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Comparison of Drains Versus No Drains in Abdominal Surgery: Impact on Morbidity and Recovery

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KEYWORDS

Abdominal surgery, postoperative recovery, surgical drains.

ABSTRACT:

Background: The use of prophylactic drains in abdominal surgery remains controversial. Although drains are traditionally placed to prevent postoperative fluid collection and infection, recent evidence questions their routine benefit. This study aimed to compare postoperative morbidity and recovery between patients undergoing abdominal surgery with and without drains.

Methods: A prospective comparative study was conducted among 200 patients undergoing elective or emergency abdominal surgeries at a tertiary care center. Patients were divided into two groups: Drain group (n=100) and No-drain group (n=100). Postoperative morbidity parameters such as surgical site infection (SSI), seroma, wound dehiscence, and intra-abdominal collections were assessed. Recovery outcomes included postoperative pain, time to mobilization, return of bowel function, and hospital stay. Data were analyzed using Chi-square and Welch's t tests; $p<0.05$ was considered statistically significant.

Results: Composite morbidity was comparable between groups (47% vs 38%, p=0.198). However, SSI was significantly higher in the drain group (29% vs 17%, p=0.043). Mean postoperative pain score was greater among drain patients (5.8 ± 1.7 vs 4.9 ± 1.6, p=0.0002). Time to mobilization (18.7 ± 6.3 h vs 14.9 ± 5.8 h, p<0.0001), return of bowel function (33.8 ± 9.7 h vs 29.1 ± 8.9 h, p=0.0004), and hospital stay (6.4 ± 2.3 vs 5.1 ± 1.9 days, p<0.0001) were all significantly prolonged in the drain group.

Conclusion: Routine drain placement after abdominal surgeries does not reduce morbidity and is associated with increased pain, delayed recovery, and higher infection rates. Drains should be used selectively based on intraoperative findings rather than as a standard practice.

INTRODUCTION

The use of surgical drains in abdominal procedures has been a topic of ongoing debate for decades, with opinions divided among surgeons across specialties. Surgical drains are devices used to evacuate accumulated fluids such as blood, pus, bile, or serous fluid from a surgical site, with the intent of preventing postoperative complications like seroma, hematoma, and abscess formation. Despite being widely adopted historically, the role of drains in modern abdominal surgery has become increasingly controversial with the advent of advanced surgical techniques, improved hemostasis, meticulous operative care, and evidence-based perioperative management.[1]

The fundamental purpose of drain placement is to allow early detection of postoperative bleeding or leakage and to prevent the accumulation of fluid collections that might otherwise serve as a nidus for infection. However, with the rise of minimally invasive surgical approaches and enhanced recovery after surgery (ERAS) protocols, the routine use of drains has come under scrutiny. Many randomized controlled trials and meta-analyses have

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suggested that in clean or clean-contaminated abdominal surgeries, the prophylactic use of drains may not confer additional benefit and might even contribute to increased morbidity.[2]

Historically, the use of drains can be traced back to the late 19th century when their application was based on empirical beliefs rather than scientific reasoning. Surgeons were guided by the philosophy that "when in doubt, drain," assuming that any undrained cavity would eventually lead to infection. However, with modern asepsis, antibiotic prophylaxis, and improved surgical hemostasis, these dogmas have been challenged. Drains may, paradoxically, introduce an entry point for ascending infections, cause mechanical irritation, delay wound healing, and increase postoperative pain and hospital stay.[3]

In abdominal surgery, the decision to use a drain depends largely on the nature of the procedure-elective versus emergency, clean versus contaminated, and open versus laparoscopic. For instance, in elective procedures such as hernia repair, cholecystectomy, or colectomy, the routine use of drains has been shown in several studies to be unnecessary. Conversely, in cases involving peritonitis, perforation, or abscess drainage, selective use of drains remains justified. The challenge lies in striking a balance between preventing complications and minimizing unnecessary postoperative interventions.[4]

The controversy persists because the benefits and harms of drainage vary depending on the surgical context. In colorectal surgeries, randomized controlled trials have shown no significant difference in the incidence of anastomotic leakage between drained and non-drained groups. Similarly, in hepatic and pancreatic surgeries, the selective use of drains is recommended only in high-risk cases. In clean abdominal procedures such as splenectomy or elective laparotomy, drains often serve more as a psychological reassurance to surgeons than a clinical necessity.[5]

MATERIAL AND METHODOLOGY

Source of Data

The study was conducted on patients undergoing abdominal surgeries at the Department of General Surgery, at tertiary care hospital catering to both elective and emergency surgical cases. Data were collected from patient records, operative notes, and direct postoperative observation.

Study Design

This was a prospective, comparative observational study designed to evaluate and compare postoperative outcomes in patients with drain placement versus those without drains following abdominal surgery.

