(ISSN Online: 3006-1113) Full Paper

Libyan Journal of Medical and Applied Sciences

Journal homepage: https://ljmas.com/index.php/journal/index

SHORT COMMUNICATION

Effect of Closed Suction Drainage on Postoperative Seroma Formation After Lichtenstein Hernioplasty for Complete Inguinoscrotal Hernia: A Prospective Comparative Study

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Article Information

Article history:
Received on: 11/Jul/2026
Revised on: 12/Aug/2026
Accepted on: 25/Aug/2026
Available online:31/Aug/2026
Published on: 05/Sep/2026

Keywords:
Complete inguinal hernia, Lichtenstein's hernioplasty, Closed suction drain, Seroma, Hematoma

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Abstract

Background: Lichtenstein tension-free hernioplasty is widely accepted as the standard technique for inguinal hernia repair. Nevertheless, postoperative complications such as seroma and scrotal hematoma occur in approximately 5–12% of cases, particularly in patients with large or complete inguinoscrotal hernias. These complications are frequently associated with extensive surgical dissection and inflammatory reactions related to polypropylene mesh.**Objective:** To evaluate the effectiveness of closed suction drainage in preventing postoperative seroma formation following Lichtenstein hernioplasty in patients with complete inguinoscrotal hernia. **Materials & Methods**: A prospective non-randomized comparative study with alternate allocation was conducted on 92 patients diagnosed with complete inguinoscrotal hernia. Patients were assigned by alternate allocation into two groups: a Drain group and a Drainless group. The incidence of postoperative seroma, hematoma, and surgical site infection (SSI) was compared between the two groups.
Results: The incidence of hematoma, seroma, and surgical site infection was lower in the drain group compared with the drainless group (2.17% vs 13.04%, 2.17% vs 17.39%, and 2.17% vs 13.04%, respectively). Statistical analysis showed a statistically significant reduction in postoperative seroma formation in the drain group, whereas the differences in hematoma and surgical site infection did not reach statistical significance.**Conclusion:** Placement of a closed suction drain after distal sac dissection during Lichtenstein hernioplasty significantly reduces postoperative seroma formation. The observed reductions in hematoma and surgical site infection were not statistically significant.

1. Introduction

Inguinal hernia repair is among the most commonly performed procedures in general surgery. The Lichtenstein tension-free mesh repair has become the preferred open technique due to its simplicity, low recurrence rate, and reproducible outcomes [1]. Polypropylene mesh is widely used because of its availability, low cost, and favorable handling characteristics during surgery.

Despite these advantages, postoperative complications such as seroma and scrotal hematoma remain relatively common, particularly in patients with complete inguinoscrotal hernias. The reported incidence ranges between 5% and 12% following Lichtenstein hernioplasty [2]. These complications are often related to extensive dissection, the presence of a large distal hernia sac, and inflammatory reactions associated with mesh implantation.

Although small postoperative seromas may resolve spontaneously, larger seromas may require repeated aspiration or surgical drainage. Persistent seroma can cause patient discomfort, anxiety, and repeated hospital visits. Therefore, various strategies have been proposed to minimize seroma formation following hernia repair.

The routine use of suction drains following Lichtenstein hernioplasty remains controversial, with differing opinions among surgeons regarding its potential benefits and risks [3–5]. The present study was undertaken to assess the effectiveness of closed suction drainage in reducing postoperative seroma formation following Lichtenstein hernioplasty in patients with complete inguinoscrotal hernia.

DOI: https://doi.org/10.64943/ljmas.2026.040310

2. Materials and Methods

This prospective comparative study was conducted between January 2021 and December 2024 at the Department of Surgery, Ibn Sina Hospital and Sirte Oncology Center, Sirte, Libya.

Ethical approval was obtained from the Research Center of the Faculty of Medicine, and written informed consent was obtained from all patients prior to participation.

Complete inguinal hernia was defined as a hernia extending to the base of the scrotum. Patients presenting with obstructed or strangulated hernias, incomplete inguinal hernias, or other types such as femoral or sliding hernias were excluded from the study.

All patients underwent Lichtenstein tension-free hernioplasty using polypropylene mesh fixed with 2-0 Prolene sutures under spinal or general anesthesia. All procedures were performed by consultant surgeons.

