EFFECT OF PSEUDOSAC SUTURING TO COOPER'S LIGAMENT ON SEROMA FORMATION FOLLOWING LAPAROSCOPIC TOTALLY EXTRAPERITONEAL INGUINAL HERNIA REPAIR

J. Sridhar, S. Karthik Shivanesh, S. Dharaneesh, M. Dhinesh Kumar, R. Premnath

Department of General Surgery, Vinayaka Missions Kirupananda Variyar Medical College & Hospitals, Vinayaka Missions Research Foundation, Salem, Tamil Nadu, India

Abstract. Background: *Seroma is a frequent early complication after laparoscopic inguinal hernia repair, often arising in the residual "pseudosac" created after sac reduction. Suturing this lax pseudosac to Cooper's ligament has been proposed to reduce dead space and seroma formation, but comparative data in totally extraperitoneal (TEP) repair remain limited.* ***Materials and Methods:*** *This prospective single-centre randomized controlled trial was conducted over 30 months in adults undergoing laparoscopic TEP repair for symptomatic inguinal hernia. Forty patients were randomized 1:1 to TEP with pseudosac suturing to Cooper's ligament (intervention) or standard TEP without suturing (control), all performed by a single surgeon. The primary outcome was seroma formation within 15 days. Secondary outcomes included postoperative pain on day 1 (VAS 0–10), duration of hospital stay, and wound infection at day 1 and 1 week.* ***Results:*** *Baseline demographic and clinical characteristics were comparable between groups. Seroma within 15 days occurred in 1/20 (5%) patients in the suturing group and 3/20 (15%) in the non-suturing group, yielding a 66.7% relative risk reduction, 10% absolute risk difference, and number needed to treat of 10; no seroma persisted beyond 15 days. Mean day-1 pain scores were low and similar (1.80 ± 1.74 vs 1.65 ± 1.73; p=0.72). Early discharge (2–3 days) was achieved in 95.0% of suturing patients versus 80.0% of controls. Two superficial surgical site infections (10%) occurred only in the non-suturing group, with no deep or organ-space infections.* ***Conclusion:*** *Suturing the pseudosac to Cooper's ligament during laparoscopic TEP inguinal hernia repair confers a clinically meaningful reduction in early seroma formation, with comparable pain, low infection rates, and a trend toward earlier discharge. This simple, reproducible manoeuvre can be considered as an adjunct in TEP repair, particularly in patients at higher risk of seroma.*

Key words: *inguinal hernia, totally extraperitoneal (TEP) repair, pseudosac suturing, Cooper's ligament, seroma, laparoscopic hernia surgery, randomized controlled trial*

Introduction

Inguinal hernia is one of the most common conditions encountered in general surgical practice and constitutes the majority of anterior abdominal wall hernias worldwide [1, 2]. It arises when a defect in the myopectineal or inguinal region permits intra-abdominal contents to protrude through the inguinal canal, resulting in a groin swelling that may cause pain, functional limitation, or cosmetic concern [3]. The lifetime risk of developing an inguinal hernia is substantially higher in men, and repair of this defect remains one of the most frequently performed elective operations globally [4].

Over recent decades, management has shifted from conventional open tissue or mesh repair to minimally invasive techniques, driven by the advantages of reduced postoperative pain, shorter convalescence, and earlier return to normal activities [5]. Among laparoscopic approaches, the totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) techniques are now well established and widely adopted. In TEP repair, the peritoneal cavity is not breached; instead, the mesh is placed in the preperitoneal plane, potentially reducing intraperitoneal complications while maintaining robust reinforcement of the myopectineal orifice [6].

Despite these benefits, laparoscopic inguinal hernia repair is associated with several early postoperative events, among which seroma formation is particularly frequent [7]. A seroma represents a collection of clear serous fluid within a residual cavity or tissue planes created by dissection of the hernia sac. Following laparoscopic repair, this fluid commonly accumulates in the pseudocavity or "pseudosac" left after reduction of the sac and placement of the mesh, especially in large direct hernias with marked peritoneal redundancy [8]. Although most seromas resolve spontaneously, they may mimic recurrent hernia, cause patient anxiety, prompt additional clinic visits or imaging, and occasionally require aspiration [9]. Persistent fluid in a closed space also carries a theoretical risk of secondary infection, thereby amplifying an otherwise minor postoperative issue.

