

COMPARATIVE STUDY OF FIXATION VERSUS NON-FIXATION OF PSEUDOSAC IN LAPAROSCOPIC INGUINAL HERNIA SURGERY

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ABSTRACT

Background: The sac encountered in a direct inguinal hernia is typically not a true peritoneal sac but a bulge of thinned-out transversalis fascia, commonly termed the "pseudosac." Opinion remains split on whether this structure should be actively fixed during laparoscopic repair or simply reduced and left alone, and few studies have directly weighed one approach against the other.

Objective: To compare pseudosac fixation with non-fixation during laparoscopic repair of direct inguinal hernias, with particular attention to seroma rates, recurrence, time taken in theatre, and postoperative pain.

Methods: Sixty patients who had undergone laparoscopic direct inguinal hernia repair at Saveetha Hospital, Department of General Surgery, between January 2023 and December 2025 were reviewed retrospectively and split evenly into a fixation arm and a non-fixation arm (30 each). Case records were used to capture patient demographics, intraoperative findings, time taken for the procedure, postoperative complications (seroma and haematoma), and duration of hospital admission. Group differences in categorical variables were tested using the chi-square test, taking $p < 0.05$ as the threshold for significance.

Results: By 48 hours, more patients in the fixation arm reported pain above VAS 3 than in the non-fixation arm (33.3% vs 10.0%; $p = 0.03$). Seroma, on the other hand, occurred only in the non-fixation arm (16.7% vs 0.0%; $p = 0.02$). Rates of urinary retention and haematoma were similar between groups, and neither arm recorded a recurrence.

Conclusion: Fixing the pseudosac appears to trade a modest amount of extra pain and operating time for protection against seroma, whereas leaving it unfixed shortens the procedure at the cost of a higher seroma rate. With recurrence equally absent in both arms, the decision between the two techniques is best left to individual patient factors and operator preference rather than a blanket recommendation.

KEYWORDS: Pseudosac; direct inguinal hernia; laparoscopic hernia repair; TEP; TAPP; seroma; mesh fixation

INTRODUCTION

Among the various presentations of groin hernia, the direct inguinal type is encountered regularly in surgical practice, and most centres now favour a minimally invasive route — either the totally extraperitoneal (TEP) or transabdominal preperitoneal (TAPP) route — for its repair^{8,15}. Two complications continue to dominate the postoperative course after such repairs: recurrence of the hernia and formation of a seroma at the operative site^{10,15}. A peculiarity of the direct hernia is that what appears at operation to be a hernial sac is, in many cases, not true peritoneum but a stretched-out fold of transversalis fascia — a structure surgeons have come to call the "pseudosac"^{1,2,6}. No firm consensus exists on how this fold should be handled once identified: some operators reduce it and move on, while others take the extra step of folding it inward and securing it in place, reasoning that this closes off the space in which fluid might otherwise collect and go on to form a seroma^{1,2}. Proponents of fixation point to lower rates of seroma and recurrence as justification for the added step^{2,4}, whereas critics argue that skipping fixation gives comparable results while sidestepping risks such as persistent groin pain or mesh displacement^{5,7}.

Although the subject generates considerable discussion at surgical meetings, head-to-head data comparing fixation against non-fixation of the pseudosac remain sparse^{3,6}, which is the gap this study sets out to address.

Objectives

The present work sets out to weigh pseudosac fixation against non-fixation during laparoscopic repair of direct inguinal hernias, looking specifically at seroma occurrence, recurrence, time spent in the operating room, and the pain patients report afterward.

MATERIALS AND METHODS

Study Design

Data for this work were gathered and analysed retrospectively, comparing two surgical strategies against one

another.

Sample Size

The final cohort numbered 60 patients, split evenly into a fixation arm and a non-fixation arm of 30 patients apiece.

Study Population

Eligible patients were those who had a direct inguinal hernia repaired laparoscopically within the Department of General Surgery at Saveetha Hospital.

Surgical Technique

All patients underwent laparoscopic repair of a direct inguinal hernia via the TEP or TAPP approach under general anaesthesia, in accordance with standard endoscopic hernioplasty principles^{8,15}. After creation and insufflation of the extraperitoneal or preperitoneal working space, the myopectineal orifice was dissected to expose the direct hernia defect. The attenuated, redundant transversalis fascia bulging through the defect — the pseudosac — was carefully reduced from the inguinal canal into the preperitoneal space by gentle traction and blunt dissection, taking care to avoid injury to the inferior epigastric vessels and the "triangle of doom" and "triangle of pain."

