Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/h280xx53

COMPARISON BETWEEN ENHANCED VIEW TOTAL EXTRA-PERITONEAL RETRO-MUSCULAR (ETEP) APPROACH VERSUS INTRAPERITONEAL ONLAY MESH (IPOM) FOR VENTRAL HERNIA REPAIR

Muhammad Ammar Fayyaz[1], Ch Muhammad Aqeel[2*], Pir Muneeb Rehman[3], Faryal Ufaq[4], Hafiz Zia Farooq[5], Hanzla Khalid[6], Mohammed Aslam[7]

[1]THQ hospital Safdar Abad district Sheikhupura, Pakistan. Email: ammarfiaz@gmail.com
[2*]Assistant Professor of Surgery, Azra Naheed Medical College, Lahore, Pakistan
Email: muhammadaqeel685@gmail.com
[3]Assistant Professor Surgery, Services Institute of Medical Sciences Lahore, Pakistan
Email: dr_pm@outlook.com
[4]Senior Registrar Surgery CMA Teaching Hospital Lahore, Pakistan. Email: faryal2011@gmail.com
[5]Senior Registrar Surgery, CMA Teaching Hospital Lahore, Pakistan.
Email: Ziiafarooq93@gmail.com
[6]Khalid Clinic Village Maingri Ansarian P.O Noorkot Tehsil Shakargarh District Narowal, Pakistan
Email: hanzlagee@gmail.com
[7]Professor of Surgery Azra Naheed Medical college Lahore, Pakistan.
Email: aslam_mohammed1964@homailcom

***Corresponding author:** Ch Muhammad Aqeel
*Email: muhammadaqeel685@gmail.com

ABSTRACT

Background: Ventral abdominal hernia repair is frequent for general surgeons. IPOM commonly places mesh intra-abdominally. Modern procedures such extended extra-peritoneal retro-muscular approach (eTEP) have advantages over intra-peritoneal onlay mesh. Using post-operative discomfort, surgical site infection risk, and hospital stay, this research compares these two treatments.
Study design: randomized controlled trial
Study place and duration: Department of Surgical Unit-I, Chaudhry Muhammad Akram Teaching & Research Hospital , Azra Naheed Medical College , Lahore (From Nov 2023 to Oct 2024)
Patients and Methods: 49 ventral hernia patients were randomised into IPOM and eTEP repair groups of 24 and 25. Patients were monitored for discomfort, wound infection, hospital stay, and hernia recurrence after surgery. All data was recorded and analysed with SPSS 26.
Results: Mean age of the patients was 41.49 ± 10.962 years. Mean in-hospital stay ($p<0.05$), pain score at 6 months ($p=0.012$), grade of SSI ($p=0.01$), and rate of SSI at 1 week (0.003) differed significantly among the groups. Two cases of recurrence within 6 months of follow-up were reported in IPOM whereas none in eTEP group, however, this difference was not significant ($p=0.235$). Rest of the outcome variables was comparable between the groups.
Conclusion: The findings of this study indicate that enhanced view extraperitoneal retromuscular sublay repair for ventral hernia correlates with reduced hospital stay, decreased likelihood of chronic pain, and lower incidence of post-operative surgical site infections.

Keywords: IPOM, eTEP, VAS score, recurrence, postoperative pain

INTRODUCTION

Abdominal ventral hernias are flaws in the abdominal wall fascia that are neither inguinal nor hiatal. They are often encountered in healthcare environments. General surgeons often do procedures to rectify these abdominal wall anomalies.[1] Congenital ventral hernias are often linked to genetic diseases or in utero insults, but acquired hernias may arise from chronic tissue stress (as seen in multigravida women or those experiencing recurrent weight fluctuations), trauma, or may be iatrogenic in origin.[2, 3] The incidence of post-surgical hernia formation is contingent upon the surgical method used; specifically, midline laparotomy presents a 10% risk, muscle-splitting transverse incision a 5% danger, and laparoscopic repair less than 1% risk. [4] The principal sites of weakness in the abdominal wall include the umbilicus, linea semilunaris, inguinal regions, and oesophageal diaphragmatic hiatus. Surgical scar sites and osteotomy locations may act as the sites for incisional and parastomal hernias, respectively. The maximum achievable tissue tensile strength post-surgery is limited to 80%.[5]