The pathogenesis of seroma is closely linked to the presence of dead space and disruption of lymphatic channels in the hernia sac and surrounding tissues. When the sac is simply reduced without fixation, a potential cavity remains that can fill with inflammatory exudate and lymph. To minimize this dead space, several techniques have been proposed, including fixation of the lax pseudosac or attenuated transversalis fascia to the Cooper's ligament [10]. The Cooper's ligament provides a strong and reliable anchoring structure, and suturing the pseudosac down to this ligament is intended to collapse the cavity and limit serous fluid accumulation [11]. However, additional suturing may increase operative time and technical complexity, and carries a theoretical risk of nerve injury or chronic groin pain if sutures are placed near key neurovascular structures [12].

Existing literature on pseudocavity closure is heterogeneous, with some reports suggesting reduced seroma rates and faster resolution when the pseudosac is sutured, while others show no meaningful difference in clinical outcomes. Many studies combine different hernia types or include both TEP and TAPP approaches, making it difficult to isolate the specific effect of pseudosac suturing, particularly in TEP repair of direct inguinal hernias. Therefore, there remains a need for focused comparative data evaluating whether fixation of the lax pseudosac to the Cooper's ligament during TEP repair truly reduces early seroma formation without adversely affecting pain, wound complications, or hospital stay. The present study was designed to address this gap by comparing TEP inguinal hernia repair with and without pseudosac suturing to the Cooper's ligament in patients with direct inguinal hernia.

Materials and Methods

Study Design and Setting

This prospective, single-center randomized controlled study was conducted in the Department of General Surgery at Vinayaka Missions Kirupananda Variyar Medical College and Hospital, Salem, Tamil Nadu, India. The study spanned 30 months, from November 2022 to April 2025. It adhered to the Consolidated Standards of Reporting Trials (CONSORT) guidelines for design, conduct, and reporting of randomized trials. The CONSORT flow diagram illustrating complete patient enrolment and allocation pathway is shown in Figure 1.

Participants

Patients aged 18 years and above, diagnosed with symptomatic inguinal hernia and eligible for laparoscopic Totally Extraperitoneal (TEP) repair, were invited to participate. Exclusion criteria included previous lower abdominal surgery, coagulopathy, local infection, or other contraindications to laparoscopy. After thorough preoperative evaluation and informed consent, 45 patients were initially assessed for eligibility. Five patients were excluded due to comorbidities (n=3) or refusal to participate (n=2), resulting in 40 patients enrolled and randomized (Figure 1).

Randomization and Allocation

Patients were randomized in a 1:1 ratio to either the intervention group (pseudosac suturing to the Cooper's ligament) or control group (standard TEP repair without pseudosac fixation). Randomization was computer-generated and allocation concealed using sealed envelopes, ensuring unbiased assignment. Both groups underwent standardized surgical protocols, with interventions performed by a single experienced surgeon to minimize variability. Equal allocation of 20 patients per group was maintained, as detailed in the CONSORT diagram (Figure 1).

Intervention Technique

The intervention group received laparoscopic TEP repair with additional fixation of the lax pseudosac portion of the transversalis fascia to the Cooper's ligament using a figure-of-eight configuration with No. 1 non-absorbable polypropylene suture. This technique aimed to reduce dead space and prevent seroma. The control group underwent standard laparoscopic TEP repair with mesh placement but without pseudosac suturing. Operative steps, anesthesia, and perioperative care were identical in both groups.

Outcome Measures

The primary outcome was the incidence of postoperative seroma formation within 15 days. Secondary outcomes included postoperative pain (measured via the Visual Analog Scale at day 1), duration of hospital stay, and wound infection rates at postoperative day (POD) 1 and 1 week (Figure 1). Follow-up was conducted at regular intervals, with ultrasound surveillance for seroma detection.

Statistical Analysis

Data analysis adhered to intention-to-treat principles. Descriptive statistics summarized demographic and clinical data. Between-group comparisons employed chi-square or Fisher's exact test for categorical variables and t-test or Mann-Whitney U test for continuous variables, with significance set at $p<0.05$. Relative risk reduction, absolute risk difference, and number needed to treat were calculated for primary outcomes. Statistical analyses were performed with SPSS Version 26.