In the fixation group, once reduced, the redundant pseudosac was anchored — using tacking device or suturing technique to a stable structure such as Cooper's ligament or the rectus muscle, so as to flatten the residual fascial redundancy and obliterate the potential dead space before mesh placement^{1,2,9}. In the non-fixation group, the reduced pseudosac was left unanchored in the preperitoneal space after reduction, without any additional suture or tack directed at the sac itself^{5,11}. External pressure was applied in dressing for 1 week.

In both groups, a standard flat polypropylene mesh (approximately 15 × 10 cm) was subsequently placed to cover the entire myopectineal orifice. Mesh fixation to the abdominal wall (using absorbable tacks, fibrin glue, or judicious non-fixation of the mesh itself, per operating surgeon preference) was performed independently of pseudosac management and was comparable between groups^{12,13,14}. The preperitoneal space was inspected for haemostasis, the peritoneal flap was reduced or closed where relevant (TAPP), the pneumoperitoneum was desufflated, and port sites were closed in standard fashion.

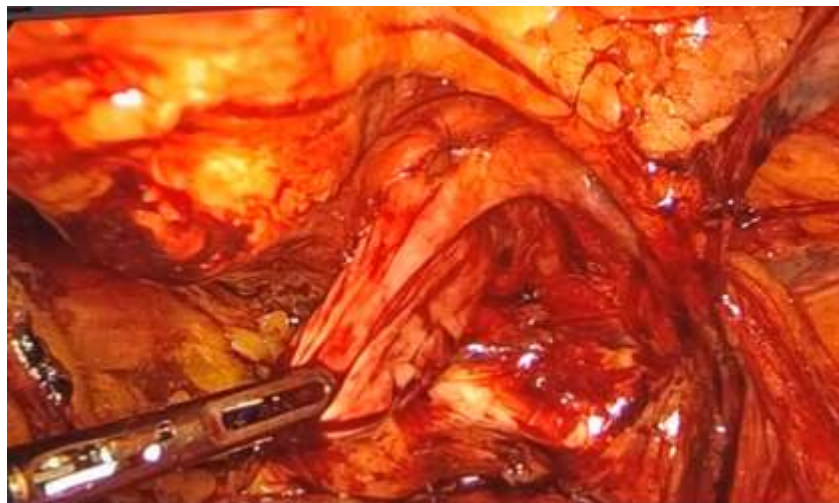


Figure 1. Intraoperative image showing reduction of the pseudosac from the inguinal canal into the preperitoneal space.

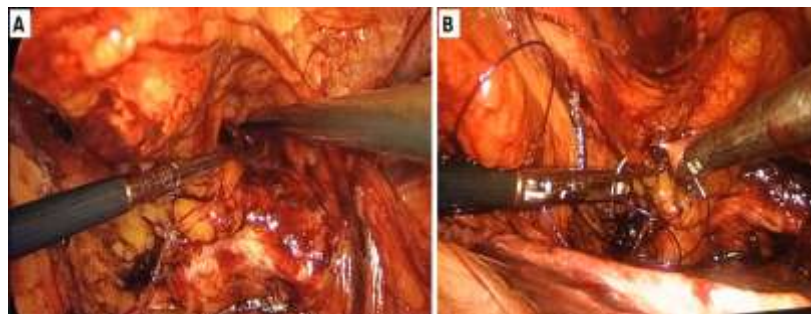


Figure 2. Intraoperative images showing the pseudosac fixation technique: (A) anchoring of the redundant pseudosac to a stable structure; (B) securing the fixation suture.

Data Collection

Operation theatre records supplied the variables used in this analysis: patient demographics, complications noted during surgery, how long each procedure took, postoperative seroma or haematoma, and the number of days spent

in hospital — each of these was then set side by side for the fixation and non-fixation groups.

Statistical Analysis

Group comparisons for categorical data relied on the chi-square test, with a result taken as significant below the conventional $p = 0.05$ mark.