All patients received the same antibiotic regimen consisting of a third-generation cephalosporin (ceftriaxone) administered intravenously at induction of anesthesia followed by oral therapy for seven days postoperatively.

Patients were assigned by alternate allocation into two groups: the Drain group and the Drainless group.

In the Drain group, A closed negative-pressure suction drain (Romovac®) was positioned over the mesh and extended into the scrotum. The drain exited adjacent to the surgical incision and The drain was kept for a mean 2 days and removed once the daily output decreased to less than 10 mL.

In the Drainless group, No drain was inserted after mesh placement.

Postoperative evaluation included clinical assessment for seroma formation, hematoma, and surgical site infection. Seroma severity was classified according to the Morales-Conde classification used in laparoscopic ventral hernia repair6. The severity (Morales-Conde type), consequences (surgical site infection, extrusion of mesh and hernia recurrence), and outcome (spontaneous resolution, need of aspiration, and open drainage) were documented.

Statistical analysis was performed using OpenEpi online statistical software. Continuous variables were analyzed using Student's t-test. Categorical variables were compared using the Chi-square test or Fisher's exact test, as appropriate, particularly when expected cell frequencies were low. A p-value less than 0.05 was considered statistically significant.

3. Results

During the study period, 131 patients underwent inguinal hernia surgery. Of these, 92 patients met the inclusion criteria and were included in the study.

All participants were male, with ages ranging from 26 to 62 years (mean age 46 ± 8 years). Patients were equally divided into two groups of 46 patients each.

Baseline characteristics including age, body mass index, hernia side, preoperative hemoglobin level, and operative time were comparable between the two groups.

Postoperative hematoma occurred in 1 patient (2.17%) in the drain group compared with 6 patients (13.04%) in the drainless group.

Seroma formation was observed in 1 patient (2.17%) in the drain group and 8 patients (17.39%) in the drainless group.

Surgical site infection occurred in 1 patient (2.17%) in the drain group compared with 6 patients (13.04%) in the drainless group. All infections were superficial.

Seromas in the drainless group were more severe. Two patients required open drainage, while six patients required repeated needle aspiration. In contrast, the single seroma in the drain group was classified as Type I and resolved with conservative management (Table 1).

The mean drain output was 62 ± 12 mL (range 40–90 mL), and the average duration of drainage was two days.

During the six-month follow-up period, no cases of deep surgical site infection, mesh extrusion, chronic pain, or hernia recurrence were recorded.

Table 1. Baseline Characteristics and Surgical Outcomes in the Drain and Drainless Groups

Parameter	Drain (n=46)	Drainless (n=46)	P-Value
Age (years)	45.7 ±8.4	46.2 ± 8.1	0.54
BMI (kg/m2)	22.38	22.70	0.91
Hernia side (Right: Left)	30:16	29:17	0.74
Pre-op Hb (g/dL)	12.2 ± 1.1	12.1 ± 1.2	0.71
Incarcerated hernia	5	6	0.68
Operating time(minutes)	60 ± 7	60 ± 5	0.82
Hematoma formation	1 (2.17%)	6 (13.04%)	0.1106
Seroma formation	1 (2.17%)	8 (17.39%)	0.0302
Severity of Seroma	Type I-1	Type II- 6 ; Type III- 2	-
Surgical site infection	1 (2.17%) (All superficial)	6 (13.04%) (All superficial)	0.1106

4. Discussion

Lichtenstein hernioplasty is currently regarded as the standard technique for open inguinal hernia repair, with polypropylene mesh being the most commonly utilized prosthetic material because of its affordability, durability, and wide availability [1]. In addition, several studies have demonstrated that polypropylene mesh can also be safely used in more complex situations such as contaminated or strangulated hernias and abdominal wall reconstruction following perforation peritonitis, with acceptable morbidity and satisfactory short-term outcomes [6-8].

Despite these advantages, mesh-based inguinal hernia repair is associated with a number of postoperative complications, among which seroma and scrotal hematoma are frequently encountered. Previous reports have shown that these complications occur in approximately 5–12% of patients undergoing Lichtenstein hernioplasty [2]. The pathogenesis of postoperative seroma formation is multifactorial and may be related to extensive tissue dissection, the presence of a large distal hernia sac, and inflammatory reactions induced by the implanted polypropylene mesh [9–11].