An abdominal wall hernia often presents as localised discomfort, a sensation of fullness, or swelling that may change position with movement. In instances of confinement or strangulation, the swelling may sometimes seem erythematous or lead to asymmetries.[6] An abdominal hernia is usually identified by patient history and physical examination; however, a significantly elevated BMI, a critical risk factor, may complicate the diagnostic process. [7] Considering that activity or posture might induce variations in hernia, it is essential to assess the patient in many postures throughout the examination.[8] In the medical history, it is essential to enquire about the first observation of the hernia, any triggering events, erythema, accompanying discomfort, constipation, the dimensions of the swelling, variations in size and causes influencing these changes, previous occurrences of hernias, and fluctuations in weight. [9]

Among ventral hernias, the incisional hernia is the most prevalent, after by umbilical, paraumbilical, and epigastric hernias. Hypogastric and Spigelian hernias are hardly seen.[10] Incisional hernias typically occur in the infraumbilical region, where the posterior rectus sheath is lacking. Smaller abdominal wall defects can lead to complications like strangulation and incarceration. Ventral hernias are more common in South-east Asian populations, with the order being incisional, umbilical, paraumbilical, epigastric, spigelian, and hypogastric. In Pakistan, the most common are infraumbilical.[11, 12]

Significant risk factors linked to hernia include weight, gender, great multiparity, previous abdominal trauma or surgery, and a familial history of hernia development. Regular exercise has a negligible negative connection with hernia. Chronic cough, weightlifting, and recurrent fluctuations in weight can contribute to the development of hernia. Females are more predisposed than males to have abdominal hernias. Complications may be mitigated via prompt diagnosis, accessible medical intervention, and public health education. To prevent recurrence, novel treatment techniques should be explored. [13]

Laparoscopic ventral hernia repairs using an intraperitoneal onlay mesh (IPOM) implant are classified as minimally invasive (MIS) treatments. Enhancements in surgical technique were among the modifications used in the advancement of laparoscopic operations, alongside the utilisation of novel coated meshes and anchoring devices. The traditional onlay and retromuscular/preperitoneal options were discarded because to these technological improvements.[14]

OBJECTIVE: To compare the outcomes of enhanced view total extra-peritoneal retro-muscular approach versus intraperitoneal onlay mesh for ventral hernia repair.

MATERIALS AND METHODS

Study design: It was a randomized control trial in which 49 patients were randomly allocated into 2 groups where Group A (24 patients) underwent intraperitoneal onlay mesh repair while Group B (25

patients)had retromuscular extraperitoneal sublay mesh repair.

Study place and duration: It was conducted at Department of Surgical Unit-I, Chaudhry Muhammad Akram Teaching & Research Hospital , Azra Naheed Medical College , Lahore (From Nov 2023 to Oct 2024)

Inclusion of patients: Patients of age 20-60 years of either gender undergoing elective laparoscopic Ventral Hernia Repair for hernia defect size up to 5cm.

Exclusion of patients: Patients with BMI>35 kg/m^2, having immunosuppressive or co-morbid conditions (CLD, CRF) causing more chances of surgical site infections, recurrent hernia, with emergency indications of hernia repair, requiring intra-operatively gut resection and anastomosis.

Sample size: The sample size 24 in both groups (total 48) was estimated by using following formula: keeping power of study at 90%, confidence level at 95% and mean pain score with eTEP as 2.0 ± 1.1 and with IPOM as 3.5 ± 2.0. Calculated sample size of our study turned out to be 48 with at least 24 patients to be included in each group. However, total data of 49 patients was collected. 24 patients were allocated into IPOM group and 25 into eTEP group.

Sampling technique: Non-probability, purposive sampling was used to enroll participants and they were randomly allocated in both groups using the lottery method.