RESULTS

Men outnumbered women in both study arms, more markedly so in the non-fixation group (93.3% male) than the fixation group (83.3% male), though this gap did not reach significance ($p = 0.23$). Beyond gender, the two arms lined up closely on every baseline measure checked: age (44.8 ± 10.2 vs 45.6 ± 9.7 years, $p = 0.76$), body mass index (25.3 ± 2.6 vs 25.1 ± 2.9 kg/m², $p = 0.78$), ASA grade ($p = 0.71$), rates of diabetes (53.3% vs 36.7%, $p = 0.19$), hypertension (26.7% vs 33.3%, $p = 0.57$) and smoking (16.7% vs 26.7%, $p = 0.35$), laterality of the hernia ($p = 0.67$), and the size of the defect itself (2.3 ± 2.0 vs 2.5 ± 2.0 cm, $p = 0.70$). The full breakdown appears in Table 1, with the gender split shown in Figure 3 and the comorbidity profile shown separately in Figure 4.

Table 1. Baseline patient characteristics recorded for the two treatment arms.

Parameter	Fixation (n = 30)	Non-Fixation (n = 30)	Total (N = 60)	P-Value
Male, n (%)	25 (83.3%)	28 (93.3%)	53 (88.3%)	0.23
Female, n (%)	5 (16.7%)	2 (6.7%)	7 (11.7%)	0.23
Age (years), mean $\pm$ SD	44.8 ± 10.2	45.6 ± 9.7	45.2 ± 10.0	0.76
BMI (kg/m ²), mean $\pm$ SD	25.3 ± 2.6	25.1 ± 2.9	25.2 ± 2.8	0.78
ASA grade I, n (%)	5 (16.7%)	7 (23.3%)	12 (20.0%)	0.71
ASA grade II, n (%)	23 (76.7%)	22 (73.3%)	45 (75.0%)	0.71
ASA grade III, n (%)	2 (6.7%)	1 (3.3%)	3 (5.0%)	0.71
Diabetes mellitus, n (%)	16 (53.3%)	11 (36.7%)	27 (45.0%)	0.19
Hypertension, n (%)	8 (26.7%)	10 (33.3%)	18 (30.0%)	0.57
Smoking history, n (%)	5 (16.7%)	8 (26.7%)	13 (21.7%)	0.35
Hernia side — Right, n (%)	11 (36.7%)	14 (46.7%)	25 (41.7%)	0.67
Hernia side — Left, n (%)	13 (43.3%)	12 (40.0%)	25 (41.7%)	0.67
Hernia side — Bilateral, n (%)	6 (20.0%)	4 (13.3%)	10 (16.7%)	0.67
Hernia defect size (cm), mean $\pm$ SD	2.3 ± 2.0	2.5 ± 2.0	2.4 ± 2.0	0.70

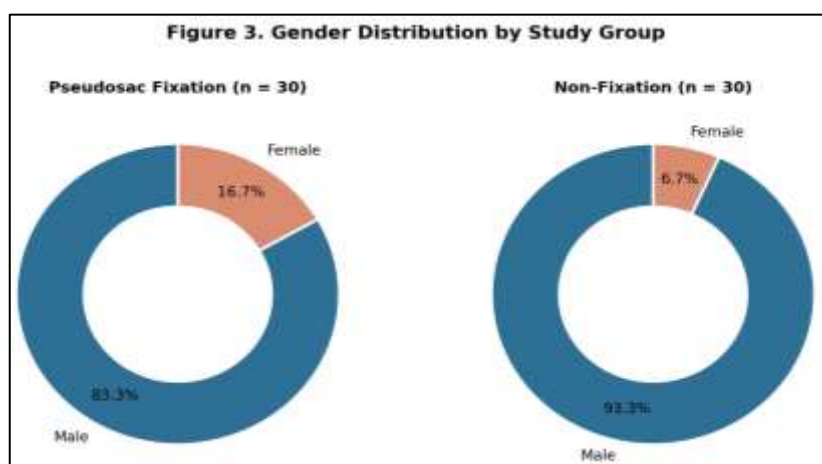


Figure 3. Gender distribution by study group (data unchanged from original poster).

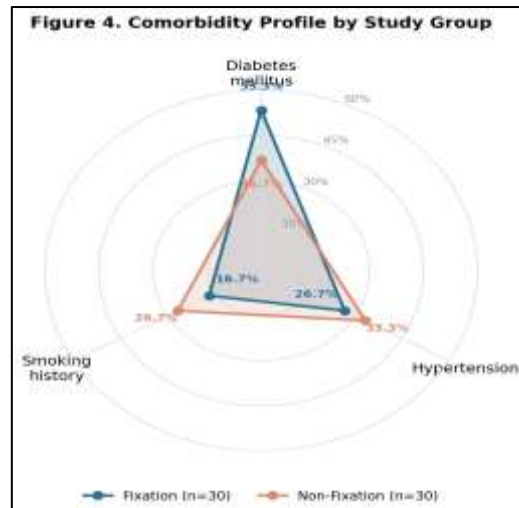


Figure 4. Comorbidity profile (diabetes, hypertension, smoking history) by study group.

