INDEX COPERNICUS INTERNATIONAL

REVIEW ARTICLE

Systematic review and meta-analysis comparing ventral hernia repair using minimally-invasive extended totally extraperitoneal repair versus intraperitoneal onlay mesh repair

Authors' Contribution:
A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

Yegor Tryliskyy[1,2ABCDE], Volodymyr Tyselskyi[3BF], Andrii Kebkalo[3E], Nikita Ponomarov[3BE]

[1]Severn PGME School of Surgery, Bristol, United Kingdom
[2]The University of Edinburgh, Edinburgh, United Kingdom
[3]P.L. Shupyk National Medical Academy of Postgraduate Education, Kiev, Ukraine

Article history: Received: 21.12.2022 Accepted: 10.02.2023 Published: 17.02.2023

ABSTRACT:

Introduction: This systematic review and meta-analysis analysed was set up to compare totally extraperitoneal mesh repair (TEP) and intraperitoneal onlay mesh placement (IPOM) in patients undergoing minimally invasive ventral hernia mesh surgery (MIS-VHMS).

Aim: This systematic review and meta-analysis were set up to compare safety and effectiveness of eTEP and IPOM in patients undergoing MIVHMR.

Methods: A systematic literature searches of three major databases were conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines to identify studies that compared two techniques of MIS-VHMS: TEP and IPOM. Primary outcome of interest was major complications post-operatively, defined as a composite outcome of surgical-site occurrences requiring procedural intervention (SSOPI), readmission to hospital, recurrence, reoperation or death. Secondary outcomes were intraoperative complications, duration of surgery, surgical site occurrence (SSO), SSOPI, postoperative ileus, post-operative pain. The risk of bias was assessed using Cohrane's Risk of Bias tool 2 for randomized controlled trials (RCTs) and Newcastle-Ottawa score for observational studies (OSs).

Results: Five OSs and two RCTs al including total number of 553 patients were included. There was no difference in primary outcome (RD 0.00 [–0.05, 0.06], p = 0.95), incidence of postoperative ileus. Operative time was longer in TEP (MD 40.10 [27.28, 52.91], p<0.01). TEP was found to be associated with less postoperative pain at 24h and 7 days after surgery.

Conclusions: Both TEP and IPOM were detected to have equal safety profile and do not differ in SSO or SSOPI rates, incidence of postoperative ileus. TEP has longer operative time but provides better early postoperative pain outcomes. Further high-quality studies with long follow up evaluating recurrence and patient reported outcomes are needed. Comparison of other transabdominal and extraperitoneal MIS-VHMS techniques is another direction of future research.

KEYWORDS: eTEP, IPOM, minimally invasive hernia repair

ABBREVIATIONS

eTEP – enhanced view totally extraperitoneal
IPOM – intraperitoneal onlay mesh placement
MESH – Medical Subject Headings
MIS-VHMS – minimally invasive ventral hernia mesh surgery
MIVHMR – minimally invasive ventral hernia mesh repair
OSs – observational studies
PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analysis
RCTs – randomized controlled trials
SSI – surgical site infections
SSO – surgical site occurrence
SSOPI – surgical-site occurrences requiring procedural intervention
TEP – totally extraperitoneal mesh repair

INTRODUCTION

In 1993 LeBlanc et al. first described the intraperitoneal onlay mesh (IPOM) technique for minimally invasive ventral hernia mesh repair (MIVHMR) [1, 2]. The enhanced view totally extraperitoneal (eTEP) technique for the minimally invasive repair of ventral hernias has been described by Belyansky et al. [3]. Both techniques are widely used in in original approach and with modifications and choice between two is commonly a matter of surgeon's preference. Main known limitations of IPOM technique are: intraperitoneal mesh placement and traumatic mesh fixation. While retro-rectus mesh placement is deemed preferential by many for open ventral hernia repair, the ideal anatomic location of mesh placement in MIVHMR is debated and there are currently no definitive guidelines [2, 4].

Tab. I. Search strategy.

MEDLINE
(((hernia).ti,ab OR exp *"HERNIA, ABDOMINAL"/) AND ((IPOM).ti,ab OR (intraperitoneal).ti,ab)) AND ((e-TEP).ti,ab OR (eTEP).ti,ab OR (extraperitoneal).ti,ab OR (retromuscular).ti,ab OR (retrorectus).ti,ab OR (sublay).ti,ab OR (Rives Stoppa).ti,ab OR (Rives-Stoppa).ti,ab)
CINAHL
(exp *HERNIA/ AND ((IPOM).ti,ab OR (intraperitoneal).ti,ab)) AND ((extraperitoneal).ti,ab OR (retromuscular).ti,ab OR (retrorectus).ti,ab OR (sublay).ti,ab OR (Rives Stoppa).ti,ab OR (Rives-Stoppa).ti,ab OR (IPOM).ti,ab OR (intraperitoneal).ti,ab)
EMBASE
(((IPOM).ti,ab OR (intraperitoneal).ti,ab) AND ((e-TEP).ti,ab OR (eTEP).ti,ab OR (extraperitoneal).ti,ab OR (retromuscular).ti,ab OR (retrorectus).ti,ab OR (sublay).ti,ab OR (Rives-Stoppa).ti,ab OR (Rives Stoppa).ti,ab)) AND (exp *"ABDOMINAL WALL HERNIA"/ OR (hernia).ti,ab)

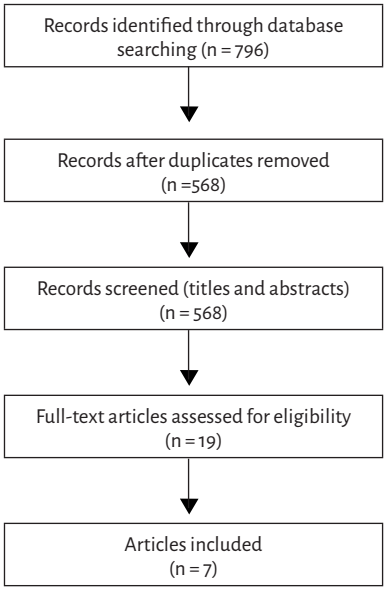


Fig. 1. Flowchart of the literature search.

