



Drain versus no drain after open hernia repair: perioperative outcomes from a real-world registry-based analytical cross-sectional study.

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Abstract

Background:

Open hernia repair remains one of the most frequently performed procedures in general surgery. The role of routine drain placement after open repair is still debated because drains can potentially reduce fluid collections, yet they can also increase discomfort, prolong hospitalization, and complicate postoperative care.

Objectives:

To compare perioperative and short-term postoperative outcomes between patients who underwent open hernia repair with drain placement and those managed without a drain.

Methods:

This hospital-based registry-derived analytical cross-sectional study included 100 adults who underwent elective open hernia repair at Government Medical College and associated teaching hospital, Suryapet, Telangana, India, between January 2025 and December 2025. Patients were classified into drain and no-drain comparison groups, with 50 patients in each group. Demographic variables, hernia characteristics, operative details, hospital stay, postoperative complications, ambulation, and return to normal activity were analyzed using standard comparative statistics.

Results:

Baseline demographic and clinical characteristics were comparable between the two groups. The drain group had a longer operative time and longer hospital stay than the no-drain group. Seroma formation was numerically lower with drains, but the difference was not statistically significant. Rates of hematoma, surgical site infection, wound dehiscence, and moderate-to-severe wound pain were comparable between groups. Patients without drains ambulated earlier and returned to normal activity sooner.

Conclusion:

Routine drain placement after open hernia repair did not produce a statistically significant reduction in postoperative complications in this registry-derived cross-sectional analysis. Drain use was associated with longer surgery, prolonged hospitalization, delayed ambulation, and slower functional recovery.

Recommendations:

Selective rather than routine use of drains should be considered during open hernia repair. Surgeons should individualize drain placement based on intraoperative dissection, dead space, bleeding risk, and hernia complexity while strengthening standardized postoperative pathways and uniform registry documentation.

Keywords: drain; open hernia repair; perioperative outcomes; seroma; surgical site infection; analytical cross-sectional study; registry-based study

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Introduction

Abdominal wall hernias represent a major component of everyday general surgical practice. Groin hernia repair alone accounts for a substantial global procedural burden, and international guidance has emphasized the need to optimize operative technique, reduce recurrence, and minimize postoperative pain and wound morbidity [1-3]. Open repair continues to be widely performed across a broad spectrum of groin, umbilical, and incisional hernias because of its reproducibility, applicability in resource-limited settings, and suitability for diverse patient profiles. At the same time, ventral and incisional hernias remain clinically important because they are associated with repeated healthcare utilization, high long-term recurrence, and considerable economic cost [4].

Among the unresolved technical questions in open hernia surgery is whether a drain should be placed routinely at the end of the procedure. Drains are commonly used with the intention of evacuating blood and serous fluid, reducing dead-space collection, and lowering the risk of seroma or hematoma formation [5]. This rationale is especially attractive in patients with extensive dissection, large hernia sacs, obesity, onlay mesh placement, or wide subcutaneous flaps. However, the biological and practical disadvantages of drains are equally relevant. They can act as a conduit for retrograde contamination, increase patient discomfort, restrict early mobility, prolong inpatient observation, and delay discharge or return to routine function [6-8].

The current evidence base remains inconsistent. Early randomized evidence in inguinal hernia surgery suggested that suction drainage might reduce wound events in selected complicated cases [6]. In contrast, subsequent work in ventral and incisional hernia repair has shown that drains do not consistently decrease postoperative collections and, in some settings, have been associated with higher wound infection rates or longer hospital stay [7]. Registry analyses and meta-analyses have also produced mixed findings, with some studies reporting lower seroma rates after retromuscular repair, whereas others show no clear overall advantage for routine drainage in broader open hernia populations [11-14]. This heterogeneity likely reflects differences in hernia type, operative plane, mesh position, patient risk, and surgeon preference.

Because perioperative decision-making in hernia surgery is often shaped by local practice patterns rather than uniform evidence, real-world institutional data remain valuable. Registry-derived analytical cross-sectional studies can describe routine surgical behavior, short-term perioperative outcomes, and early recovery measures that are not always

fully represented in tightly controlled trials, provided that such studies are reported transparently and interpreted with appropriate caution. In resource-constrained and high-volume settings, understanding whether drains meaningfully influence clinically relevant outcomes such as hospital stay, wound complications, ambulation, and return to normal activity is particularly important.

The objective of this study was to compare demographic characteristics, perioperative variables, postoperative complications, and early recovery outcomes between patients undergoing open hernia repair with drain placement and those undergoing repair without a drain, and to determine whether drain use was associated with measurable perioperative benefit in a real-world registry-based analytical cross-sectional dataset.

