a 20 cm × 25 cm Prolene mesh is used for eTEP RS where the mesh is placed flat from one linea semilunaris to another and from epigastrium to pubis. Fixation of mesh is not required. The gas insufflation is then stopped and space is deflated under vision taking care that the mesh is flat.

**POSTOPERATIVE CARE:** Postoperatively patients were monitored in the ward. For immediate postoperative pain relief, injectable analgesics were given later oral analgesics were given. Early ambulation was encouraged and orals were allowed in the evening on the same day of operation. Patients were discharged from the hospital as soon as the patient became ambulatory and tolerated orals. Patients were then called for follow-up at 1 week, 1 month, 3 months and 6 months.

#### Following parameters were recorded:

- Information on gender, age, comorbidities and past surgical history.
- Hernia characteristics like type of hernia whether supraumbilical, paraumbilical or infraumbilical.
- Operative time was recorded from the time of skin incision to closure of ports.
- Postoperative complications if any were recorded.
- Wound was assessed for any seroma, hematoma or Wound infection.
- Duration of hospitalization of each patient was noted.
- Recurrence up to 6 months was evaluated by physical examination during regular follow ups.

#### STATISTICAL METHODS

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Statistical software SPSS (version 20.0) and Microsoft Excel were used to carry out the statistical analysis of data. Continuous variables were expressed as Mean # SD and categorical variables were summarized as percentages. For patient satisfaction, surgical satisfaction questionnaire (SSQ-5) was used:

Q1. How satisfied are you with how your pain was controlled in the hospital after surgery.

Q2. How satisfied are you with how your pain was controlled when you returned home after surgery.

Q3. How satisfied are you with the amount of time it took for you to return to your daily activities, e.g. housework or social activities outside the home.

Q4. How satisfied are you with the amount of time it took for you to return to work.

Q5. How satisfied are you with the results for your surgery.

All the above questions contained five options via: a) Very satisfied b) Satisfied c) Neutral. D) Unsatisfied e) Very unsatisfied.

## OBSERVATION AND RESULTS

#### AGE DISTRIBUTION

Of the total 25 study patients, majority i.e. 10 (40%) patients belonged to the age group of 41-50 years followed by 8 (32%) patients who belonged to age < 40 years, 4 (16%) were aged between 51-60 years and 3 (12%) patients were 61-70 years. The mean age of the patients in our study was 46 # 13.5 with youngest patient being 32 years and oldest being 66 years.

Table 1. Age distribution

AGE (YEARS)	NUMBER	PERCENTAGE
< 40	8	32%
41-50	10	40%
51-60	4	16%
61-70	3	12%
TOTAL	25	100%

MEAN#SD(RANGE)= 46 ± 13.5 (32-66 YEARS)

**GENDER DISTRIBUTION:** Among the study patients Females outnumbered males in our study with only 2 (8%) males and 23 (92%) females.

Table 2. Gender distribution of study patients

GENDER	NUMBER	PERCENTAGE
FEMALE	23	92
MALE	2	8
TOTAL	25	100

**CLINICAL PRESENTATION:** In our study patients swelling anterior abdominal wall was the major complaint in all patients with associated dull aching pain in 10 patients (40%).

Table 3. Chief Complaints At Presentation among Study Patients

CHIEF COMPLAINTS	NUMBER	PERCENTAGE
SWELLING	25	100
PAIN	10	40

**DIAGNOSIS OF THE STUDY PATIENTS:** The diagnosis of the study population revealed that most of the patients had Infraumbilical Hernia i.e. 48%. The second common diagnosis was found to be Umbilical Hernia i.e. 32%. The least common diagnosis in the patients was Infra-umbilical hernia. In our study patients postoperative complications are one patient (4%) had mesh or wound infection and 1 patient (4%) had seroma formation.

Table 4. Diagnosis of Study Patients

DIAGNOSIS	NUMBER	PERCENTAGE
SUPRAUMBILICAL HERNIA	5	20
UMBILICAL HERNIA	8	32
INFRAUMBILICAL HERNIA	12	48
TOTAL	25	100

**HOSPITAL STAY:** In our study patients Mean Hospital stay of the study patients was 2.9 # 0.6 days.



**PATIENT SATISFACTION:** On the basis of questionnaire, based on five questions, the patient satisfaction after the procedure was evaluated. Meanwhile, 17 patients (68%) were satisfied with the procedure, 6 patients (24%) were very satisfied with the procedure, 1 patient (4%) was neutral and 1 patient (4%) was unsatisfied with the procedure.