AIM

This systematic review and meta-analysis were set up to compare safety and effectiveness of eTEP and IPOM in patients undergoing MIVHMR.

METHODS

Search strategy

The study was prospectively registered with PROSPERO (CRD 42021288563) and conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines [5].

The search terms were devised to cover technical aspects of MIVHMR to identify studies that provide direct comparison of eTEP and IPOM or modifications of these approaches. This was performed by using the following text words (including their synonyms/ variants) and Medical Subject Headings (MESH terms): laparoscopy, ventral hernia repair, incisional hernia repair, umbilical hernia repair, eTEP, IPOM, retro-muscular, retro-rectus, Rives-Stoppa. The search terms were combined using the Boolean AND/OR operators.

Medline, Embase, CINAHL were comprehensively searched. The initial database searches encompassed studies published in English from the inception date of each database to 31st of November 2021. Second search was run on the 1st of March 2022. In order to ensure that all relevant studies were identified, no restrictions were placed on the date of publication or regional state. Two reviewers identified relevant articles that provided direct comparison of eTEP and IPOM and modifications of these techniques in patients undergoing MIVHMR. Reference lists of all retrieved articles were manually searched to identify additional studies. Complete search algorithms for each database are available in Tab. I.

Studies published in English that fulfilled the following criteria were included: (1) studies that compared eTEP and its modifications with IPOM and its modifications in MIVHMR, (2) full text manuscripts.

Exclusion criteria

Studies were excluded from analysis: (1) studies in which it was not possible to extract data from the published results, (2) the studies contained re-published data, (3) studies published in other language than English, and (4) publications that are editorials, comments, letters, review articles, conference abstracts, retractions, case reports.

Outcome measures

Primary outcomes for this study were major complications at up to 2 years post-operative. Major complications were defined as a composite outcome of surgical-site occurrences requiring procedural intervention (SSOPI), readmission to hospital, recurrence, reoperation or death. Readmission was calculated as an independent major complication event irrespective whether this was associated with any interventions or not. Secondary outcomes included: intraoperative complications, surgical site occurrence (SSO), SSOPI, postoperative ileus, duration of surgery, postoperative pain. SSO included surgical site infections (SSI), seroma, wound dehiscence, enterocutaneous fistula, wound cellulitis, non-healing incisional wound, fascial disruption, skin or soft tissue ischemia, skin or soft tissue necrosis, wound serous or purulent drainage, stitch abscess, seroma, hematoma, and infected or exposed mesh [6]. SSOPI was defined as wound opening or debridement, suture excision, percutaneous drainage, or mesh removal [6]. Postoperative pain was assessed at 24 hours and 7 days.

Study selection

Study eligibility assessments, methodological quality assessments were independently performed by two investigators (YT and VT) using a standardized data form according to the predetermined selection criteria. Differences of opinion were resolved by consensus with the senior author (AK).

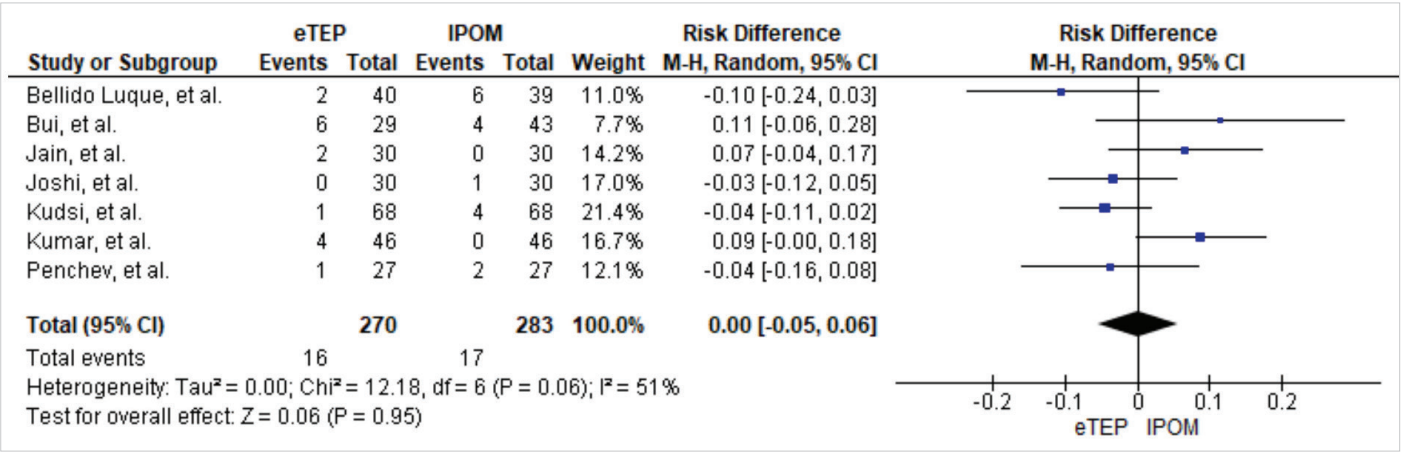


Fig. 2. Major complications.