Methodology

Study design and setting

This study was designed as a hospital-based registry-derived analytical cross-sectional study. It was conducted at the Government Medical College and associated teaching hospital, Suryapet, Telangana, India, a government tertiary care teaching centre that provides general surgical services to patients from Suryapet district and adjoining rural and semi-urban areas. The Department of General Surgery manages routine elective abdominal wall hernia cases, including inguinal, umbilical, and incisional hernias, along with other elective and emergency surgical admissions. The present registry-based analysis included 100 eligible adult open hernia repairs recorded between January 2025 and December 2025, representing the routine institutional open hernia workload during the defined study period. The cross-sectional design was adopted because drain status and perioperative outcomes were assessed from a single index surgical episode within a defined registry period, without planned longitudinal follow-up or time-to-event assessment. The study was prepared and reported in accordance with the STROBE recommendations for observational research, using the cross-sectional reporting framework [1].

Participants

All consecutive adult patients aged 18 years and above who underwent elective open repair for inguinal, umbilical, or incisional hernia during the study period were screened through the departmental hernia registry. Only patients with complete operative records, inpatient perioperative documentation, discharge details, and early postoperative outcome entries were included in the final analysis. The final study sample comprised 100 patients.



Eligibility criteria:

Inclusion criteria

Adult patients aged 18 years and above; elective open repair of inguinal, umbilical, or incisional hernia; availability of complete operative notes documenting drain status; and availability of perioperative and early postoperative outcome data in the registry.

Exclusion criteria

Laparoscopic or robotic hernia repair; emergency hernia surgery; recurrent hernia requiring complex abdominal wall reconstruction; hernia repair combined with bowel resection or another major abdominal procedure; contaminated or grossly infected operative field; and incomplete or missing outcome documentation.

Comparison groups

The comparison variable was intraoperative drain placement. Patients were classified into a drain group and a no-drain group according to the operative note recorded at the index procedure. Drain placement was left to the discretion of the operating surgeon based on intraoperative findings such as the extent of dissection, perceived dead space, oozing, and tissue handling. Fifty patients underwent drain placement, and fifty patients underwent open repair without a drain.

Variables and outcome measures

The registry variables analyzed included age, sex, body mass index, hernia type, diabetes mellitus, and hypertension. Perioperative outcomes included operative time, estimated intraoperative blood loss, and length of hospital stay. Postoperative complications included seroma formation, hematoma, surgical site infection, wound pain of moderate-to-severe intensity, and wound dehiscence. Early recovery variables included time to ambulation and time to return to normal daily activity. For patients in the drain group, the duration of drain placement was also documented. Outcomes were assessed during the index admission, and early postoperative review was documented in the institutional registry.

Data collection procedure

Data were extracted from the departmental real-world hernia registry and cross-verified with operative records, postoperative progress sheets, discharge summaries, and early postoperative review entries. Continuous variables

were recorded as mean with standard deviation, while categorical variables were documented as frequency and percentage. To improve consistency, postoperative wound events were defined according to the treating surgical team documentation and registry coding, which followed standard clinical reporting terminology used in abdominal wall surgery [7,8,10].

Statistical analysis

Data were entered into a structured database and analyzed using standard statistical methods suitable for an analytical cross-sectional comparison. Continuous variables were compared between groups using the independent-samples t-test after assessment of distributional suitability. Categorical variables were compared using the chi-square test as appropriate. A p-value of less than 0.05 was considered statistically significant. The analysis was directed toward estimating associations and group differences in perioperative burden, postoperative wound morbidity, and early recovery rather than establishing causal inference.

Ethical considerations

The study used de-identified registry and case-record data. Ethical approval was obtained from the Institutional Ethics Committee, Government Medical College, Suryapet, Telangana, India. Confidentiality of patient information was maintained throughout data extraction, analysis, and manuscript preparation. No personal identifiers were retained in the analytical dataset.

Informed consent. The requirement for informed consent was waived due to the retrospective nature of the registry-based analysis and the use of anonymized data, as approved by the Institutional Ethics Committee, Government Medical College, Suryapet, Telangana, India.

Results

A total of 100 patients who underwent elective open hernia repair were included in this hospital-based registry-derived analytical cross-sectional study. The study sample was divided into two comparison groups according to intraoperative drain placement: drain group (n = 50) and no-drain group (n = 50). Baseline demographic and clinical characteristics were comparable between the groups, and no statistically significant difference was observed in age, sex distribution, body mass index, hernia type, diabetes mellitus, or hypertension, indicating acceptable baseline comparability for descriptive analytical comparison (Table 1).