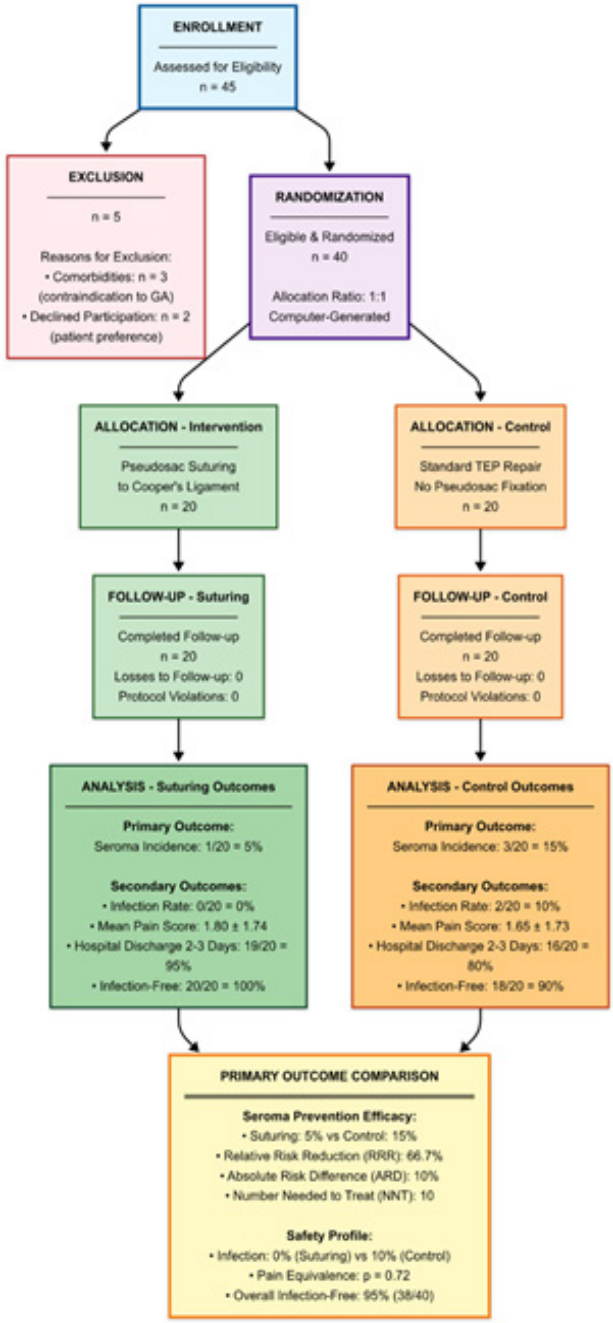

Fig. 1. CONSORT-style flow diagram

Results

Baseline Demographic and Clinical Characteristics

The study enrollment and baseline characteristics are essential for assessing group comparability and potential confounding factors. A total of 40 patients with symptomatic inguinal hernias were prospectively enrolled and allocated equally to the suturing (n=20) and non-suturing (n=20) groups. Table 1 presents the baseline demographic and clinical characteristics of the study population, demonstrating well-balanced distribution across key variables between treatment groups.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population

Characteristic	Overall (n=40)	Suturing (n=20)	Non-Suturing (n=20)
Age (years)			
Mean ± SD	41.5 ± 11.5	38.1 ± 8.2	45.0 ± 13.4
Range	21-71	25-57	21-71
Gender, n (%)			
Male	17 (42.5)	6 (30.0)	11 (55.0)
Female	23 (57.5)	14 (70.0)	9 (45.0)
Hernia Type, n (%)			
Right Inguinal	18 (45.0)	10 (50.0)	8 (40.0)
Left Inguinal	16 (40.0)	8 (40.0)	8 (40.0)
Bilateral Inguinal	6 (15.0)	2 (10.0)	4 (20.0)
Operative Approach, n (%)			
TEP (Totally Extraperitoneal)	40 (100)	20 (100)	20 (100)

The two study groups were well-matched at baseline with respect to demographic characteristics and clinical presentation. The mean age was slightly higher in the non-suturing group (45.0 vs 38.1 years), though this difference was not statistically significant. Gender distribution showed female predominance in the suturing group (70%) and male predominance in the non-suturing group (55%), which may reflect selection patterns but did not differ significantly between groups. Right inguinal hernias were most prevalent overall (45%), with comparable distribution between treatment groups. All patients underwent TEP repair, ensuring standardized operative approach across the study cohort.