Tab. II. Patients' characteristics.

REFERENCES	AGE (ETEP; IPOM)	MALE (%) (ETEP; IPOM)	BMI (ETEP; IPOM)	PRIMARY VENTRAL HERNIA (%) (ETEP; IPOM)	DEFECT AREA CM² (ETEP; IPOM)	HERNIA LOCATION
Penchev, et al. [14]	* 58.7 ±11.7; 55.6 ±14.1	55.5; 59.2	* 25.1 ±3.9; 27.1 ±3.2	29.6; 22.2	* 71.4 ±47.1; 76 ±53.2	M1–M5
Kudsi, et al. 13]	* 56.5 ±15.9; 57.8 ±12.7	52.9; 50	* 31.6 ±7; 31.2 ±5.7	58.8; 41.2	** 15.7 (11.7–23.5) 12.5 (3.9–24.3)	Medial lateral/both
Kumar, et al. [15]	* 44.24 ±7.45; 45.7 ±7.64	63; 63	* 28.6 ±4.15; 30.57 ±4.22	60.9; 54.3	* 3.89 ±0.85; 4 ±0.76	M1–M5
Bellido Luque, et al. [11]	* 60.1 ±12.3; 54.9 ±17.1	NP	* 27.2 ±5.0; 26.8 ±4.7	53; 35	* 62.9 ±23.4; 57.3 ±24.0	Midline
Bui, et al. [12]	** 57 (48–69); 57(49.5–67)	55.2; 51.2	** 30.5 (27.3–32.8); 30.5(27.3–34.3)	79.3; 60.5	* 9.1 ±7.2; 11.8 ±18.9	M2, M3, L2, L3
Joshi, et al. [10]	* 36;41	60; 50	NP	NP	NP	NP
Jain, et al. [16]	* 47.9 ±13.2; 47.1 ±10.9	47; 40	*27.9 ±1.5; 28.0 ±1.6	53.8; 50	*11.7 ±5.7;9.5 ±5.3	M2–M4

*Mean & standard deviation, **Median & interquartile range, NP – not provided; eTEP – extended totally extraperitoneal repair; IPOM – intraperitoneal onlay mesh repair.

Tab. III. Sample size, characteristics of studies and interventions.

REFERENCES	STUDY DESIGN	SAMPLE SIZE (ETEP; IPOM)	PROCEDURE TYPE	DEFECT CLOSURE (ETEP; IPOM)	MESH TYPE, EXTEND OF OVERLAP AND FIXATION TECHNIQUE (ETEP; IPOM)
Penchev, et al. [14]	O-RS	27/27	Lap	Yes/no	polypropylene medium weight macroporus mesh to cover the whole retro-rectus space without any fixation; PTFE mesh secured to the abdominal wall using double crown technique without transfascial sutures with at least 5 cm coverage of the defect in every direction.
Kudsi, et al. [13]	O-RS	68/68	Rob	Yes/yes	Polypropelene, polyester, ePTFE mesh, 94.1% not fixed. Mesh/Defect ratio: ** 16.9 (13.3–24.5); Polypropelene, polyester, ePTFE, absorbable all with fixation using absorbable sutures. Mesh/Defect ratio: **9.4 (7.5–20.2).
Kumar, et al. [15]	O-P	46/46	Lap	Yes/yes	medium weight polypropylene mesh with minimum 5 cm of overlap of the defect in each direction usually without any fixation; Composite (polyester mesh along with a second layer of anti-adhesive absorbable barrier of collagen) fixed using four transfascial and intracorporeal sutures with nylon suture material No. 2–0 (ethilon) with at least 5 cm overlap.
Bellido Luque, et al. [11]	O-RS	40/39	Lap	Yes/yes	Low-weight polypropylene mesh (Optilene® Mesh elastic, B. Braun) with fixation using Cyanocrylate glue (Histoacryl®, B. Braun), self-adhesive mesh (Parietex Progrip®, Medtronic). Complete cover of retrorectus space; PTFE-c mesh (Omyra® mesh, B. Braun) Non-absorbable, fixation with helicoidal sutures placed at 3 cm intervals (ProtackTM, Medtronic) in a double-crown fashion. The radius of the mesh was four times the radius of the defect) in the horizontal and vertical axis.
Bui, et al. [12]	O-RS	29/43	Lap	Yes/yes	macroporous polypropylene mesh to cover all retro-rectus cavity and no fixation; composite mesh fixed with non-absorbable tacks in a double-crown technique with at least 5 cm overlap to each side.
Joshi, et al. [10]	RCT	30/30	Lap	NP	NP
Jain, et al. [16]	RCT	30/30	Lap	Yes/Yes	heavyweight polypropylene mesh; dual mesh 5 cm overlap and doble crowning tacks.

**Median & interquartile range, O-RS – observational retrospective, O-RS – observational retrospective; O-P – observational prospective; RCT – randomized controlled trial; Lap – laparoscopic; Rob – robotic; NP – not provided.

Tab. IV. Newcastle-Ottawa score for observational studies.