Table 1. Baseline demographic and clinical characteristics of study participants (n = 100)

Variable	Drain group (n = 50)	No-drain group (n = 50)	p-value
Age (years, mean $\pm$ SD)	46.8 $\pm$ 12.4	45.6 $\pm$ 11.8	0.62
Male sex	42 (84.0%)	40 (80.0%)	0.59
BMI (kg/m ² , mean $\pm$ SD)	26.2 $\pm$ 3.4	25.8 $\pm$ 3.1	0.48
Type of hernia			0.64
Inguinal	38 (76.0%)	36 (72.0%)	
Umbilical	8 (16.0%)	10 (20.0%)	
Incisional	4 (8.0%)	4 (8.0%)	
Diabetes mellitus	12 (24.0%)	10 (20.0%)	0.63
Hypertension	16 (32.0%)	14 (28.0%)	0.66

Perioperative outcomes showed a statistically significant increase in operative time in the drain group compared with the no-drain group (72.6 $\pm$ 14.2 minutes versus 65.8 $\pm$ 12.6 minutes; $p = 0.01$). Length of hospital stay was also significantly longer among patients who received drains (3.8

$\pm$ 1.2 days versus 2.6 $\pm$ 0.9 days; $p < 0.001$). Although the mean intraoperative blood loss was slightly higher in the drain group, this difference was not statistically significant (Table 2).

Table 2. Perioperative outcomes (n = 100)

Variable	Drain group (n = 50)	No-drain group (n = 50)	p-value
Operative time (minutes, mean $\pm$ SD)	72.6 $\pm$ 14.2	65.8 $\pm$ 12.6	0.01
Intraoperative blood loss (mL, mean $\pm$ SD)	84.2 $\pm$ 28.6	78.4 $\pm$ 26.1	0.28
Length of hospital stay (days, mean $\pm$ SD)	3.8 $\pm$ 1.2	2.6 $\pm$ 0.9	<0.001

Postoperative wound-related complications were broadly comparable between the two groups. Seroma formation occurred less frequently in the drain group than in the no-drain group, but the difference did not reach statistical significance (12.0% versus 20.0%; $p = 0.27$). Similarly,

hematoma, surgical site infection, wound pain, and wound dehiscence did not differ significantly between groups. The direction of effect suggested a modest reduction in fluid collection with drains, offset by a slightly higher burden of infection and pain-related morbidity (Table 3).

Table 3. Postoperative complications (n = 100)

Complication	Drain group (n = 50)	No-drain group (n = 50)	p-value
Seroma formation	6 (12.0%)	10 (20.0%)	0.27
Hematoma	3 (6.0%)	4 (8.0%)	0.69
Surgical site infection	5 (10.0%)	3 (6.0%)	0.46
Wound pain (moderate-to-severe)	14 (28.0%)	9 (18.0%)	0.23
Wound dehiscence	2 (4.0%)	1 (2.0%)	0.56

Recovery-related outcomes favored the no-drain group. Patients without drains ambulated significantly earlier than those with drains (18.6 ± 5.2 hours versus 22.4 ± 6.8 hours; $p = 0.002$) and returned to normal activity sooner (7.8 ± 2.4 days versus 9.6 ± 2.8 days; $p < 0.001$). Among patients in whom drains were placed, the mean duration of drain

retention was 2.8 ± 0.9 days. These findings indicate that, in this cross-sectional registry analysis, drain placement was associated with slower early postoperative recovery without a corresponding statistically significant reduction in short-term complications (Table 4).

Table 4. Recovery outcomes (n = 100)

Variable	Drain group (n = 50)	No-drain group (n = 50)	p-value
Time to ambulation (hours, mean $\pm$ SD)	22.4 ± 6.8	18.6 ± 5.2	0.002
Time to return to normal activity (days, mean $\pm$ SD)	9.6 ± 2.8	7.8 ± 2.4	<0.001
Drain duration (days, mean $\pm$ SD)	2.8 ± 0.9	-	-

Discussion

This real-world registry-derived analytical cross-sectional study compared perioperative and early postoperative outcomes between drain and no-drain strategies after open hernia repair. The principal observation was that routine drain placement was not associated with a statistically significant reduction in seroma, hematoma, surgical site infection, or wound dehiscence. In contrast, drain use was associated with longer operative duration, prolonged hospital stay, delayed ambulation, and slower return to normal activity. These findings suggest that the measurable perioperative burden of drains exceeded their observable short-term benefit in this study sample.

The seroma pattern in this study requires careful interpretation. Although seroma occurred less often in the drain group, the absolute reduction was modest and

statistically nonsignificant. This pattern is clinically plausible and aligns with the broader literature showing that drainage can reduce fluid accumulation in selected operative planes but does not consistently translate into a clear overall complication advantage across open hernia repairs [8-14]. Willemin et al. reported no meaningful reduction in postoperative fluid collection after open mesh incisional hernia repair with prophylactic drainage, although some secondary wound outcomes differed between groups [8]. Massey et al. also concluded that evidence supporting routine adjunctive measures, including drainage, remained limited and heterogeneous [9].

