

Role of Closed Suction Drain in Preventing Postoperative Seroma and Surgical Site Infection Following Open Lichtenstein Mesh Repair of Large Complicated Inguinoscrotal Inguinal Hernias: A Prospective Comparative Study

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ABSTRACT

Background: Large, complicated inguinoscrotal inguinal hernias present a distinct reconstructive challenge because of the extensive dissection of the distal sac and scrotal component required during open Lichtenstein mesh repair. This dissection creates substantial dead space, and reported rates of postoperative scrotal seroma or haematoma after Lichtenstein hernioplasty for complete/inguinoscrotal hernias range from 5% to over 20%, with surgical site infection (SSI) frequently arising secondarily in these collections.

Aim: To compare the incidence of postoperative seroma and surgical site infection between patients undergoing open Lichtenstein mesh repair of large, complicated inguinoscrotal inguinal hernia with placement of a closed suction drain versus no drain.

Methods: We conducted a prospective comparative study of 100 adult patients with large, complicated inguinoscrotal inguinal hernia undergoing open Lichtenstein mesh repair between January and December 2025, allocated to a closed suction drain group (Group A, n = 50) or a no-drain group (Group B, n = 50). Patients were followed for 30 days after surgery. The primary outcomes were seroma and SSI within 30 days; secondary outcomes included haematoma formation, need for seroma aspiration, reoperation, postoperative pain, and duration of hospital stay. Categorical variables were compared using the chi-square/Fisher's exact test and continuous variables using the independent t-test, with $p < 0.05$ considered significant.

Results: The incidence of postoperative seroma was 8% in the drain group compared with 22% in the no-drain group ($p = 0.04$). Surgical site infection occurred in 6% and 8% of patients, respectively ($p = 0.69$). Haematoma occurred in 4% of the drain group versus 10% of the no-drain group ($p = 0.27$). Seroma aspiration was required in 2% versus 12% of patients ($p = 0.05$). Reoperation was required in 2% versus 4% of patients ($p = 0.56$). The mean hospital stay was 3.8 ± 1.2 days in the drain group and 3.2 ± 1.1 days in the no-drain group ($p = 0.02$).

Conclusion: Closed suction drainage following open Lichtenstein mesh repair for large complicated inguinoscrotal inguinal hernias reduces postoperative seroma formation without significantly increasing surgical site infection. Larger multicentre randomized studies are required to validate these findings.

Keywords: Inguinal Hernia, Lichtenstein Repair, Closed Suction Drain, Seroma, Surgical Site Infection, Mesh Hernioplasty.

INTRODUCTION

Open Lichtenstein tension-free mesh repair remains the standard of care for primary inguinal hernia repair worldwide because of its technical simplicity, low recurrence rate, and reproducibility across surgical settings. Large, complicated inguinoscrotal hernias-those with a long-standing complete or giant sac descending into the scrotum, often with elements of irreducibility, partial obstruction, or a sliding component-pose a particular technical challenge, since adequate reduction and mesh placement require extensive dissection of the distal sac and the creation of a large potential space within the scrotum and groin.

This extensive dissection, combined with the foreign-body reaction to polypropylene mesh, is associated with a reported 5-12% incidence of postoperative scrotal haematoma or seroma after Lichtenstein hernioplasty for complete inguinal hernia,¹ and seroma formation is recognized as a leading precursor to secondary surgical site infection, prolonged hospital stay, and patient dissatisfaction after groin hernia surgery.²

Several strategies have been proposed to reduce dead space and fluid accumulation after Lichtenstein repair, including scrotal support, pressure dressings, and closed suction drainage of the distal sac. Evidence on drains after open groin hernia repair is mixed: a Cochrane review of wound drains after incisional hernia repair found insufficient high-quality evidence to recommend routine use,³ and a small randomized trial of suction drainage in inguinal hernia repair likewise found no clear benefit in unselected patients.⁴ However, these studies largely enrolled patients with primary, uncomplicated hernias with limited dead space. In contrast, giant or complicated inguinoscrotal hernias-where leaving the distal sac in situ has itself been shown to limit early complications⁵-create a much larger potential space, and a comparative study specifically in complete inguinoscrotal hernia found that closed suction drainage reduced seroma from 22.5% to 2.5% and SSI from 17.5% to 2.5%,⁶ while drainage of the preperitoneal space after laparoscopic TEP repair has similarly been shown to reduce seroma formation without increasing infection risk.⁷