STUDY	SELECTION	COMPARABILITY	EXPOSURE/OUTCOME	TOTAL SCORE
Bui, et al. [12]	****		**	6
Kudsi, et al. [13]	****	**	***	9
Penchev, et al. [14]	***		**	5
Bellido-Luque, et al. [11]	****		***	7
Kumar, et al. [15]	***		**	5

Data extraction

Data from each study reporting the outcomes of interest were extracted by two independent reviewers (NP, VT). The extracted data included the following: the basic characteristics of the study, including authors, year, sample size; the basic patient characteristics; characteristics of hernia; technical characteristics of surgery and mesh characteristics; comparative outcomes. Disagreement was resolved by discussion to reach a consensus; if an agreement between the two reviewers could not be reached, a third person (AK) was involved.

Risk of bias assessment

All studies were independently assessed by two investigators for quality and validity using the Newcastle – Ottawa score, in which patient selection, comparability of the study groups, and assessment of outcome were scored respectively and then these scores were added up to get a total score. The maximum total score obtained by this scoring system was 9, and studies with scores ≥7 were defined as high quality [7]. Cochrane Risk of Bias Tool 2 Algorithm was used for randomized controlled studies with the effect of principal interest being assignment to intervention at baseline [8]. Disagreements in the quality assessment were resolved by consensus.

Statistical analysis

All statistical analyses were performed using Revman software, version 5.3 (Cochrane Collaboration, The Nordic Cochrane Centre, Copenhagen). Meta-analysis was performed for primary outcomes as well as for secondary outcomes. Random-effects models to analyze data was used. Risk difference (RD) were calculated for dichotomous outcomes. A 95% confidence interval (CI) was recorded. Statistical heterogeneity was assessed using the I2 test statistic [9].

RESULTS

Description of study selection

The predefined search strategy captured 796 potentially relevant publications. In total, 228 duplicate studies were removed. After titles and abstracts screening, additional 549 studies were excluded. After full text screening of 12 studies were excluded. The full texts of the remaining 7 studies were reviewed and subsequently confirmed to be eligible to be entered into the review and meta-analysis [10–16]. The PRISMA flow diagram of this process is shown in Fig. 1.

Study characteristics

Five observational studies and two RCTs enrolled 553 participants that were included in the analysis [10–16]. All studies included patients who underwent MIVHMR repair using eTEP technique (or its modification) and IPOM technique (or modification of the IPOM). Overall, 270 and 283 patients were allocated and received intervention in the eTEP group and IPOM group, respectively. The main characteristics (patient and surgery related) of studies are provided in Tab. II.–III.

Risk of bias

Assessment of quality was based on journal articles. The risk of bias summary data is provided in Tab. IV.–V.

Primary outcomes

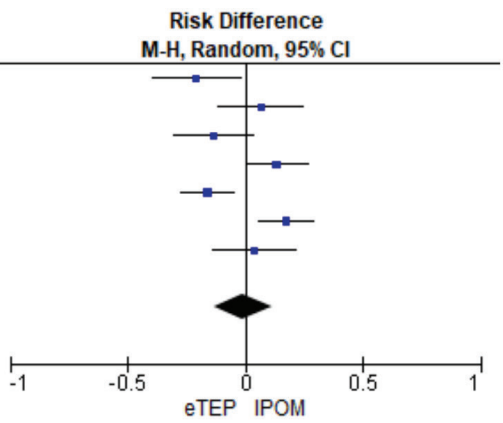
Major complications

In the study of Joshi et al. one patient from the IPOM group developed recurrence [10]. In the study of Kudsi et al., one patient in the eTEP group required percutaneous abscess drainage because of superficial SSI [13]. In the IPOM group, however, one patient developed superficial SSI, and one patient developed a deep SSI and wound dehiscence. Both patients were treated with drainage and antibiotic medication [13]. The other two patients with major complications in the IPOM group required mesh excision and primary closure of incision due to mesh infection, and exploratory laparotomy for small bowel obstruction, respectively [13]. In the study of Penchev et al. there was one readmission and one recurrence in IPOM group and in the eTEP group there was single episode of outpatient ultrasound-guided aspiration [14]. In the study of Bellido et al. in the eTEP group there was an episode of one postoperative retrorectus haematoma which required reoperation for haematoma removal. There was also one case of limited umbilical burned skin in the eTEP group. The devitalised navel skin was removed, and the wound was healed using a povidone iodine dressing. Five patients in the IPOM group were readmitted with paretic ileus. There was also one recurrence in the IPOM + group [11]. In the study of Bui et al. in the IPOM group there were four episodes of readmission. In the eTEP group, five patients were readmitted, and one patient had a major complication with post- operative small bowel obstruction, which required emergency operative intervention. The obstruction was due to a defect in the posterior rectus sheath through which the bowel strangulated. In the study of Jain et al. one patient in the eTEP group was readmitted and had exploratory emergency laparotomy which identified dehiscence of the posterior rectus sheath and small bowel strangulation. In the study of Kumar et al. two patients were readmitted with recurrence. The cause of recurrence was posterior rectus sheath dehiscence in both the cases. Both patients were operated for this. No difference between two techniques was found when RD of major complications as a composite outcome was calculated (RD 0.00 [-0.05, 0.06], p = 0.95) (Fig. 2.).