TEP was the chosen route in 12 of the 30 fixation-group patients (40.0%) and 14 of the 30 non-fixation-group patients (46.7%), with TAPP making up the balance in each arm ($p = 0.60$). Where the difference showed up clearly was in operating time: fixation cases ran to 90 ± 10 minutes on average against 80 ± 8 minutes for non-fixation ($p < 0.001$). Patients in the fixation arm also stayed in hospital a little longer (2.7 ± 0.6 vs 2.4 ± 0.5 days, $p = 0.04$), though the two groups were back on their feet at a similar pace, with no real difference in time to resume normal activity (4.8 ± 0.7 vs 4.6 ± 0.6 days, $p = 0.24$). These figures are laid out in Table 2 and plotted in Figure 5.

Table 2. Peri-operative parameters recorded for the fixation and non-fixation arms.

Parameter	Fixation (n = 30)	Non-Fixation (n = 30)	Total (N = 60)	P-Value
Approach — TEP, n (%)	12 (40.0%)	14 (46.7%)	26 (43.3%)	0.60
Approach — TAPP, n (%)	18 (60.0%)	16 (53.3%)	34 (56.7%)	0.60
Mean operative time (min), mean $\pm$ SD	90 ± 10	80 ± 8	85 ± 10.3	<0.001
Length of hospital stay (days), mean $\pm$ SD	2.7 ± 0.6	2.4 ± 0.5	2.55 ± 0.57	0.04
Time to return to normal activity (days), mean $\pm$ SD	4.8 ± 0.7	4.6 ± 0.6	4.7 ± 0.66	0.24

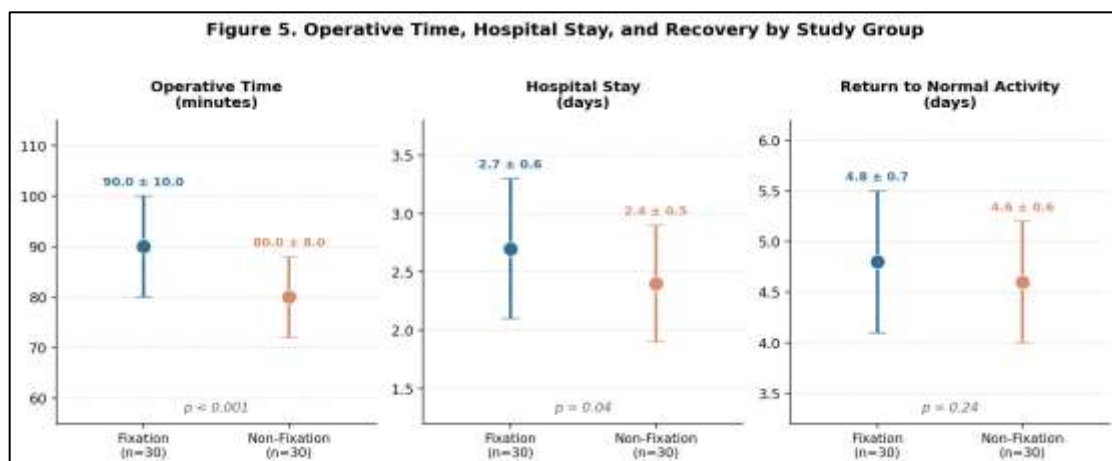


Figure 5. Operative time, hospital stay, and time to return to normal activity by study group (mean $\pm$ SD). The postoperative complications recorded across both arms, together with combined totals, are set out in Table 3.

Table 3. Postoperative complication rates recorded across the fixation and non-fixation arms.