**Table 5. Operative time of Study Patients**

OPERATIVE TIME (MINUTES)	NUMBER	PERCENTAGE
< 150	5	20
151-180	10	40
181-210	4	16
>210	6	24
TOTAL	25	100

MEAN ± SD (RANGE)=178.2±36.2 (150 -240 MINUTES)

**POST OPERATIVE COMPLICATIONS**

**Table 6. Postoperative complications of study patients**

COMPLICATIONS	NUMBER	PERCENTAGE
SEROMA/HEMATOMA FORMATION (V1)	1	4
MESH AND WOUND INFECTION (V2)	0	0
RECURRENT E (V3)	0	0

**HOSPITALSTAY**

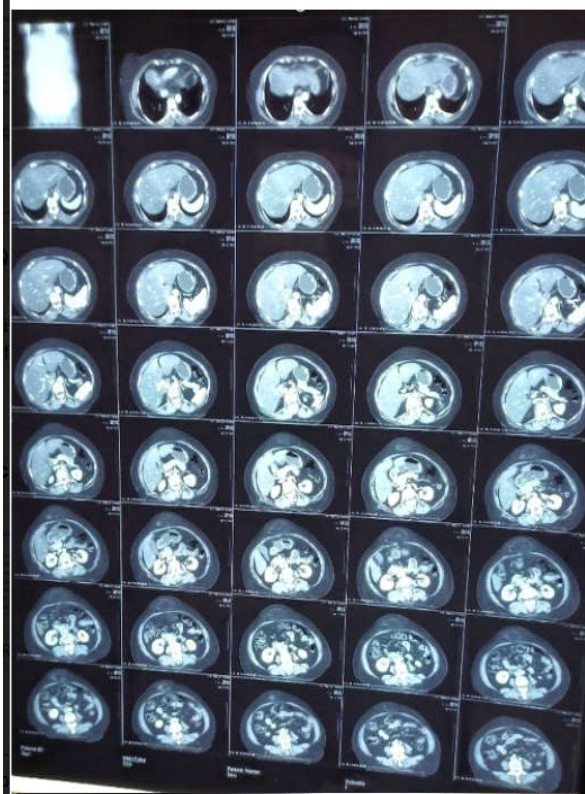
In our study patients Mean Hospital stay of the study patients was 2.9 # 0.6 days.

HOSPITALSTAY (DAYS)	NUMBER	PERCENTAGE
2 DAYS	6	24
3 DAYS	16	64
4 DAYS	3	12
TOTAL	25	100

MEAN±SD (RANGE)=2.9 ±0.6 (2 - 4 DAYS)

**RECURRENCE**

In our study patients after a follow up of 2 weeks, 1 month, 3 months, 6 months no recurrence was noted.