Data Collection procedure: This research was carried out following the approval of the hospital's ethical committee. Both procedures are safe and were conducted following the explanation and acquisition of written consent from all patients. The patient faced no harm or threat to life. The confidentiality of the patient was maintained, and the patient retained the right to withdraw from the study at any time.
Forty-nine patients with ventral hernia who met the inclusion criteria were selected from the outpatient department of General Surgery at CMA Hospital, Azra Naheed Medical College, Lahore. Routine laboratory investigations included complete blood count (CBC), renal function tests (RFTs), liver function tests (LFTs), clotting profile, viral markers, and ultrasound. A total of 49 patients were initially enrolled in the study following the acquisition of informed consent and were subsequently randomised into a treatment group utilising a randomisation lottery technique. Demographic information, including name, age, gender, duration, and type of hernia, was recorded at the time of enrolment. All patients received laparoscopic ventral hernia repair performed by a single surgical team, with the assistance of a researcher. A total of 24 patients underwent the IPOM procedure, while 25 patients were treated using the eTEP approach. The procedure was conducted under general anaesthesia and rigors aseptic protocols. Postoperatively, all patients received the same broad-spectrum antibiotics and analgesics. Postoperative pain levels were assessed by the on-duty surgical resident 48 hours after surgery, utilising the visual analogue pain scale. The duration of hospital stay was documented, and patients were observed for the development of surgical site infections through follow-up assessments at 1 week, 2 weeks, 4 weeks, and 6 months. Patients unable to attend follow-up appointments were contacted via telephone to evaluate pain severity and identify any symptoms indicative of surgical site infection. Surgical site infections were assessed using the Southampton scoring system. Data collection was conducted using a pre-designed proforma.

Data Analysis: The data was entered and analyzed in SPSS version 26. T-test/ Mann-Whitney test was used to compare the numeric variables in both groups and Chi-square test to compare categorical variables in both groups taking p-value <0.05 as statistically significant.

RESULTS

In this trial, the mean age of participants was 41.49 ± 10.962 years. Mean weight was 85.86 kilograms with standard deviation of 17.617. Weight showed normal distribution among the study population. Only one female had epigastric hernia in the absence of any risk factors. Her BMI was recorded to be 23.5 kg/m^{2}with no history of prior surgery. However, that patient had intraperitoneal onlay mesh repair and hernia contents were made primarily by omentum with no part of stomach, esophagus, bowel or other abdominal viscera within the hernia sac. Table I

Table I: Baseline characteristics of patients enrolled in the trial (n=49)

		Group	
		IPOM (n = 24)	eTEP (n = 25)
Age (in years, mean±SD)		42	41
Sex	Male	7	9
	Female	17	16
Weight (in kgs, mean±SD)		87	84
Type of hernia	Umbilical / paraumbilical	18	18
	Incisional	5	7
	Epigastric	1	0
	Spigelian	0	0
	Hypogastric	0	0

Mean duration of in-hospital stay among whole study population was 2.143 ± 1.2247 days (1 to 5 days) while those of IPOM and eTEP group were 2.625 ± 1.2959 and 1.680 ± 0.9670 days respectively. There existed difference of duration of hospital stay in terms of statistical significance ($p<0.05$) among the study groups. Mean VAS score in eTEP group at 1-week follow-up was 3.48 whereas in IPOM group, it was 4.87. At the follow-up of six months, mean VAS score of IPOM group was 0.96 ± 0.751 as opposed to that of 0.16 ± 0.374 of the eTEP group ($p=0.012$). These indicate that use of onlay mesh is associated more with the chronic pain that immediate post-operative one. Table II

		Group		**p-value**
		IPOM (n-24)	**eTEP (n-25)**	
Duration of stay (days)		2.6±1.30	1.7±0.97	0.0083
Pain at 1 week	Mean±SD	4.87±3.29	3.48±2.38	0.096
	0	2	4	0.07*
	1	3	2	
	2	1	3	
	3	3	4	
	4	4	3	
	5	1	2	
	6	2	4	
	7	2	3	
	8	1	0	
	9	2	0	
	10	3	0	
Pain at 2 weeks	Mean±SD	2.13±1.57	1.24±1.17	0.0288
	0	4	9	0.263
	1	5	6	
	2	7	5	
	3	2	5	
	4	4	0	
	5	2	0	
Pain at 4 weeks	Mean±SD	1.21±0.88	0.68±0.69	0.0230

	0	5	11	0.443
	1	11	11	
	2	6	3	
	3	2	0	
Pain at 6 months	Mean±SD	0.96±0.75	0.16±0.37	0.00002
	0	7	21	0.012*
	1	11	4	
	2	6	0	
Surgical site infection at	1 week	11	2	0.003**
	2 weeks	6	2	0.110**
	4 weeks	2	0	0.235
	6 months	0	0	NA
SSI grade	Mean±SD	1.2±1.57	0.27±0.94	0.001*
Recurrence		2	0	0.235

Surgical site infections were assessed by examination on hand of researcher and graded correspondingly. Similar to pain scores, prevalence of SSI in both the groups gradually declined due to clearance of infection such that no patient reported any SSI at 6 months. Significantly higher number of cases having SSI was observed in the first follow-up at 1 week interval (Pearson chi-square test, p=0.001; Fischer exact, p=0.003) in the IPOM group. Insignificant differences were found in rates of surgical site infections in the later follow-ups (2-week, p=0.110; 4-week, p=0.235). IPOM vs eTEP SSI was compared and the incidence of SSI was (45.9 % vs 8.0%) at 1 week, (25.0% vs 8.0% t 2 weeks, (8.3% vs 0.0%) at 4 weeks. The grade of SSI differed highly significantly (p=0.001) in groups. The mean SSI grade noticed in the IPOM group had been IA according to Southampton SSI score while in eTEP group, it lied somewhere between 0 and 1.