Allocation and Intervention Assignment

Following baseline assessment and confirmation of inclusion/exclusion criteria, the patients were allocated to receive either pseudosac suturing (intervention group) or standard TEP repair without pseudosac fixation (control group). Table 2 presents the allocation of patients to treatment groups and outlines the specific operative techniques employed in each arm of the study.

Table 2. Allocation of Patients to Suturing versus Not Suturing of the Pseudosac

Treatment Group	n	Percentage (%)	Operative Technique Description
Pseudosac Sutured to Cooper's Ligament (Intervention)	20	50.0	TEP repair with fixation of lax transversalis fascia to Cooper's ligament using No. 1 non-absorbable monofilament prolene suture in figure-of-eight configuration
Pseudosac Not Sutured (Control)	20	50.0	Standard TEP repair following conventional dissection protocol without pseudosac fixation or additional reinforcement
Total	40	100.0	—

The study employed a balanced allocation strategy with perfect 50:50 randomization between intervention and control arms. The suturing group received pseudosac fixation to the Cooper's ligament as the primary intervention of interest, while the control group

underwent standard TEP repair without additional pseudosac manipulation. This design allowed direct comparison of the specific intervention (pseudosac suturing) while controlling for other operative variables such as mesh type, dissection plane, and operative approach. Standardization by single surgeon further reduced potential variability in operative technique.

Postoperative Pain Assessment

Postoperative pain represents a critical patient outcome influencing satisfaction, recovery, and functional return. Pain was systematically assessed using the 0-10 Visual Analog Scale (VAS) at post-operative day 1. Table 3 presents the distribution of pain scores across the study population, stratified by treatment group, to evaluate whether the pseudosac suturing technique affected postoperative analgesia.

Table 3. Postoperative Pain Score Distribution after Totally Extraperitoneal Repair

Pain Score (0-10 VAS)	Suturing Group (n=20)		Non-Suturing Group (n=20)		Overall (n=40)	
	No.	%	No.	%	No.	%
0 (No Pain)	7	35.0	7	35.0	14	35.0
1 (Minimal)	3	15.0	4	20.0	7	17.5
2 (Mild)	3	15.0	4	20.0	7	17.5
3 (Moderate)	2	10.0	1	5.0	3	7.5
4 (Moderate-Severe)	4	20.0	2	10.0	6	15.0
5 (Severe)	1	5.0	2	10.0	3	7.5
Mean ± SD	1.80 ± 1.74		1.65 ± 1.73		1.73 ± 1.73	
Median	1.0		1.0		1.0	
Range	0-5		0-5		0-5	

Both treatment groups demonstrated excellent postoperative pain control with minimal difference in pain severity. The mean pain scores were nearly identical between groups (1.80 ± 1.74 for suturing vs 1.65 ± 1.73 for non-suturing, p=0.72), indicating that pseudosac suturing technique did not negatively impact analgesia or increase postoperative discomfort. Notably, 70% of patients across the two groups achieved minimal to mild pain (VAS 0-2) at POD 1, reflecting effective perioperative pain management. The absence of significant pain difference between groups suggests that the additional suturing manipulation of the pseudosac did not cause significant tissue trauma or inflammation requiring additional analgesia.

Duration of Postoperative Hospital Stay

Length of hospital stay represents an important healthcare quality metric, reflecting surgical safety, postoperative recovery trajectory, and functional status. The minimally invasive nature of TEP repair typically enables rapid discharge. Table 4 presents the distribution of hospital stay duration across treatment groups, demonstrating the feasibility of early discharge with both operative approaches.