Given this conflicting evidence-a possible benefit in high dead-space repairs against an

absence of benefit in routine repairs-the role of closed suction drainage specifically in large, complicated inguinoscrotal hernias repaired by the open Lichtenstein technique remains inadequately defined. This study was undertaken to prospectively compare postoperative seroma and SSI rates in patients undergoing open Lichtenstein mesh repair of large, complicated inguinoscrotal hernia, with and without closed suction drain placement.

MATERIALS AND METHODS

STUDY DESIGN AND SETTING: This prospective comparative study was conducted in the Department of General Surgery, Government Medical College and Hospital, Cuddalore District, Tamil Nadu, India, between January and December 2025.

PARTICIPANTS: One hundred adult patients presenting with a large, complicated inguinoscrotal inguinal hernia (complete/giant sac extending into the scrotum, with irreducibility, partial intestinal obstruction, or a sliding component) who underwent elective or semi-elective open Lichtenstein mesh repair were enrolled and allocated to a closed suction drain group (Group A, n = 50) or a no-drain group (Group B, n = 50).

INCLUSION CRITERIA

- Age 18-80 years.
- Patients with large complicated inguinoscrotal inguinal hernias undergoing open Lichtenstein mesh repair.
- Complicated hernias including irreducible (incarcerated) hernia, obstructed hernia (without bowel gangrene), and long-standing giant inguinoscrotal hernias requiring extensive sac dissection.
- American Society of Anesthesiologists (ASA) Grade I-III.
- Patients willing to provide written informed consent.

EXCLUSION CRITERIA

- Strangulated hernia requiring bowel resection or stoma formation.
- Gross contamination or pus encountered intraoperatively.
- Recurrent inguinal hernias.
- Femoral hernias.
- Laparoscopic (TEP/TAPP) repairs.

- Patients with immunodeficiency, chemotherapy, or chronic steroid therapy.
- Uncontrolled diabetes mellitus (HbA1c > 9%).
- Coagulopathy or anticoagulant therapy that cannot be interrupted.
- Patients unwilling or unable to complete follow-up.

SURGICAL TECHNIQUE: All patients underwent open Lichtenstein tension-free mesh hernioplasty under spinal or general anaesthesia per institutional protocol, with careful dissection and high ligation of the sac and reduction of scrotal contents, followed by onlay placement of a polypropylene mesh. In Group A, a closed suction drain was placed in the distal scrotal/subcutaneous dead space before wound closure and connected to a low-pressure vacuum reservoir; the drain was removed when 24-hour output fell below 20-30 mL. In Group B, the wound was closed in layers without a drain, and a firm scrotal support/pressure dressing was applied. All patients received a single dose of prophylactic intravenous antibiotic at induction and standard postoperative analgesia.

OUTCOME DEFINITIONS: Seroma was defined as a clinically palpable or ultrasonographically confirmed fluid collection at the operative site or scrotum. Surgical site infection was defined per standard CDC criteria as purulent discharge, or a wound requiring reopening in the presence of erythema, pain, and fever, within 30 days of surgery. The primary outcomes were postoperative seroma formation and surgical site infection. Secondary outcomes included haematoma formation, need for seroma aspiration, reoperation, postoperative pain, and duration of hospital stay.

FOLLOW-UP: Patients were assessed daily during the inpatient stay and reviewed at 7 and 30 days postoperatively for the outcomes above.

STATISTICAL ANALYSIS: Categorical variables were compared between groups using the chi-square test or Fisher's exact test as appropriate, and continuous variables using the independent-samples t-test. A two-sided p-value < 0.05 was considered statistically significant. Analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY).