Two cases of recurrence of hernia were reported in the 6 month follow-up in the IPOM and none in the eTEP group. Although this difference was not statistically significant (Pearson chi-square, p=0.235; Fischer Exact, p=0.141). When rate of recurrence was compared to the duration of hospital stay, prolonged in-hospital stay showed slight association with lower chances of recurrence (2.17 versus 1.5 days, p=0.037). Table II

At any point in the follow-up time period, pain score in eTEP group stayed lower relative to IPOM group, however, statistically significant difference was obtained at 6 months duration. Mean VAS scores for pain in IPOM were higher as compare to eTEP at 1, 2 and 4 weeks and at the follow-up of 6 months which may be attributed to the higher incidences of SSI during this time period. VAS score gradually declined over follow-up interval in IPOM vs eTEP (45.9 % vs 8.0%) at 1 week, (25.0% vs 8.0% t 2 weeks, (8.3% vs 0.0%) at 4 weeks. Fig I & Table II

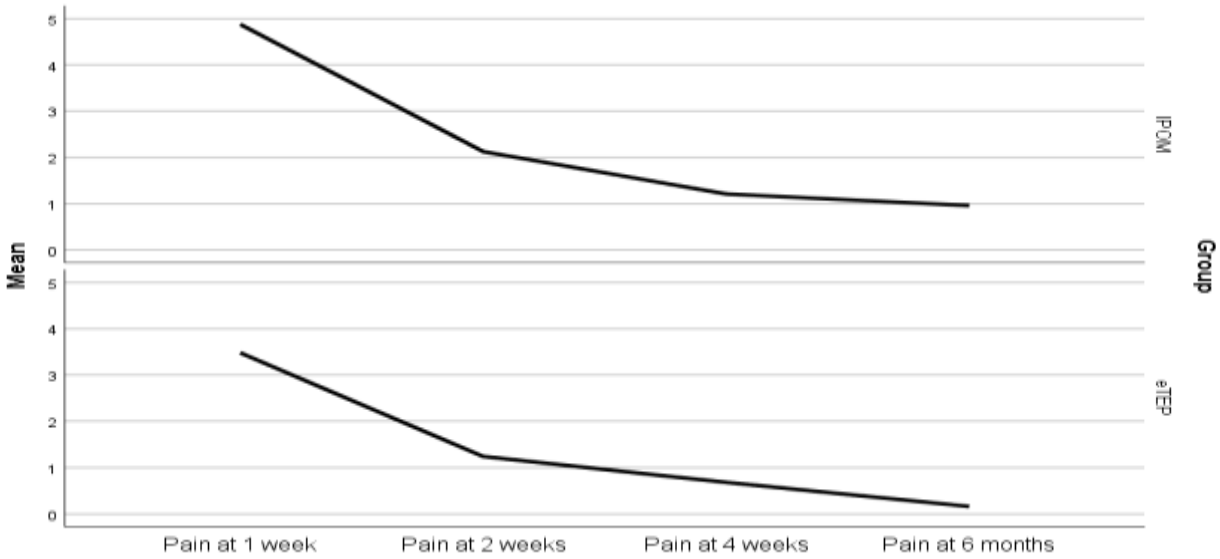

Figure Error! No text of specified style in document.**I: VAS scores in groups**

DISCUSSION

This study, conducted in Surgical Unit-I of CMA Hospital Lahore, involved 49 patients randomised into two groups for IPOM or eTEP ventral hernia repair. Significant differences were observed in pain levels at the 6-month follow-up, the rate of surgical site infections within one week post-surgery, the grade of surgical site infection, and the duration of hospital stay. The placement of the mesh influences these post-operative variables.