The finding of longer hospital stay and slower recovery with drain use is especially important for routine surgical practice. These observations are concordant with the large registry analysis by Sahm et al., which found worse overall outcomes among drained patients undergoing elective open



incisional hernia operations [13]. The recent meta-analysis by Sanha et al. similarly reported increased infection rate and longer hospital stay in drained groups without a significant reduction in seroma formation [14]. In practical terms, a drain can extend inpatient observation, require output monitoring, generate anxiety or discomfort, and interfere with patient confidence during mobilization.

The lack of significant benefit in wound complications in the present study also reflects the complexity of postoperative risk. Prior work has shown that wound morbidity after hernia repair is strongly influenced by hernia size, degree of dissection, mesh position, obesity, operative time, and contamination profile rather than a single technical adjunct [6,7]. White et al. found that drains did not reduce abnormal fluid collections in ventral hernia repair and that wound infections were more frequent when drains were used [6]. Fischer et al. demonstrated that operative complexity and wound characteristics are major determinants of surgical site occurrence risk [7]. Thus, a drain is unlikely to compensate fully for the broader biological drivers of wound morbidity. At the same time, the literature should not be oversimplified into a universal anti-drain conclusion. Some retromuscular and robotic ventral hernia studies have suggested lower seroma rates without increased infection when drains are used selectively [10-12]. The discrepancy between such findings and this study likely relates to differences in hernia type, reconstructive plane, mesh position, and patient selection. In the present study, most repairs were inguinal, with fewer umbilical and incisional cases, and the benefits observed in complex abdominal wall reconstruction cannot be assumed to apply equally to routine open hernia repair. From a clinical standpoint, the current results support a selective rather than routine approach to drainage. When intraoperative dissection is limited and hemostasis is secure, omitting a drain appears reasonable and may facilitate earlier mobilization and discharge. Conversely, in patients with extensive tissue undermining, sizable dead space, diffuse oozing, or more complex incisional defects, selective drain use can still be justified on case-specific grounds. This balanced interpretation is consistent with evolving hernia guidelines, which emphasize tailored decision-making and outcome-focused care rather than rigid routine practices [2,3].

Generalizability

Because this registry-derived analytical cross-sectional study reflects routine open hernia practice in a real-world government tertiary care teaching hospital in Telangana, the findings are relevant to similar hospitals that manage mixed

hernia populations with conventional open techniques. The results are especially applicable to centers where early mobilization, short hospital stay, and cost-conscious perioperative care are priorities. Extrapolation to complex abdominal wall reconstruction, laparoscopic repair, robotic repair, contaminated emergency surgery, or long-term recurrence outcomes should be made cautiously.

Conclusion

In this hospital-based registry-derived analytical cross-sectional study of 100 patients undergoing open hernia repair, drain placement did not show a statistically significant reduction in major short-term postoperative complications, including seroma, hematoma, surgical site infection, or wound dehiscence. Instead, drain use was associated with longer operative time, prolonged hospital stay, delayed ambulation, and slower return to normal activity. These findings support the view that routine drainage after open hernia repair offers limited overall benefit in uncomplicated or moderately complex cases. A selective approach, guided by intraoperative dead space, tissue dissection, bleeding risk, and hernia complexity, appears more appropriate than default drain placement in everyday surgical practice.

Limitations

This study was based on a single-center registry-derived analytical cross-sectional dataset with a relatively small sample size and short-term postoperative outcome assessment. Drain placement was surgeon-directed rather than randomized, which introduces selection bias and confounding by indication. The study design does not permit assessment of longitudinal outcomes or causal inference. The sample also included mixed hernia types, and subgroup-specific inference was limited. Long-term outcomes such as recurrence, chronic pain, and reintervention were not analyzed in this dataset.

Recommendations

Routine drain placement after open hernia repair should be avoided in standard-risk cases where meticulous hemostasis and limited dead space are achieved. Hospitals should adopt explicit criteria for selective drain use, incorporate recovery-focused pathways that prioritize early ambulation and discharge, and standardize documentation of wound events in institutional hernia registries. Larger prospective multicenter studies from Indian surgical settings should evaluate drain use separately in inguinal, umbilical, and incisional hernia repair, with longer follow-up for



recurrence, chronic pain, quality of life, and resource utilization. Registry-based audit cycles should be used to continuously refine local practice.

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Abbreviations

BMI - Body mass index

CI - Confidence interval

LOS - Length of stay

SSI - Surgical site infection

STROBE - Strengthening the Reporting of Observational Studies in Epidemiology

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Conflict of interest

The authors declare no conflict of interest.

Author contributions

DG-Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **RT** -Concept and design of the study, results interpretation, review of literature, preparing the first draft of the manuscript, and revision of the manuscript. **SLK** - Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation. **SJ** - Design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript, revision of the manuscript

Data availability

De-identified data underlying the findings of this study are available upon reasonable request

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