A

Study or Subgroup	eTEP Events	eTEP Total	IPOM Events	IPOM Total	Weight	Risk Difference M-H, Random, 95% CI
Bellido Luque, et al.	6	40	14	39	12.9%	-0.21 [-0.40, -0.02]
Bui, et al.	6	29	6	43	13.2%	0.07 [-0.11, 0.25]
Jain, et al.	2	30	6	30	13.7%	-0.13 [-0.30, 0.04]
Joshi, et al.	4	30	0	30	15.2%	0.13 [0.00, 0.27]
Kudsi, et al.	4	68	15	68	15.9%	-0.16 [-0.28, -0.05]
Kumar, et al.	8	46	0	46	15.8%	0.17 [0.06, 0.29]
Penchev, et al.	4	27	3	27	13.3%	0.04 [-0.14, 0.22]
Total (95% CI)		**270**		**283**	**100.0%**	**-0.01 [-0.13, 0.12]**
Total events	34		44			

Heterogeneity: Tau² = 0.02; Chi² = 29.94, df = 6 (P < 0.0001); I² = 80%
Test for overall effect: Z = 0.15 (P = 0.88)



B

Study or Subgroup	eTEP Events	eTEP Total	IPOM Events	IPOM Total	Weight	Risk Difference M-H, Random, 95% CI
Bellido Luque, et al.	2	40	0	39	11.8%	0.05 [-0.03, 0.13]
Bui, et al.	1	29	0	43	10.9%	0.03 [-0.05, 0.12]
Jain, et al.	1	30	0	30	10.0%	0.03 [-0.05, 0.12]
Joshi, et al.	0	30	0	30	19.6%	0.00 [-0.06, 0.06]
Kudsi, et al.	1	68	3	68	24.0%	-0.03 [-0.09, 0.03]
Kumar, et al.	2	46	0	46	15.5%	0.04 [-0.03, 0.11]
Penchev, et al.	1	27	0	27	8.2%	0.04 [-0.06, 0.13]
Total (95% CI)		**270**		**283**	**100.0%**	**0.02 [-0.01, 0.04]**
Total events	8		3			

Heterogeneity: Tau² = 0.00; Chi² = 4.55, df = 6 (P = 0.60); I² = 0%
Test for overall effect: Z = 1.11 (P = 0.27)

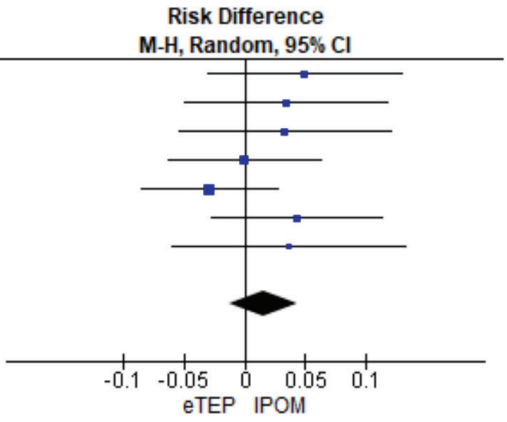


Fig. 3. (A) SSO; (B) SSOPI.

SSO & SSOPI

Meta-analysis of SSOs was performed separately from major complications outcome. This did not identify any difference between 2 techniques for SSO and SSOPI (Fig. 3A.–3B.).

Intraoperative complications

In the study of Bellido et al. intraoperative small bowel serosal tears were reported in two case and one patient had inferior epigastric vessel injury with subsequent bleeding due to tacker fixation in IPOM group. In all three cases complications were dealt with intraoperatively without changing of initial approach [11]. No intraoperative complications were reported for eTEP group [11].

In the study of Jain et al. three patients with severe adhesions in the eTEP group were converted to IPOM/ laparoscopic-assisted IPOM and there were no conversions in the IPOM group [16]. There was no report of bowel or vascular injury in either of groups [16]. In the study of Kudsi et al. all of the intraoperative complications were serosal intestinal injuries occurred during the lysis of dense intraabdominal adhesions. None of these injuries were full-thickness and all were repaired intra- operatively using absorbable suture [13]. In the study of Penchev et al. one patient in the eTEP group had bleeding more than 100ml [14]. Due to heterogeneity of intraoperative complications with regards to their severity and impact on postoperative recovery we did not find it appropriate to perform a meta-analysis on this outcome.

Postoperative ileus

There was no difference in the incidence of postoperative ileus between two groups (Fig. 4.).

Duration of surgery

ETEP was found to require significantly longer time to complete in comparison to IPOM (MD 40.10 [27.28, 52.91], p<0.01) (Fig. 5.).

Postoperative pain

The study of Bui et al. analysed the requirement for postoperative transversus abdominis plane block, epidural analgesia and other additional medications [12]. It found that the need for abdominis plane block and epidural analgesia was significantly higher after IPOM compared to eTEP-RM (33% *vs.* 0%, p = 0.002), while there was no significant difference between the groups considering the need for additional analgesic medication (23% *vs.* 14%, p = 0.489) [12]. The study of Kumar et al. found that mean postoperative parenteral analgesic requirement was significantly higher in the IPOM group [15]. Three studies compared early postoperative pain using visual pain scores (VAS – visual analogue score) [11, 15, 16]. It was found that patients in eTEP group had less postoperative pain at 24 hours after surgery (St Mean Difference -3.05 [-4.81, 1.29], p<0.01) (Fig. 6.) and 7 days after surgery (St Mean Difference -2.77 [-4.78, 0.75], p<0.01) (Fig. 7.).