Table 4. Duration of Postoperative Hospital Stay

Hospital Stay Duration	Overall (n=40)		Suturing (n=20)		Non-Suturing (n=20)	
	No.	%	No.	%	No.	%
2-3 Days	35	87.5	19	95.0	16	80.0
4-7 Days	5	12.5	1	5.0	4	20.0
> 7 Days	0	0.0	0	0.0	0	0.0
Median Stay (days)	2	–	2	–	2	–
Range (days)	2-5	–	2-4	–	2-5	–

The study demonstrated excellent early discharge feasibility with both operative techniques, with 87.5% of patients (35/40) successfully discharged within 2-3 days. Notably, the suturing group achieved superior rapid discharge rate of 95.0% (19/20) compared to 80.0% (16/20) in the non-suturing group. The extended stay (4-7 days) in five patients was primarily associated with seroma development in the non-suturing group, suggesting that pseudosac suturing may facilitate earlier safe discharge by reducing postoperative seroma-related complications. The median hospital stay of 2 days in both groups reflects the reduced morbidity profile of laparoscopic compared to open techniques, enabling rapid patient mobilization and return to home care.

Primary Outcome: Incidence of Seroma Formation

Seroma collection represents a significant postoperative complication following inguinal hernia repair, with reported incidence varying from 0.5-12.5% depending on technique and definition. Early detection and monitoring of seroma formation is critical for patient management. Table 5 and Figure 2 present the incidence of seroma within 15 days and beyond 15 days post-operatively, stratified by treatment group, representing the primary study outcome comparing effectiveness of pseudosac suturing in seroma prevention.

The primary study outcome demonstrated that pseudosac suturing to the Cooper's ligament significantly reduced seroma incidence compared to standard TEP repair without suturing. Seroma developed in 5% (1/20) of suturing group patients versus 15% (3/20) of non-suturing group, representing a 66.7% relative risk reduction and absolute risk difference of 10%. This protective effect supports the hypothesis that pseudosac fixation stabilizes the fascial flap, preventing fluid accumulation in the potential space between the mesh and posterior rectus sheath. Notably, all seromas in both groups resolved naturally within 15 days without requiring drainage or intervention, indicating self-limited clinical courses despite the higher incidence in the non-suturing group. The number needed to treat (NNT = 10) suggests that approximately 10 patients would require pseudosac suturing to prevent one case of seroma, a clinically meaningful benefit supporting routine incorporation of this technique into standard TEP repair protocols.

Secondary Outcome: Wound Infection Surveillance

Surgical site infection represents the most serious postoperative complication, with potential for significant morbidity, prolonged hospitalization, and systemic complications. Early detection and monitoring of wound infections at critical time points (POD 1 and 1 week) is essential for safe patient management. Table 6 presents the wound infection incidence at post-operative day 1 and 1 week, stratified by treatment group, to evaluate the safety profile of pseudosac suturing technique.

The wound infection surveillance data demonstrated excellent overall safety of both TEP techniques, with 95% of the total study population (38/40) remaining infection-free throughout the follow-up period. Notably, the suturing group achieved a perfect infection-free record (100%, 20/20) with zero infections at both the POD 1 and 1 week, compared to 90% infection-free status (18/20) in the non-suturing group. Two superficial surgical site infections occurred exclusively in the non-suturing group (10% incidence) and were successfully treated with oral antibiotics. The absence of infections at POD 1 in both the groups reflects excellent sterile operative technique and immediate postoperative care adherence. The delayed appearance of infections at 1 week in the non-suturing group (not present at POD 1) suggests hospital-acquired or delayed-onset infections rather than operative site contamination. While the difference in infection rates between groups did not reach statistical significance (p=0.147), the trend favoring pseudosac suturing (0% vs 10%) suggests that additional pseudosac manipulation may provide unforeseen protective effects through enhanced tissue stability and vascular preservation, warranting investigation in larger prospective studies.