The duration of hospital stay was longer in the IPOM group, aligning with findings from another randomised controlled trial comparing IPOM plus and eTEP.[15] In alignment with this study, we observed no recurrences in the eTEP group, while the IPOM group exhibited two cases of recurrence. However, the difference in recurrence rates was not statistically significant in our study, nor in that conducted by Bellido Luque and colleagues.[15]

The study involved 79 patients with ventral hernia, comprising 39 patients in the IPOM+ group and 40 in the eTEP group. The eTEP group and IPOM+ group exhibited significantly extended operating times and prolonged hospital stays. On the first, seventh, and thirty-first postoperative days, the eTEP group exhibited significantly lower pain levels compared to the IPOM+ group. Activity restrictions for the eTEP group were significantly diminished on the 30th and 180th days post-surgery. At 30 and 180 days post-surgery, significant improvements in cosmetic outcomes were observed in the eTEP group. The average follow-up duration in the eTEP group was 15 months, whereas in the IPOM+ group, it was 28 months. No significant differences were observed, with no recurrences in the eTEP group and one recurrence in the IPOM+ group.[15]

The study by Berrevoet and colleagues yielded comparable results. The study compared retromuscular repair (group I) and open intraperitoneal repair (group II) in patients with umbilical hernia, utilising a sample size of 116. In contrast to our study, group I had a significantly longer mean hospital stay (3.8 days compared to 2.1 days, $p<0.001$) than group II. The recurrence rate was higher with intraperitoneal repair compared to retromuscular mesh repair, although this difference was not statistically significant. After one year, the quality of life for both groups was similar.[16]

Pain scores in our study showed minimal variation among the groups during the initial follow-ups; however, significant differences were observed at the 6-month interval. This phenomenon can be attributed to the increased likelihood of mesh migration associated with IPOM, resulting in chronic pain for these patients. eTEP does not facilitate mesh migration, resulting in a lack of chronic pain complaints.

The incidence of surgical site infections differed among the groups at the 1-week follow-up. In contrast to our study, research conducted at Lahore General Hospital identified the IPOM technique

as a more effective method for managing paraumbilical and umbilical hernias, particularly regarding surgery duration, postoperative pain, hospital stay, and hernia recurrence rates.[17]

The findings of our study are corroborated by a prospective randomised study conducted in Georgia, which demonstrated that while the technique employed does not impact recurrence, the location of mesh placement may affect post-operative complications.[18] The duration of the operation in the retromuscular group was significantly longer than that in the onlay group ($p<0.001$). Wound complications were observed in the retromuscular group at a rate of 22.1%, while the onlay group exhibited a rate of 50.0%. A statistically significant difference was observed (p-value < 0.001). Seroma was reported as most prevalent post-surgical complication, i.e. 16.9% vs 41.0%, respectively ($p= 0.0013$), while for other complications including wound infection or hematoma, there is no difference in both techniques.

Weiland et al., also conducted a trial on 123 patients, out of which 92 had eTEP and 31 had IPOM. The IPOM group had prologned admission time (eTEP: 3days vs. IPOM: 4days, p-value < 0.001). The IPOM had significantly shorter operative time (median: 66.5 vs. 106.5 min; p-value = 0.043) but less postoperative complications were observed with eTEP (eTEP: 4.17% vs. IPOM: 25%, p-value = 0.009). Pain level was also less with eTEP as compared to IPOM.[19]

In a systemic review, Li et al., included 5 trials containing 433 patients and compared IPOM technique with eTEP for abdominal hernia repair. It was observed that eTEP had prolonged surgical duration [difference = 44.79; 95%CI: 26.57-63; P-value = 0.00001], less postoperative pain after 24 hours (difference = -3.90; 95%CI: (-4.42)-(-3.38); P-value < 0.00001), and after a week (difference = -3.72; 95%CI: -6.09--1.35; P=0.002), and also less hospital stay (difference = -0.56; 95%CI: (-0.74)-(-0.39); P-value = 0.00001). But in difference was observed regarding complications including seroma, hematoma, intraoperative complications, and postoperative ileus in both groups. [20]

CONCLUSIONS:

Mean VAS scores for pain in IPOM were significantly higher than those in eTEP at both one week and six weeks. The incidence of surgical site infections (SSI) was significantly higher in the IPOM group during the one-week follow-up period. The reoccurrence rate was elevated in the IPOM group. The study found a significant difference between the two groups regarding pain, recurrence rate, and surgical site infection.