Accumulation of serous fluid or blood within the dead space surrounding the mesh or in the scrotum may create a favorable environment for bacterial growth, thereby increasing the risk of surgical site infection. In severe cases, infection may lead to mesh extrusion, visceral complications, or even hernia recurrence [6]. Moreover, postoperative scrotal swelling resulting from seroma or hematoma can be distressing for patients and may cause prolonged discomfort, pain, cellulitis, and repeated hospital visits [12].

Although small seromas often resolve spontaneously without intervention, larger or persistent collections frequently require repeated percutaneous aspiration or, in some cases, surgical drainage [13]. Consequently, considerable efforts have been made to identify effective strategies to minimize postoperative complications following Lichtenstein hernioplasty.

The intrinsic foreign-body nature of polypropylene mesh has been debated in the literature; however, modifications in mesh type have not consistently resulted in a significant reduction in mesh-related complications or dissection-related morbidity [14]. Some studies have suggested that the use of alternative mesh systems, such as the Prolene Hernia System, may reduce the incidence of postoperative complications in selected cases [11].

In resource-limited settings, additional challenges may arise because many patients present late with large inguinoscrotal hernias extending to the bottom of the scrotum [15]. Furthermore, in teaching hospitals a considerable proportion of hernia repairs are performed by surgical trainees under supervision, which may increase the technical difficulty of the procedure and potentially influence postoperative outcomes [16].

The use of closed suction drainage following Lichtenstein hernioplasty remains a subject of debate among surgeons [3–5]. Although suction drains are widely employed in several surgical procedures, including extraperitoneal and laparoscopic repairs, the available evidence regarding their effectiveness in preventing seroma formation after inguinal hernia repair is still limited [17–19].

Only a few studies have specifically evaluated the therapeutic value of closed suction drainage in patients with complete inguinoscrotal hernias, a condition that is typically associated with large redundant sacs, extensive dissection, and a higher risk of postoperative seroma or hematoma formation [20,21].

One of the concerns related to the use of drains is the possibility of introducing infection in the presence of prosthetic material. In addition, some surgeons believe that the use of drains contradicts the principle of day-care hernia surgery. Nevertheless, suction drains are routinely used in many surgical specialties in situations where postoperative fluid accumulation is anticipated [17,22–24].

In the present study, the incidence of postoperative seroma was significantly higher in the drainless group compared with the group in which a closed suction drain was used, whereas the difference in hematoma was not statistically significant. The significant reduction in seroma suggests that the use of a drain may effectively evacuate accumulating fluid and reduce the formation of dead space after extensive dissection.

Moreover, if a suction drain is not placed in cases of large inguinoscrotal hernia, complications such as deep infection or the need for repeated aspiration or surgical drainage may occur more frequently following an otherwise standardized procedure such as Lichtenstein hernioplasty.

Importantly, no cases of mesh infection were observed in the drain group in our study. Closed suction drainage systems function as a sealed negative-pressure system that continuously evacuates collected fluid while simultaneously facilitating collapse of the potential dead space, thereby limiting the entry of microorganisms from the external environment [24].

Several alternative techniques have been proposed to reduce postoperative seroma formation. These include leaving the distal hernia sac undissected, the application of medical talc powder (hydrated magnesium silicate), injection of triamcinolone acetonide, use of fibrin sealants, or placement of quilting sutures [13,25–28]. However, the effectiveness of these methods remains uncertain, and concerns have been raised regarding the potential risk of infection or foreign-body granuloma formation.

In the present study, distal sac dissection was performed in all patients; nevertheless, postoperative seroma formation still occurred in some cases. This observation suggests that additional factors, such as inflammatory reaction to the mesh and residual dead space, may contribute to seroma formation.

Our findings are consistent with the results reported by Sahu et al., who reported a reduction in postoperative seroma and hematoma when closed suction drainage was used following Lichtenstein hernioplasty in patients with complete inguinoscrotal hernia [29]. In the present study, however, the reduction in hematoma did not reach statistical significance.