Parameter	Fixation (n = 30)	Non-Fixation (n = 30)	Total (N = 60)	P-Value	Significance
Pain score after 48 hrs (VAS > 3)	10 (33.3%)	3 (10.0%)	13 (21.7%)	0.03	Significant
Seroma formation	0 (0.0%)	5 (16.7%)	5 (8.3%)	0.02	Significant
Urinary retention	3 (10.0%)	1 (3.3%)	4 (6.7%)	0.30	Not significant
Haematoma formation	0 (0.0%)	1 (3.3%)	1 (1.7%)	0.50	Not significant
Recurrence rate	0 (0.0%)	0 (0.0%)	0 (0.0%)	N/A	—

By the 48-hour mark, ten fixation-group patients (33.3%) rated their pain above VAS 3, against only three (10.0%) in the non-fixation arm ($p = 0.03$) — the clearest signal in the entire dataset for greater early discomfort with fixation. The picture reversed for seroma: five patients (16.7%) in the non-fixation arm developed one, compared with none among those who had fixation ($p = 0.02$). Urinary retention (10.0% vs 3.3%, $p = 0.30$) and haematoma (0.0% vs 3.3%, $p = 0.50$) were too infrequent in either arm to reach statistical significance, and not a single recurrence turned up in either group across the study period. These comparisons are plotted in Figure 6.

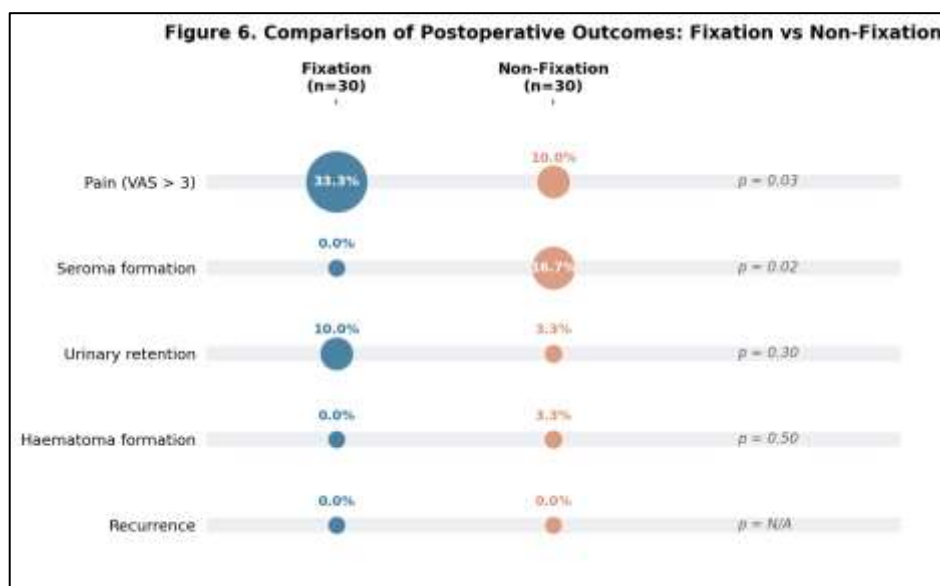


Figure 6. Comparison of postoperative outcomes between fixation and non-fixation groups (data unchanged from original poster).

DISCUSSION

The clearest signal to emerge from this comparison was pain: patients who had their pseudosac fixed were substantially more likely to describe significant discomfort (VAS above 3) at the 48-hour mark than those who didn't (33.3% against 10.0%, $p = 0.03$). Time in theatre told a similar story, running longer on average for fixation cases in a way that reached statistical significance (90 ± 10 minutes versus 80 ± 8 minutes, $p < 0.001$).

Neither finding comes as a surprise set against the wider literature on mesh and sac fixation, where adding fixation points — be it tacks, sutures, or staples — has repeatedly been linked to more early pain and longer procedures relative to techniques that keep fixation to a minimum^{12,13,14}. The seroma data ran the opposite direction, with the non-fixation arm affected far more often (16.7% versus 0.0%, $p = 0.02$) — a pattern that lines up with registry-scale and meta-analytic evidence tying an unaddressed redundant sac to leftover dead space and the fluid collections that follow^{9,10,11}.

A few other complications — urinary retention and haematoma among them — turned up somewhat more in the fixation arm, though not enough to clear the bar for statistical significance. Neither group produced a single recurrence over the study period, which is worth noting in its own right.

Read together, these results paint fixation as a trade: a bit more time on the table and a rougher first couple of days, purchased against a lower chance of seroma. That trade-off sits comfortably within the broader position taken by international guidance, which treats fixation and non-fixation as two legitimate paths within a risk-adapted approach to groin hernia surgery rather than declaring one universally superior¹⁵. What this implies practically is that the decision is best made case by case, weighing the individual patient's risk profile against what

the surgeon is most comfortable executing.