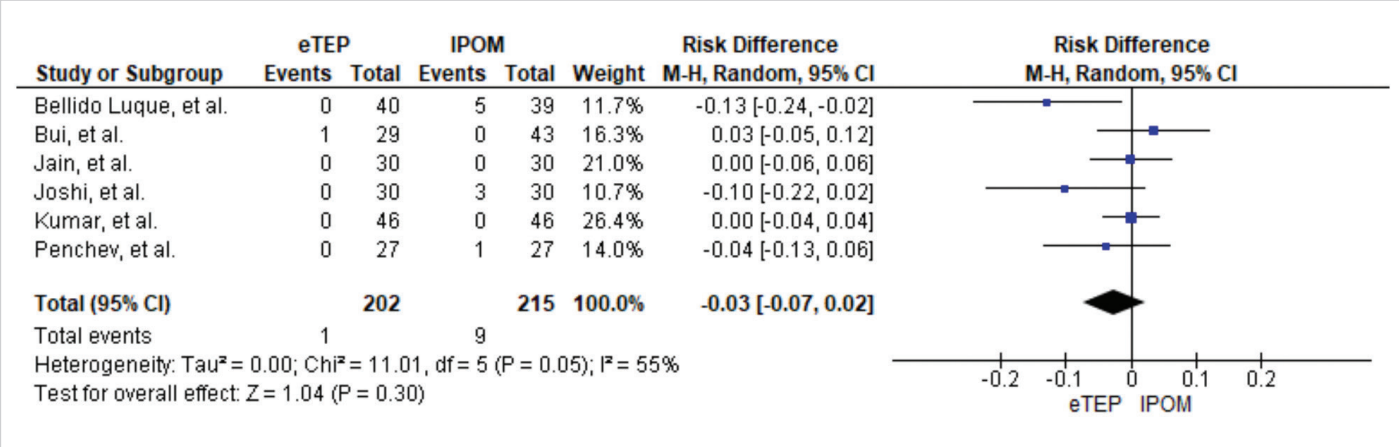


Fig. 4. Postoperative ileus.

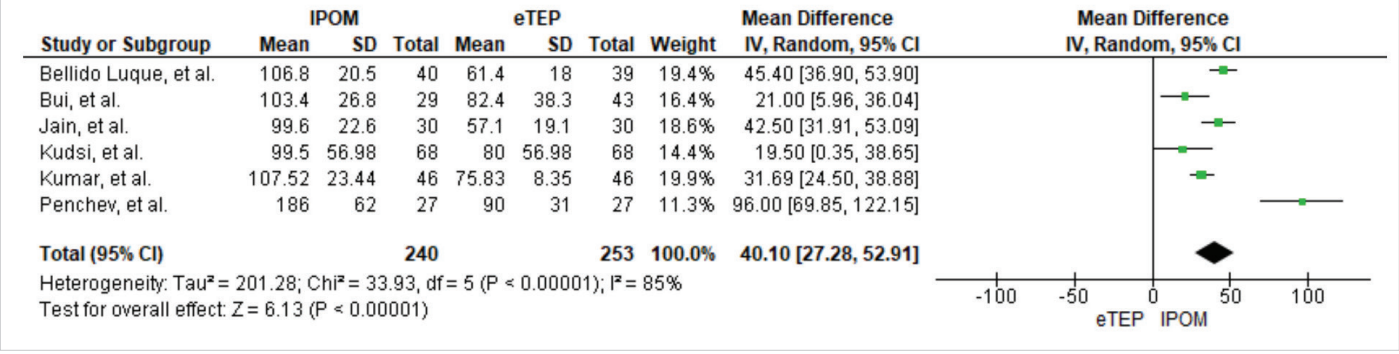


Fig. 5. Duration of surgery.

Tab. V. Risk of Bias tool 2.

STUDY	DOMAIN 1. RANDOMIZATION PROCESS	DOMAIN 2. DEVIATION FROM INTENDED INTERVENTION	DOMAIN 3. MISSING OUTCOME DATA	DOMAIN 4. MEASUREMENT OF THE OUTCOME	DOMAIN 5. SELECTION OF RECORDED RESULTS	OVERALL
Joshi, et al. [10]	High	High	High	High	Some concern	High
Jain, et al. [16]	Low	Low	Low	Low	Low	Low

Assessment of reporting biases

According to the Cochrane guidelines, we were unable to assess the reporting biases because there were fewer than 10 trials included in the analysis.

DISCUSSION

Our study confirmed that both techniques have no superiority of one over another in terms of major postoperative complications. Neither of two techniques were associated with death, cardiopulmonary or thrombotic complications and overall can be considered safe. Both techniques were not associated with significant intraoperative complications and rate of conversion from the initial surgical plan was low. Based on the result of our study, both techniques have equal safety profile. Reported complications in our study may not represent true incidence of events as our study was limited to inclusion of publications that directly compared two techniques and did not include case series, registries or single arm studies. It should be borne in mind that eTEP is technically challenging operation and in unexperienced hands or low volume centers rates of complication may be much higher compared to incidence from studies included in our review. Complication related to the dehiscence or failure to close the posterior layer which constitutes technical error were observed exclusively in eTEP group, despite all operations performed by experienced surgeons in high level centers. ETEP was found to take significantly longer to perform which leads but not limited to increased costs of the operation. However, eTEP technique requires less expensive polypropylene mesh and does not require any fixation device which provides cost reduction in comparison to IPOM.