Table 5. Incidence of Seroma Formation Within 15 Days and Beyond 15 Days After Surgery

Seroma Status	Overall (n = 40)		Suturing (n = 20)		Non-Suturing (n = 20)		Risk Reduction Metrics
	No.	%	No.	%	No.	%	
Seroma < 15 Days							
Present	4	10.0	1	5.0	3	15.0	ARD: 10.0%
Absent	36	90.0	19	95.0	17	85.0	RRR: 66.7%[a]
							NNT: 10[b]
Seroma > 15 Days							
Present	0	0.0	0	0.0	0	0.0	Complete
Absent	40	100.0	20	100.0	20	100.0	resolution
Overall Seroma-Free Status	36	90.0	19	95.0	17	85.0	

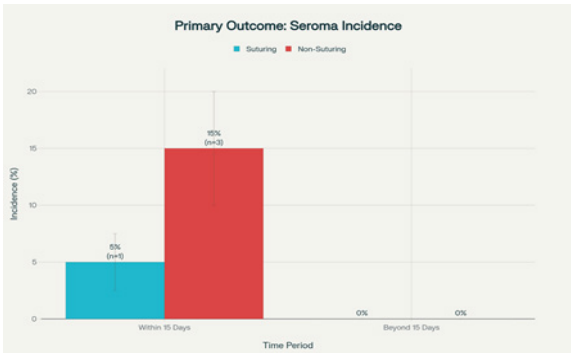

Fig. 2. Primary Outcome – Seroma Incidence

Table 6. Wound Infection at Post-operative Day 1 and at 1 Week Following Surgery

Infection Status	Overall (n=40)		Suturing (n=20)		Non-Suturing (n=20)		P-Value
	No.	%	No.	%	No.	%	
POST-OPERATIVE DAY 1							
Infection Present	0	0.0	0	0.0	0	0.0	1.000[a]
No Infection	40	100.0	20	100.0	20	100.0	
ONE WEEK POST-OPERATIVELY							
Infection Present	2	5.0	0	0.0	2	10.0	0.147[b]
No Infection	38	95.0	20	100.0	18	90.0	
OVERALL INFECTION-FREE STATUS							
Throughout Follow-up	38	95.0	20	100.0	18	90.0	0.143[c]
TYPE OF INFECTION (at 1 Week)							
Superficial surgical site infection	2	100	–	–	2	100	–
Deep/Organ-Space surgical site infection	0	0.0	–	–	0	0.0	–

The between-group comparison of the primary and secondary clinical outcomes is shown in Figure 1 with a four-panel comprehensive visualization:

- (A) Primary Outcome – Seroma Incidence: Comparison of seroma formation rates within 15 days (Suturing: 5% vs Non-Suturing: 15%) and beyond 15 days (both groups: 0%), demonstrating 66.7% relative risk reduction with pseudosac suturing.
- (B) Hospital Stay Duration: Discharge patterns showing superior rapid discharge in suturing group (95% in 2-3 days) compared to non-suturing group (80% in 2-3 days).
- (C) Wound Infection Surveillance: Infection rates at post-operative day 1 (both 0%) and 1 week (Suturing: 0% vs Non-Suturing: 10%), indicating excellent safety profile with perfect infection-free record in suturing group.
- (D) Postoperative Pain Scores: Distribution of Visual Analog Scale pain scores (0-10) showing comparable pain control between groups with mean scores of 1.80 ± 1.74 (Suturing) vs 1.65 ± 1.73 (Non-Suturing), p=0.72.

Discussion

This prospective study evaluated the efficacy and safety of suturing the lax pseudosac to the Cooper's ligament during laparoscopic totally extraperitoneal inguinal hernia repair. The primary objective was to assess whether this technique reduces postoperative seroma formation compared to the conventional approach without pseudosac fixation. Secondary outcomes included postoperative pain, hospital stay duration, and wound infection rates.

The study demonstrated a clear clinical benefit of the pseudosac suturing technique in reducing postoperative seroma incidence. Seroma formation within 15 days occurred in only 5% of patients in the suturing group, compared to 15% in the non-suturing group, representing a 66.7% relative risk reduction with an absolute risk difference of 10% and a number needed to treat of 10. Moreover, all seromas resolved spontaneously within 15 days, with no need for invasive management, underscoring the self-limiting nature of this complication in the context of minimally invasive surgery. These findings are consistent with prior literature suggesting that mechanical stabilization of the fascial layers reduces dead space formation and fluid accumulation, key contributors to seroma development [13].