CONCLUSION

Pseudosac fixation appears to be advantageous in reducing seroma formation and giving a good cosmetic result for the patient. Eventhough it takes a few extra operative duration.. Non-fixation carries a higher risk of seroma formation, though it may offer advantages in terms of reduced pain and shorter operative duration. No recurrence was observed in either group, suggesting that both techniques are effective, and the choice should be tailored based on patient-specific factors and surgeon expertise.

REFERENCES

1. Lodha M, Meena SP, Parihar YK, Badkur M, Puranik AK, Kompally PV. A newer method of seroma reduction by fenestration of pseudo-sac during laparoscopic repair of direct inguinal hernia: A randomised, controlled pilot study. *J Minim Access Surg.* 2023;19(1):69–73.
2. Ghosal S, Agrawal H, Chakraborty M, Kumar P, Ranjan G, Kumar A, Gupta N, Agarwal N. Role of pseudosac fixation on seroma formation following totally extraperitoneal repair for direct inguinal hernia: A randomised controlled trial. *J Clin Diagn Res.* 2024;18(10):PC01–PC04.
3. Modh M, Patel K, Patel D, Patel R. Outcome of Laparoscopic Hernia Repair with and Without Pseudo Sac Fixation. *Int J Pharm Clin Res.* 2024;16(2):1560–1564.
4. Panse M, Sharma R, Singh K, Kumar A. Comparative study of seroma formation in laparoscopic inguinal hernia repair with and without pseudosac fixation. *Int J Surg.* 2023;95:106–110.
5. Reddy RRS, Reddy SR, Reddy SM. Pseudosac fixation in laparoscopic inguinal hernia repair: A randomized controlled trial. *Hernia.* 2022;26(4):789–795.
6. Sarofim M, et al. Significance of the pseudosac during inguinal hernia repair. *ANZ J Surg.* 2025 [Epub ahead of print].
7. Usmani F, Wijerathne S, Malik S, Yeo C, Rao J, Lomanto D. Effect of direct defect closure during laparoscopic inguinal hernia repair ("TEP/TAPP Plus" technique) on post-operative outcomes. *Hernia.* 2020;24:167–171.
8. Takata MC, Duh QY. Laparoscopic inguinal hernia repair. *Surg Clin North Am.* 2008;88(1):157–178.
9. Shi H, Lin R, Teng T, Wang M, Lu F, Chen Y, Lin X, Fang H, Wang C, Yang Y, Huang H. Effects of intraoperative fixation of residual hernia sac on postoperative seroma in laparoscopic transabdominal preperitoneal inguinal hernia repair: A prospective randomized controlled trial. *Updates Surg.* 2023;75(5):1343–1349.
10. Köckerling F, Bittner R, Adolf D, Fortelny R, Niebuhr H, Mayer F, Schug-Pass C. Seroma following transabdominal preperitoneal patch plasty (TAPP): incidence, risk factors, and preventive measures. *Surg Endosc.* 2018;32(5):2222–2231.
11. Chai SW, Chiang PH, Chien CY, Chen YC, Soong RS, Huang TS. Sac transection versus sac reduction during laparoscopic herniorrhaphy: A systematic review and meta-analysis. *Asian J Surg.* 2022;45(4):981–986.
12. Shi Z, Fan X, Zhai S, Zhong X, Huang D. Fibrin glue versus staple for mesh fixation in laparoscopic transabdominal preperitoneal repair of inguinal hernia: A meta-analysis and systematic review. *Surg Endosc.* 2017;31(2):527–537.
13. Shah NS, Fullwood C, Siriwardena AK, Sheen AJ. Mesh fixation at laparoscopic inguinal hernia repair: A meta-analysis comparing tissue glue and tack fixation. *World J Surg.* 2014;38(10):2558–2570.
14. Kaul A, Hutfless S, Le H, Hamed SA, Tymitz K, Nguyen H, Marohn MR. Staple versus fibrin glue fixation in laparoscopic total extraperitoneal repair of inguinal hernia: A systematic review and meta-analysis. *Surg Endosc.* 2012;26(5):1269–1278.
15. HerniaSurge Group. International guidelines for groin hernia management. *Hernia.* 2018;22(1):1–165.