Our study has some limitations. The main limitation of the study was clinical heterogeneity related to patients' characteristics, hernia characteristics, operative techniques. Majority of studies utilized laparoscopic approach in surgery for both techniques, except study of Kudsi et al. where robotic approach was used. Different studies used different prosthetic mesh and fixation materials as well as techniques of fixation differed. Fixation techniques alter severity of postoperative pain and hence may have biased our findings favouring eTEP in early postoperative pain outcome [17].

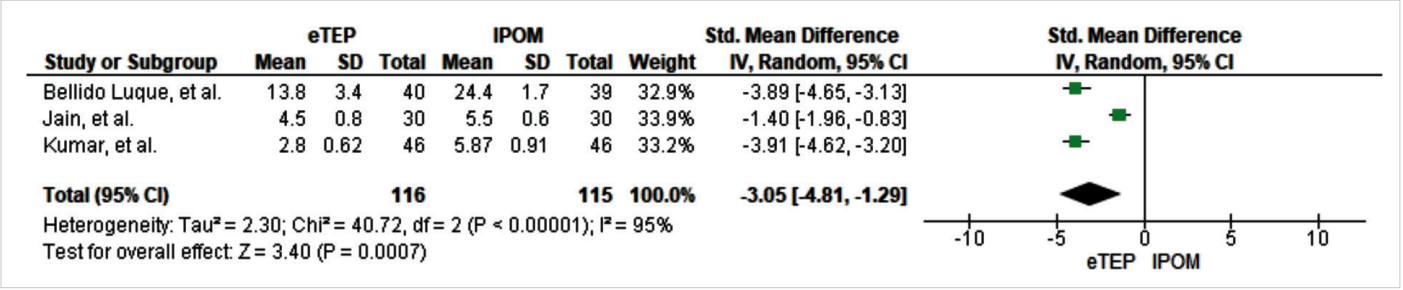


Fig. 6. Postoperative pain VAS 24h.

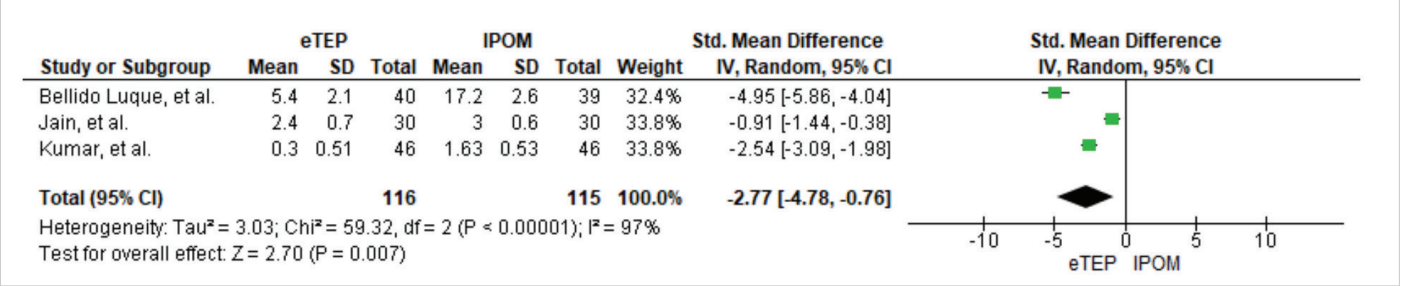


Fig. 7. Postoperative pain on day 7.

Two major modifications of IPOM included in the study were IPOM with and without fascial closure. However, we believe that this does not introduce additional heterogeneity as latest meta-analysis did not demonstrate significant difference in outcomes between fascial defect closure and no-closure groups in IPOM surgery [18].

We have identified two other systematic reviews which performed comparison analysis of IPOM and eTEP in ventral and incisional hernia mesh repair [19, 20]. To the best of our knowledge, both studies did not have study protocol published before the commencement of the projects. Both studies were published after the protocol of our study was published. The study of Yeow et al. analysed safety of IPOM *vs* extraperitoneal mesh placement techniques in MIVHMR with subgroup analysis of IPOM *vs* eTEP [19]. Outcomes of interest were SSI, seroma, hematoma, readmission, and recurrence [19]. There was no difference found in the studied outcomes [19]. The study of Li et al. provided comparison in the rate of seroma, haematoma, acute postoperative pain, intraoperative complications, postoperative ileus and length of hospital stay for patients undergoing eTEP *vs* IPOM in MIVHMR [20]. There was no significant difference concerning the incidence of seroma, hematoma, intraoperative complication, and postoperative ileus found between two tenchiques [20]. The eTEP technique was found to show significantly lower acute postoperative pain and shorter hospital study but a longer operative time [20]. In our study we aimed to adhere to proposed standards of reporting wound complications post hernia surgery as well as account for mortality and serious morbidity events, hence choice of composite outcome of major complication as primary outcome and SSO and SSOPI as secondary outcomes [6]. Our study included two randomized controlled trials that were not included in already published systematic reviews [10, 16]. Overall, our study confirms and in agreement with previously published studies of Yeow et al. and Li and el. with regards to postoperative complications, time of surgery, postoperative pain outcomes [19, 20]. Nevertheless, our study as well as study of Yeow et al. and Li et al. are based on relatively low-quality data and small sample size of heterogenic studies.