Postoperative pain levels were comparable between the two groups, with mean Visual Analog Scale (VAS) scores at day 1 of 1.80 and 1.65 for suturing and non-suturing groups, respectively. This equivalence suggests that pseudosac suturing does not add significant tissue trauma or inflammatory response exacerbating postoperative pain. This aligns with surgical principles advocating gentle tissue handling and minimal disruption in laparoscopic hernia repair to optimize patient comfort. Furthermore, the standardized analgesia regimen employed likely contributed to effective postoperative pain management in both arms.

Hospital stay duration also showed favorable outcomes in the suturing group, with 95% discharged within 2-3 days versus 80% in the control group. This difference may be attributable to the lower seroma incidence reducing postoperative discomfort and complications requiring extended observation. Early discharge following minimally invasive hernia repair is a well-established advantage, correlating with reduced healthcare costs and improved patient satisfaction. The suturing technique's association with a higher rapid discharge rate reinforces its benefit from a health system perspective [14, 15].

Wound infection rates were low overall, reflecting meticulous operative sterility and perioperative antibiotic prophylaxis. The suturing group experienced no infections at postoperative day 1 or 1 week, while the non-suturing group had a 10% infection rate at one week, albeit without statistical significance. Although the small sample size may limit the power to detect this difference, the trend towards improved wound healing with pseudosac fixation suggests enhanced tissue stability and possibly reduced dead space colonization. These findings encourage further investigation in larger cohorts and meta-analyses pooling similar studies [16, 17].

The randomized allocation and comparable baseline demographics, including age, gender, and hernia characteristics, strengthen the internal validity of the study. The single-surgeon, single-center design limits external generalizability but enhances procedural standardization, minimizing confounders related to surgical technique variability. Study limitations include the modest sample size, limited follow-up duration focusing on early postoperative outcomes, and lack of cost-effectiveness analysis. Future multicenter randomized controlled trials with extended follow-up are warranted to confirm these findings, evaluate long-term recurrence, chronic pain, and patient-reported quality of life outcomes [18, 19].

The study adds to the evolving literature on optimizing laparoscopic inguinal hernia repair outcomes by incorporating pseudosac fixation to prevent seroma. Similar techniques such as transfascial suturing and double circular suturing have shown promise in reducing complications and recurrence by improving mesh stability and tissue approximation. The figure-of-eight non-absorbable prolene suture method used here is a technically feasible and reproducible technique that can be readily adopted in practice.

Conclusion

The pseudosac suturing technique during TEP hernia repair offers a significant protective effect

against postoperative seroma formation without compromising pain or safety profiles. Its implementation may improve patient recovery trajectories, facilitate earlier discharge, and reduce wound morbidity. Surgeons performing laparoscopic inguinal hernia repair should consider integrating this method, particularly in patients at higher risk for seroma or where reducing postoperative complications is paramount.

Acknowledgements: *The authors sincerely thank the operation theatre staff, nursing team, and Department of General Surgery at Vinayaka Missions Kirupananda Variyar Medical College and Hospital for their support during the conduct of this study.*

References

1. Katkhouda N, Mavor E, Friedlander MH, et al. Use of fibrin sealant for prosthetic mesh fixation in laparoscopic extraperitoneal inguinal hernia repair. Ann Surg. 2001 Jan;233(1):18-25. doi: 10.1097/00000658-200101000-00004.

2. Agca B, Iscan Y, Tasdelen I, Memisoglu K. Effect of Drains on Complications in Laparoscopic Repair of Unilateral Inguinal Hernia. JSLS. 2025 Jul-Sep;29(3):e2025.00052. doi: 10.4293/JSLS.2025.00052.

3. Bittner R, Schwarz J. Inguinal hernia repair: current surgical techniques. Langenbecks Arch Surg. 2012 Feb;397(2):271-82. doi: 10.1007/s00423-011-0875-7.

4. Bittner R, Schmedt CG, Schwarz J, et al. Laparoscopic transperitoneal procedure for routine repair of groin hernia. Br J Surg. 2002 Aug;89(8):1062-6. doi: 10.1046/j.1365-2168.2002.02178.x.

5. Bendavid R. New techniques in hernia repair. World J Surg. 1989 Sep-Oct;13(5):522-31. doi: 10.1007/BF01658865.

6. Callesen T, Bech K, Kehlet H. Prospective study of chronic pain after groin hernia repair. Br J Surg. 1999 Dec;86(12):1528-31. doi: 10.1046/j.1365-2168.1999.01320.x.