CONFLICT OF INTEREST: None

ACKNOWLEDGEMENT:

REFERENCES:

1. Latifi R, Haider A. Abdominal Wall Reconstruction in the Elderly: Techniques, Outcomes, and Pitfalls. Surgical Decision Making in Geriatrics: A Comprehensive Multidisciplinary Approach. 2020:219-28.
2. Smith JaP, J.D. (2020).Ventral Hernia. [online] PubMed. Available at: https://www.ncbi.nlm.nih.gov/books/NBK499927/ [Accessed 25 Feb. 2020].
3. Amato G. Inguinal Hernia: Pathophysiology and Genesis of the Disease: Springer; 2022.
4. Jelinek LA, Jones MW. Surgical access incisions. StatPearls [Internet]: StatPearls Publishing; 2023.
5. Techagumpuch A, Udomsawaengsup S. Update in parastomal hernia. Annals of Laparoscopic and Endoscopic Surgery. 2019;4.
6. Gossage JA, Burnand KM. The abdomen. Browse's Introduction to the Symptoms & Signs of Surgical Disease: CRC Press; 2021. p. 491-547.
7. Ciscar A, Badia JM, Novell F, Bolívar S, Mans E. Incidence and risk factors for trocar-site incisional hernia detected by clinical and ultrasound examination: a prospective observational study. BMC surgery. 2020;20:1-7.

8. Baucom RB, Beck WC, Phillips SE, Holzman MD, Sharp KW, Nealon WH, et al. Comparative evaluation of dynamic abdominal sonography for hernia and computed tomography for characterization of incisional hernia. JAMA surgery. 2014;149(6):591-6.
9. Yu H-X, Han C-S, Xue J-R, Han Z-F, Xin H. Esophageal hiatal hernia: risk, diagnosis and management. Expert review of gastroenterology & hepatology. 2018;12(4):319-29.
10. Jaykar R, Varudkar A, Akamanchi AK. A clinical study of ventral hernia. International Surgery Journal. 2017;4(7):2326-9.
11. Jasti R, Mohan K. Study of Hernias of Anterior Abdominal Wall of Andrapradesh. Indian Journal of Public Health Research & Development. 2019;10(8).
12. Hanif S, Hanif S, Nawaz M. Anterior abdominal wall hernias in regards to prevalence and risk factors. Pakistan Journal of Surgery. 2022;38(1).
13. AhmedAlenazi A, Alsharif MM, Hussain MA, Alenezi NG, Alenazi AA, Almadani SA, et al. Prevalence, risk factors and character of abdominal hernia in Arar City, Northern Saudi Arabia in 2017. Electronic physician. 2017;9(7):4806.
14. de Oliveira FMM, Cavazzola LT, Weltz AS, Belyansky I. Ventral abdominal hernia repair: MIS extraperitoneal repair techniques: eTEP Rives, MILOS/EMILOS, and onlay MIS repair. The SAGES manual of hernia Surgery. 2019:271-90.
15. Bellido Luque J, Gomez Rosado J, Bellido Luque A, Gomez Menchero J, Suarez Grau J, Sanchez Matamoros I, et al. Endoscopic retromuscular technique (eTEP) vs conventional laparoscopic ventral or incisional hernia repair with defect closure (IPOM+) for midline hernias. A case–control study. Hernia. 2021:1-10.
16. Berrevoet F, D'Hont F, Rogiers X, Troisi R, de Hemptinne B. Open intraperitoneal versus retromuscular mesh repair for umbilical hernias less than 3cm diameter. The American journal of surgery. 2011;201(1):85-90.
17. javed moeen Doctors A. COMPARISON BETWEEN OUTCOMES OF IPOM AND SUBLAY MESH HERNIOPLASTY FOR VENTRAL HERNIA. Pakistan Postgraduate Medical Journal. 2018;29(4):134-7.
18. Demetrashvili Z, Pipia I, Loladze D, Metreveli T, Ekaladze E, Kenchadze G, et al. Open retromuscular mesh repair versus onlay technique of incisional hernia: a randomized controlled trial. International Journal of Surgery. 2017;37:65-70.
19. Wieland L, Alfarawan F, Bockhorn M, El-Sourani N. Comparison of eTEP and IPOM for ventral hernia surgery in the early postoperative period: a retrospective cohort study of a tertiary university centre. Hernia. 2024;28(6):2195-206.
20. Li J, Wang Y, Wu L. The Comparison of eTEP and IPOM in Ventral and Incisional Hernia Repair: A Systematic Review and Meta-analysis. Surgical laparoscopy, endoscopy & percutaneous techniques. 2022;32(2):252-8.