**Fig. 1. ct scans Of patient showing- Anterior Abdominal wall**

**Herniaat Supraumblical region**

**Table 7. Recurrence of disease at various**

RECURRENCE OF DISEASE AT	NUMBER	PERCENTAGE
2 WEEKS	0	0
1 MONTH	0	0
3 MONTH	0	0
6 MONTH	0	0

**Table 8. Patient satisfaction of studypatients**

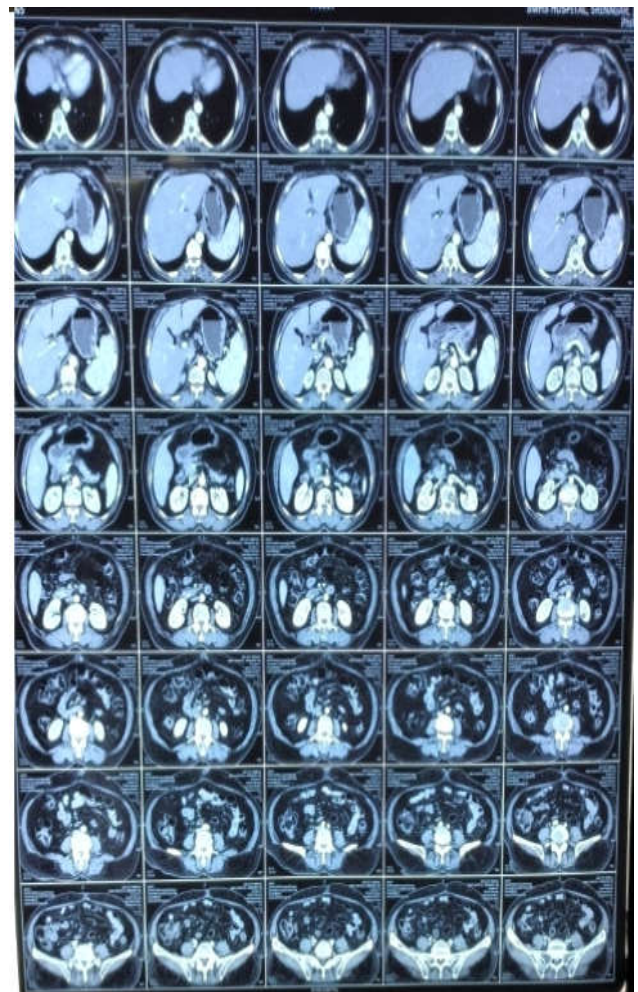
PATIENT SATISFACTION	NUMBER	PERCENTAGE
VERY SATISFIED	6	24
SATISFIED	17	68
NEUTRAL	1	4
UNSATISFIED	1	4
TOTAL	25	100

**RECURRENCE**

In our study patients after a follow up of 2 weeks, 1 month, 3 months, 6 months no recurrence was noted.

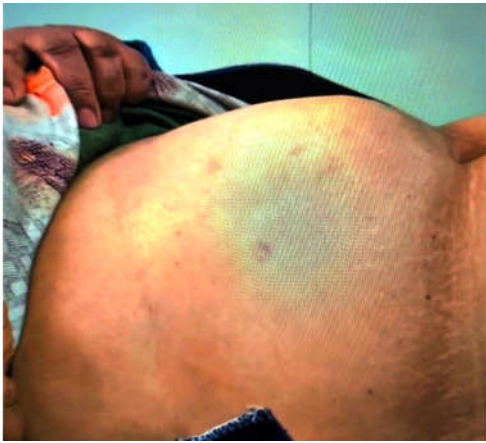
**Table 9. Recurrence of disease at various**

RECURRENCE OF DISEASE AT	NUMBER	PERCENTAGE
2 WEEKS	0	0
1 MONTH	0	0
3 MONTH	0	0
6 MONTH	0	0



**Fig. 2. Ct scan of patient showing parietal wall defect in epigastric region**

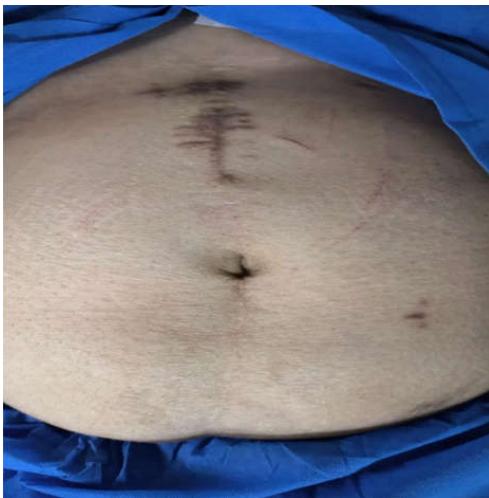




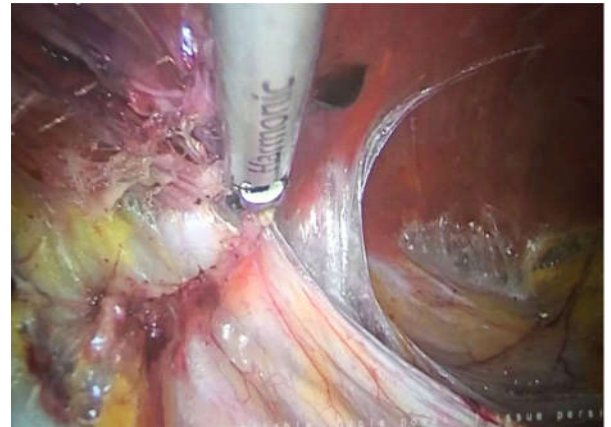
**Fig 3. Preoperative Picture of a Patient Showing Supraumbilical Bulge of ventral Hernia**