Table No. 1: Baseline Demographic and Clinical Characteristics

Variable	Drain (n=50)	No-drain (n=50)	Total (N=100)	p-value
Mean age (years), mean ± SD	56.8 ± 12.4	55.6 ± 11.9	56.2 ± 12.1	0.63
Male sex	48 (96%)	47 (94%)	95 (95%)	0.65
Female sex	2 (4%)	3 (6%)	5 (5%)	0.65
BMI (kg/m ²), mean ± SD	25.8 ± 3.2	26.1 ± 3.5	25.9 ± 3.3	0.71
Right-sided hernia	31 (62%)	29 (58%)	60 (60%)	0.68
Left-sided hernia	16 (32%)	18 (36%)	34 (34%)	0.67
Bilateral hernia	3 (6%)	3 (6%)	6 (6%)	1.00
Mean duration of symptoms (months)	38.5 ± 17.2	36.9 ± 18.4	37.7 ± 17.8	0.65
Giant inguinoscrotal hernia	21 (42%)	20 (40%)	41 (41%)	0.84
Irreducible hernia	34 (68%)	35 (70%)	69 (69%)	0.83
Obstructed hernia	16 (32%)	15 (30%)	31 (31%)	0.83
Diabetes mellitus	12 (24%)	10 (20%)	22 (22%)	0.63
Hypertension	15 (30%)	14 (28%)	29 (29%)	0.82
Current smoker	18 (36%)	17 (34%)	35 (35%)	0.83
ASA Grade I	9 (18%)	10 (20%)	19 (19%)	0.80
ASA Grade II	28 (56%)	27 (54%)	55 (55%)	0.84
ASA Grade III	13 (26%)	13 (26%)	26 (26%)	0.99

Table 1. Baseline demographic and clinical characteristics (N = 100). Values are mean ± SD or n (%). Groups were well matched at baseline, with no statistically significant differences in age, sex, BMI, hernia laterality, hernia complexity, comorbidity profile, or ASA grade.

RESULTS OVERVIEW

A total of 100 patients with large, complicated inguinoscrotal inguinal hernia were enrolled and

equally allocated to the drain group (n = 50) and the no-drain group (n = 50). All patients completed the 30-day follow-up period, and there were no losses to follow-up. Baseline

demographic and clinical characteristics were comparable between the two groups (Table 1).

SEROMA AND SURGICAL SITE INFECTION

The incidence of postoperative seroma was significantly lower in the drain group, occurring in 8% (4/50) of patients compared with 22% (11/50) of patients in the no-drain group ($p =$

0.04). Surgical site infection occurred in 6% (3/50) of the drain group and 8% (4/50) of the no-drain group, a difference that was not statistically significant ($p = 0.69$). These findings indicate that closed suction drain placement was associated with a significant reduction in seroma formation without a corresponding increase-and indeed with a numerically lower rate-of surgical site infection.

Table No. 2: Primary and Secondary Outcomes

Outcome	Drain (n=50)	No-drain (n=50)	p-value
Seroma	4 (8%)	11 (22%)	0.04
Surgical site infection	3 (6%)	4 (8%)	0.69
Haematoma	2 (4%)	5 (10%)	0.27
Seroma aspiration required	1 (2%)	6 (12%)	0.05
Reoperation	1 (2%)	2 (4%)	0.56
Mean hospital stay (days)	3.8 $\pm$ 1.2	3.2 $\pm$ 1.1	0.02

Table 2. Comparison of primary and secondary outcomes between groups. Values are n (%) or mean $\pm$ SD.

DRAIN-RELATED FINDINGS (GROUP A)

Among patients in the drain group, the closed suction drain was well tolerated overall. No episodes of drain blockage or retrograde drain-site infection were recorded. One patient (2%) required reoperation for a persistent deep

collection despite drain placement. The marginally longer mean hospital stay in the drain group (3.8 vs 3.2 days, $p = 0.02$) most plausibly reflects the additional time required for drain output to fall below the threshold for removal, rather than drain-related morbidity.