Considering the frequency and clinical impact of postoperative seroma, the findings of this study support the use of closed suction drainage as a simple and effective measure to reduce postoperative complications, minimize patient discomfort, and decrease the need for repeated hospital visits.

In addition, the alternate allocation method used in this prospective non-randomized comparative study may have introduced allocation and selection bias. The sample size may also have limited the statistical power to detect differences in low-incidence outcomes such as hematoma and surgical site infection. Follow-up assessors were not blinded to drain status; clinicians conducting postoperative assessments knew whether a drain had been placed.

Nevertheless, certain limitations should be acknowledged. These include the relatively small sample size and the fact that a proportion of the procedures were performed by surgical trainees, which may have influenced operative outcomes.

No formal a priori sample size calculation was performed before study initiation; the sample size was based on the number of eligible patients available during the study period. This may have limited the statistical power to detect differences in low-incidence outcomes such as hematoma and surgical site infection.

5. Conclusion

Closed suction drainage appears to be an effective adjunct during Lichtenstein hernioplasty for complete inguinoscrotal hernia. In this study, the use of a drain was associated with a statistically significant reduction in postoperative seroma formation, while the reductions in hematoma and surgical site infection did not reach statistical significance. The technique is simple and applicable in routine surgical practice.

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تأثير التصريف المغلق بالشفط على تكوّن الورم المصلي بعد عملية إصلاح الفتق الإربي الصفني الكامل بتقنية ليختنشتاين: دراسة مقارنة مستقبلية

المخلص

الخلفية: تُعدّ عملية إصلاح الفتق الإربي بتقنية ليختنشتاين، الخالية من الشد، التقنية القياسية المُعتمدة على نطاق واسع لإصلاح الفتق الإربي. ومع ذلك، تحدث مضاعفات ما بعد الجراحة، مثل الورم المصلي والورم الدموي الصفني، في حوالي 5-12% من الحالات، لا سيما لدى المرضى الذين يعانون من فتق إربي صفني كبير أو كامل. غالبًا ما ترتبط هذه المضاعفات بالتشريح الجراحي الواسع وردود الفعل الالتهابية المرتبطة بشبكة البولي بروبيلين. **الهدف:** تقييم فعالية التصريف المغلق بالشفط في منع تكوّن الورم المصلي بعد عملية إصلاح الفتق الإربي الصفني بتقنية ليختنشتاين لدى المرضى الذين يعانون من فتق إربي صفني كامل. المواد والأساليب: أُجريت دراسة مقارنة مستقبلية غير عشوائية مع توزيع بديل على 92 مريضًا تم تشخيص إصابتهم بفتق إربي صفني كامل. تم توزيع المرضى بالتناوب إلى مجموعتين: مجموعة التصريف ومجموعة عدم التصريف. وقورنت نسبة حدوث الورم المصلي، والورم الدموي، وعدوى موقع الجراحة بعد العملية بين المجموعتين.

النتائج: كانت نسبة حدوث الورم الدموي، والورم المصلي، وعدوى موقع الجراحة أقل في مجموعة التصريف مقارنةً بمجموعة عدم التصريف (2.17% مقابل 13.04%، و2.17% مقابل 17.39%، و2.17% مقابل 13.04% على التوالي). أظهر التحليل الإحصائي انخفاضًا ذا دلالة إحصائية في تكوّن الورم المصلي بعد العملية في مجموعة التصريف، بينما لم تكن الفروقات في الورم الدموي وعدوى موقع الجراحة ذات دلالة إحصائية. **الاستنتاج:** يُقلل وضع أنبوب تصريف مغلق بالشفط بعد تشريح الكيس البعيد أثناء عملية إصلاح الفتق بتقنية ليختنشتاين بشكل ملحوظ من تكوّن الورم المصلي بعد العملية. لم تكن الانخفاضات الملحوظة في الورم الدموي وعدوى موقع الجراحة ذات دلالة إحصائية.

الكلمات المفتاحية: فتق إربي كامل، عملية إصلاح الفتق بطريقة ليختنشتاين، أنبوب تصريف مغلق بالشفط، ورم مصلي، ورم دموي