**Fig. 6. First Port placement For E-TeP technique**



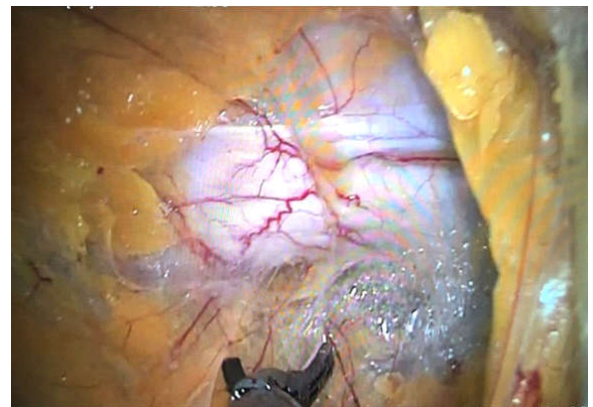
**Fig 4. Preoperative Picture of a patient Showing Upper Midline Incisional Hernia**



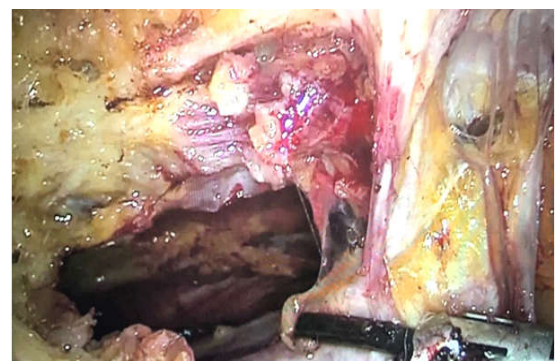
**Fig. 7. Creation of retrorectus space**



**Fig. 5. Laparoscopic instrument**



**Fig. 8. Extension of retrorectus space**



**Fig. 9. Superior Crossover In The Midline**



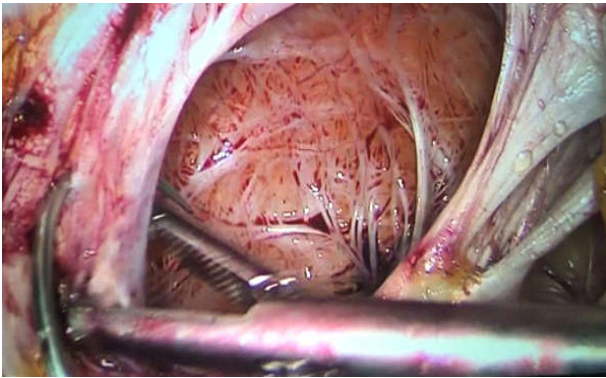


Fig. 10. Reducing the contents of hernial sac



Fig.14 unrolling of mesh in E-tep space

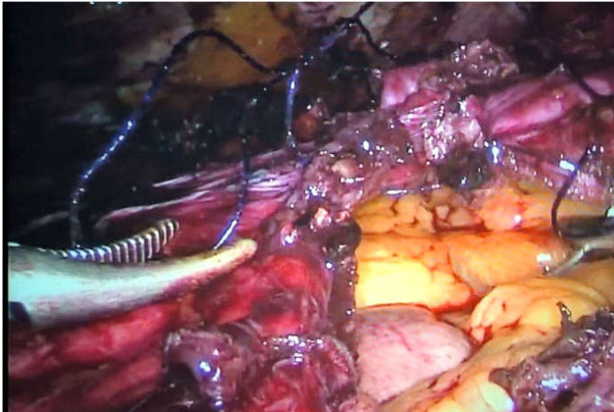


Fig 11. Closure of Rectus Sheath defect



Fig. 15. Display Of Prolene Mesh In The Retrorectus Space



Fig. 12. Prolene Mesh 30cm\*30cm



Fig 16. Post operative Picture Of the Patient Showing Port Placement after E-Tep rs Procedure



Fig.13. Preparation of prolene mesh by rolling.