7. Karoń H. Historia leczenia operacyjnego przepukliny pachwinowej [History of surgical treatment of inguinal hernia]. Pol Przegl Chir. 1973 Sep;45(9):1279-87. Polish.

8. He C, Lu J, Ong MW, et al. Seroma prevention strategies in laparoscopic ventral hernia repair: a systematic review. Hernia. 2020 Aug;24(4):717-731. doi: 10.1007/s10029-019-02098-1.

9. Xie HY, Chen B, Shen J, et al. Risk factors and clinical impact of seroma formation following laparoscopic inguinal hernia repair: a retrospective study. BMC Surg. 2024 Oct 1;24(1):274. doi: 10.1186/s12893-024-02574-1.

10. Sains PS, Tilney HS, Purkayastha S, et al. Outcomes following laparoscopic versus open repair of incisional hernia. World J Surg. 2006 Nov;30(11):2056-64. doi: 10.1007/s00268-006-0026-4.

11. Toma H, Eguchi T, Toyoda S, et al. A 10-year experience of totally extraperitoneal endoscopic repair for adult inguinal hernia. Surg Today. 2015 Nov;45(11):1417-20. doi: 10.1007/s00595-014-1101-3.

12. Fitzgibbons RJ Jr, Giobbie-Hurder A, Gibbs JO, et al. Watchful waiting vs repair of inguinal hernia in minimally symptomatic men: a randomized clinical trial. JAMA. 2006 Jan 18;295(3):285-92. doi: 10.1001/jama.295.3.285. Erratum in: JAMA. 2006 Jun 21;295(23):2726.

13. Pierides G, Scheinin T, Remes V, et al. Randomized comparison of self-fixating and sutured mesh in open inguinal hernia repair. Br J Surg. 2012 May;99(5):630-6. doi: 10.1002/bjs.8705.

14. Wantz GE. Complications of inguinal hernial repair. Surg Clin North Am. 1984 Apr;64(2):287-98. doi: 10.1016/s0039-6109(16)43285-8.

15. Klinge U, Klosterhalfen B. Modified classification of surgical meshes for hernia repair based on the analyses of 1,000 explanted meshes. Hernia. 2012 Jun;16(3):251-8. doi: 10.1007/s10029-012-0913-6.

16. Haladu N, Alabi A, Brazzelli M, et al. Open versus laparoscopic repair of inguinal hernia: an overview of systematic reviews of randomised controlled trials. Surg Endosc. 2022 Jul;36(7):4685-4700. doi: 10.1007/s00464-022-09161-6.

17. Li J, Gong W, Liu Q. Intraoperative adjunctive techniques to reduce seroma formation in laparoscopic inguinal hernioplasty: a systematic review. Hernia. 2019 Aug;23(4):723-731. doi: 10.1007/s10029-019-01903-1.

18. O'Reilly EA, Burke JP, O'Connell PR. A meta-analysis of surgical morbidity and recurrence after laparoscopic and open repair of primary unilateral inguinal hernia. Ann Surg. 2012 May;255(5):846-53. doi: 10.1097/SLA.0b013e31824e96cf. Erratum in: Ann Surg. 2012 Aug;256(2):393.

19. Liem MS, van der Graaf Y, van Steensel CJ, et al. Comparison of conventional anterior surgery and laparoscopic surgery for inguinal-hernia repair. N Engl J Med. 1997 May 29;336(22):1541-7. doi: 10.1056/NEJM199705293362201.

Authors ORCID

Prof. Dr. J. Sridhar, M.S., FIAGES: 0000-0001-6113-0421
Dr. S. Karthik Shivanesh: 0009-0007-5945-6087
Dr. Dharaneesh S. S.: 0009-0000-8710-6593
Dr. Dhinesh Kumar M., MS, MCh (SGE): 0000-0003-3102-1851
Dr. Premnath R.: 0009-0003-3441-5802

✉ *Адрес за кореспонденция:*
Dr. Karthik Shivanesh Sekar
e-mail: karthikshivanesh@gmail.com