Giving existing uncertainty and clinical equipoise RCT examining standardised long-term quality of life and recurrence outcomes for eTEP *vs* IPOM as well as other MIVHMR techniques for primary and secondary hernias using well defined narrow inclusion criteria for hernia size on a large but well-defined population would be ethical and pragmatic. Development of international registries would be another solution to gather more data on the question of interest.

AVAILABILITY OF DATA AND MATERIAL

Data available on reasonable request.

REFERENCES

1. LeBlanc K.A., Booth W.V.: Avoiding complications with laparoscopic herniorrhaphy. Surg Laparosc Endosc., 1993; 3(5): 420–424.
2. Henriksen N.A., Montgomery A., Kaufmann R. et al.: Guidelines for treatment of umbilical and epigastric hernias from the European Hernia Society and Americas Hernia Society. Br J Surg., 2020; 107(3): 171–190.
3. Belyansky I., Daes J., Radu V.G. et al.: A novel approach using the enhanced-view totally extraperitoneal (eTEP) technique for laparoscopic retromuscular hernia repair. Surg Endosc., 2018; 32: 1525–1532.
4. Bittner R., Bain K., Bansal V.K. et al.: Update of Guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias (International Endohernia Society (IEHS))-Part A. Surg Endosc., 2019; 33: 3069–3139.
5. Moher D., Shamseer L., Clarke M. et al.: Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev., 2015; 4(1): 1.
6. DeBord J., Novitsky Y., Fitzgibbons R., Miserez M., Montgomery A.: SSI, SSO, SSE, SSOPI: the elusive language of complications in hernia surgery. Hernia, 2018; 22(5): 737–738.
7. Stroup D.F., Berlin J.A., Morton S.C. et al.: Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. Jama., 2000; 283(15): 2008–2012.
8. Sterne J.A.C., Savović J., Page M.J. et al.: RoB 2: a revised tool for assessing risk of bias in randomised trials. Bmj., 2019; 366: l4898.

9. Higgins J.P., Thompson S.G., Deeks J.J., Altman D.G.: Measuring inconsistency in meta-analyses. Bmj., 2003; 327(7414): 557–560.
10. Joshi J., Dekhaiya F.: A Comparative Study between E-TEP Versus IPOM Hernia Repair. Journal of Dental and Medical Sciences., 2020; 19: 19–21.
11. Bellido Luque J., Gomez Rosado J.C., Bellido Luque A. 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; 25(4): 1061–1070.
12. Bui N.H., Jørgensen L.N., Jensen K.K.: Laparoscopic intraperitoneal versus enhanced-view totally extraperitoneal retromuscular mesh repair for ventral hernia: a retrospective cohort study. Surg Endosc., 2021; 36(2): 1500–1506.
13. Kudsi O.Y., Gokcal F., Chang K.: Robotic intraperitoneal onlay versus totally extraperitoneal (TEP) retromuscular mesh ventral hernia repair: A propensity score matching analysis of short-term outcomes. Am J Surg., 2020; 220(4): 837–844.
14. Penchev D., Kotashev G., Mutafchiyski V.: Endoscopic enhanced-view totally extraperitoneal retromuscular approach for ventral hernia repair. Surg Endosc., 2019; 33(11): 3749–3756.
15. Kumar N., Palanisamy N.V., Parthasarathi R. et al.: A comparative prospective study of short-term outcomes of extended view totally extraperitoneal (e-TEP) repair versus laparoscopic intraperitoneal on lay mesh (IPOM) plus repair for ventral hernia. Surg Endosc., 2021; 35(9): 5072–5077.
16. Jain M., Krishna A., Prakash O. et al.: Comparison of extended totally extra peritoneal (eTEP) vs intra peritoneal onlay mesh (IPOM) repair for management of primary and incisional hernia in terms of early outcomes and cost effectiveness-a randomized controlled trial. Surg Endosc., 2022; 36(10): 7494–7502.
17. Habeeb T., Mokhtar M.M., Sieda B. et al.: Changing the innate consensus about mesh fixation in trans-abdominal preperitoneal laparoscopic inguinal hernioplasty in adults: Short and long term outcome. Randomized controlled clinical trial. Int J Surg., 2020; 83: 117–124.
18. Tryliskyy Y., Wong C.S., Demykhova I. et al.: Fascial defect closure versus bridged repair in laparoscopic ventral hernia mesh repair: a systematic review and meta-analysis of randomized controlled trials. Hernia., 2022; 26(6): 1473–1481.
19. Yeow M., Wijerathne S., Lomanto D.: Intraperitoneal versus extraperitoneal mesh in minimally invasive ventral hernia repair: a systematic review and meta-analysis. Hernia., 2022; 26(2): 533–541.
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. Surg Laparosc Endosc Percutan Tech., 2022; 32(2): 252–258.

Table of content: https://ppch.pl/issue/15787 Page count: 9 Tables: 5 Figures: 7 References: 20

Corresponding author: Yegor Tryliskyy; Severn PGME School of Surgery, Park House; 1200 Parkway, Bristol BS34 8YU, United Kingdom; E-mail: yegor.tryliskyy@doctors.net.uk

Cite this article as: Tryliskyy Y., Tyselskyi V., Kebkalo A., Ponomarov N.: Systematic review and meta-analysis comparing ventral hernia repair using minimally-invasive extended totally extraperitoneal repair versus intraperitoneal onlay mesh repair; Pol Przegl Chir 2024; 96 (2): 59–67; DOI: 10.5604/01.3001.0016.2728