Fig. 17. Postoperative picture of the patient at 3 Weeks after e-tep rs procedure for lower midline incisional hernia

## DISCUSSION

This research entitled evaluation of Laparoscopic extended view totally extraperitoneal repair for ventral wall hernia was conducted in the postgraduate department of general surgery Govt. Medical College, Srinagar for 18 months. Since the early 1900s, laparoscopy has provided surgeons the hope with new and innovative ways to treat various surgical problems. Many of these minimally invasive procedures have gained universal acceptance at present by demonstrating improved outcomes. This has been applied to the treatment of ventral wall hernias, and many laparoscopic techniques for repair have been described. The laparoscopy is safe and reliable method and best results can only be achieved if a surgeon is proficient in the technique, has clear understanding of the anatomy and perform it on a regular basis. The goals of hernia repair include minimizing intraoperative and postoperative complications, achieving effective repair, lowest possible recurrence and early return to normal life, patient satisfaction and better cosmetic results. In our study, the mean age was 46 years. No patient below 32 years presented to us. The highest incidence was seen in the age group of 41-50 years.

According to the study by Rajkiran K Deshpande and Sumit Talwar International Journal of Surgery Science 2019 the average age of patients was 39.66 (43). Study by Metin Ertem, Tuncer Babür, Emel Özveri (2020) Average age was 46.4 years (29-68) (44). Our study included 25 patients, out of which 23 were females and 2 males. Females outnumbered in the study. According to study by Baig SJ, Priya P. Extended totally extraperitoneal repair (eTEP) for ventral hernias: Short-term results from a single centre. J Min Access Surgery 2019, females were 72 % and males 28% with ventral hernia (38). It is almost similar in trend as our study, taking sample size into consideration. The mean operative time in our study was 178.2 minutes. The study conducted by Baig SJ, Priya P. (2019) the mean operative time was 176.48 minutes (38). The study conducted by Rajkiran K Deshpande and Sumit Talwar (2019), the mean operative time was 2.88 hrs. (43). During postoperative period on follow up one patient had mesh or wound infection and 1 patient had seroma formation on fall (managed by single aspiration). There was no reported recurrence of hernia in our study. According to the study by V. G. Radu, M. Lica, Springer-Verlag France SAS, part of Springer Nature (2019), there was one seroma formation out of 60 patients in the postoperative period, no infection or recurrence (40). Similar study conducted by Baig SJ, Priya P. (2019) showed one seroma formation out of 21 patients with no other major complications (38).

During our study, the mean (#SD) postoperative hospital stay of the study group of 25 patients was 2.9 (#0.6) days with a range of 2-4 days, with 6 patients (24%) discharged on 2nd POD. A study by Rajkiran K Deshpande and Sumit Talwar (2019). Mean duration of stay in the hospital was 2.16 days (43). There was no recurrence of the disease noted in any of the study group of patients during various follow ups at 2 weeks, 1 month, 3 months and at 6 months. Study by Igor Belyansky, Jorge Daes (2017 surg Endos) shows hernia recurrence 1.3% (37). Study by Dr Bharat Bhushan Sharma, Dr Sanjay Singhal (2022 European Journal of Molecular & Clinical Medicine) shows no recurrence (45). On the basis of a surgical satisfaction questionnaire (SSQ-5), patient satisfaction was evaluated, 92% patients (68% satisfied, 24% very satisfied) were found satisfied with the procedure. Our study favours eTEP as a feasible and viable option for Ventral hernia repair in our hospital setup.

In our study of eTEP approach we used uncoated polypropylene meshes. These meshes are affordable, thus decreasing the costs of the procedure compared to the IPOM, where much more expensive meshes with an adhesion barrier are commonly used. Another study by Penchev D, Kotashev G, Mutafchyski V (2019) shows mean Hospital stay of 2.9 days (42).

## CONCLUSION

In our study, it was concluded, that eTEP technique has a place in the armamentarium of hernia surgeons. This technique is feasible and viable option for Ventral hernia repair in our hospital setup. ETEP is now gaining popularity because of lesser learning curve, offers better vision of the operative field, better ergonomics for surgeons. Surgeons with sufficient experience in minimally invasive surgery of the abdominal wall can execute the eTEP-RS approach to repair ventral hernias and produce effective and reproducible results. Since it is a new procedure, research with long-term follow-up will be required to better define the results over time. Comparative studies between various existing ventral hernia repair techniques will also be required to understand the true indications and restrictions, and the outcome of this growing technique for hernia repair.

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