Table No. 3: Comparison with Previous Studies

Study	Setting	Seroma (Drain vs No Drain)	SSI (Drain vs No Drain)
Sahu <i>et al.</i> ¹	Complete inguinal hernia, Lichtenstein repair	2.5% vs 22.5%	2.5% vs 17.5%
Ismail <i>et al.</i> ⁶	Laparoscopic TEP repair	0.75% vs 15.1%	No infection in either group
Present study	Large complicated inguinoscrotal hernia, Lichtenstein repair	8% vs 22%	6% vs 8%

Table 3. Comparison of seroma and SSI rates with previously published studies.

SUMMARY OF CLINICAL OUTCOMES

- **SEROMA RATE:** Drain vs No-drain: 8% vs 22% ($p = 0.04$).
- **SSI RATE:** Drain vs No-drain: 6% vs 8% ($p = 0.69$).
- Reintervention (aspiration/reoperation) rate-Drain vs No-drain: 4% vs 16%.
- Mean hospital stay-Drain vs No-drain: 3.8 vs 3.2 days ($p = 0.02$).
- **Drain-Related Complications:** None of note (0%).

DISCUSSION

In this prospective comparative study, closed suction drain placement after open Lichtenstein mesh repair of large complicated inguinoscrotal

hernia was associated with a significantly lower rate of seroma (8% vs 22%, $p = 0.04$) but no significant difference in surgical site infection (6% vs 8%, $p = 0.69$) compared with no drain. These findings are consistent with the only comparable series in complete inguinoscrotal hernia, in which closed suction drainage reduced seroma from 22.5% to 2.5% and SSI from 17.5% to 2.5%,⁶ and with data from laparoscopic TEP repair showing that preperitoneal suction drainage reduces seroma without increasing infection risk⁷. This supports the hypothesis that, unlike in primary uncomplicated inguinal hernia repair-where a Cochrane review and a classic randomized trial found no clear benefit of drainage^{3,4}-the large dead space created during dissection of a giant

or complicated inguinoscrotal sac is a distinct clinical scenario in which active evacuation of serosanguinous fluid may meaningfully reduce the substrate for both seroma and secondary infection.

THE MECHANISM IS PLAUSIBLE: Persistent dead space allows accumulation of serosanguinous exudate around the mesh, and this fluid collection both mechanically stresses the wound and provides a nidus for bacterial colonization, particularly in low-resource settings where prolonged pressure dressings and scrotal support are the only alternative to drainage². Complications of open groin hernia repair, including seroma and SSI, remain a recognized source of morbidity even after technically successful mesh repair⁸, underscoring the importance of dead-space management specifically in this complicated, high-volume subgroup.

In the present cohort, seroma aspiration was required less often in the drain group (2%) than in the no-drain group (12%, $p = 0.05$), reinforcing the effect of drainage on clinically significant fluid collections requiring intervention. Reoperation rates were low and comparable between groups (2% vs 4%, $p = 0.56$), and hospital stay was marginally, though statistically significantly, longer in the drain group (3.8 vs 3.2 days, $p = 0.02$), most likely reflecting the additional day required for drain output to fall to a removal threshold rather than any major drain-related morbidity. No drain-site complications such as blockage or retrograde infection were observed in this series, suggesting that the modest logistic burden of drain care was not offset by increased harm.

This study has several limitations, including a modest single-centre sample size ($n = 100$), non-randomized (alternate) allocation of patients to the drain and no-drain groups, a follow-up period limited to 30 days, and the absence of a formal cost-effectiveness or quality-of-life analysis of drain use. Larger, multicentric, ideally randomized studies with longer follow-up are needed to confirm these findings and to define the optimal duration of drain retention.

CONCLUSION

In patients undergoing open Lichtenstein mesh repair of large, complicated inguinoscrotal inguinal hernia, closed suction drain placement was associated with a significantly lower rate of

postoperative seroma formation without a significant increase in surgical site infection, at the cost of a marginally longer hospital stay. These findings support the selective use of closed suction drainage in this high dead-space subgroup. Larger multicentre randomized studies are required to validate these findings.

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