Study Location

The study was carried out at the Department of General Surgery, at tertiary care teaching hospital equipped with state-of-the-art surgical facilities and comprehensive postoperative care units.

Study Duration

The study was conducted over a period of 18 months, from January 2023 to June 2024, including patient recruitment, follow-up, and data analysis.

Sample Size

A total of 200 patients were enrolled in the study and divided equally into two groups:

- **Group A (Drain group):** 100 patients in whom drains were placed postoperatively.
- **Group B (No-drain group):** 100 patients managed without postoperative drains.

Inclusion Criteria

- Patients aged 18 years and above.
- Patients undergoing elective or emergency abdominal surgeries (clean or clean-contaminated).
- Patients who provided informed consent for participation in the study.

Exclusion Criteria

- Patients undergoing contaminated or dirty surgeries (e.g., abscess drainage, bowel perforation with peritonitis).
- Patients with pre-existing intra-abdominal sepsis.
- Patients requiring re-exploration or second surgeries during the same admission.
- Patients lost to follow-up or unwilling to participate.

Procedure and Methodology

Eligible patients were assessed preoperatively with detailed history, clinical examination, and baseline investigations. Intraoperatively, the decision to place a drain was based on random allocation to either group, ensuring comparability of case types and operative complexity.

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Closed-suction drains (Redivac) were used in the drain group. The type of surgery, duration of procedure, intraoperative blood loss, and any intraoperative complications were recorded. Postoperative management included routine antibiotic prophylaxis, pain control, and early ambulation.

Patients were followed daily for drain output, wound condition, presence of seroma, or infection. Drains were removed when output was <30 mL in 24 hours or as clinically indicated. In the no-drain group, patients were monitored for similar postoperative complications, and ultrasound evaluation was performed in cases of suspected fluid collection.

Sample Processing

All data were recorded in a predesigned proforma. Wound swabs, if collected, were sent for culture and sensitivity. Laboratory parameters such as leukocyte count and C-reactive protein were evaluated in suspected infections.

Statistical Methods

Data were analyzed using SPSS version 26.0. Continuous variables were expressed as Mean ± Standard Deviation (SD) and compared using the Student's *t*-test. Categorical variables were expressed as frequency and percentage, compared using the Chi-square or Fisher's exact test. A *p*-value <0.05 was considered statistically significant. Effect sizes and 95% confidence intervals were calculated where appropriate. Kaplan-Meier analysis was used for comparing duration of hospital stay, and logistic regression was performed to assess predictors of postoperative morbidity.

Data Collection

Data were prospectively collected from surgical wards, operation theaters, and postoperative records. Follow-up was maintained until suture removal or discharge, with additional outpatient review at two weeks post-surgery. All data were anonymized and securely stored for analysis.

OBSERVATION AND RESULTS

Table 1: Overall postoperative impact (N = 200)

Variable	Drain (n=100)	No-drain (n=100)	Test of significance	Effect size (95% CI)	p-value
Composite morbidity†, n (%)	47 (47.0)	38 (38.0)	$\chi^2(1)=1.66$	RD = +9.0 pp (-4.6 to +22.2)	0.198
30-day readmission, n (%)	12 (12.0)	7 (7.0)	$\chi^2(1)=1.45$	RD = +5.0 pp (-3.4 to +13.6)	0.228
30-day reoperation, n (%)	6 (6.0)	3 (3.0)	$\chi^2(1)=1.05$	RD = +3.0 pp (-3.3 to +9.8)	0.306
Pain score on POD1 (0–10), Mean ± SD	5.8 ± 1.7	4.9 ± 1.6	Welch t(≈197.3)=3.86	MD = +0.90 (0.44 to 1.36)	**0.0002**
Time to first mobilization (h), Mean ± SD	18.7 ± 6.3	14.9 ± 5.8	Welch t(≈196.7)=4.44	MD = +3.76 (2.11 to 5.49)	**<0.0001**
Hospital stay (days), Mean ± SD	6.4 ± 2.3	5.1 ± 1.9	Welch t(≈191.2)=4.36	MD = +1.30 (0.71 to 1.89)	**<0.0001**

†Composite morbidity = any of SSI, seroma, wound dehiscence, or collection needing intervention.

Table 1 compares key global outcomes between the drain and no-drain groups. Composite morbidity occurred in 47 % of drain cases versus 38 % of no-drain cases; although numerically higher with drains (risk difference +9 pp, 95 % CI -4.6 to 22.2), this difference was not statistically significant (p = 0.198). Readmission within 30 days (12 % vs 7 %) and reoperation (6 % vs 3 %) also showed no significant differences. In contrast, continuous variables demonstrated clear disadvantages in the drain cohort. Mean postoperative day-1 pain score was significantly higher (5.8 ± 1.7 vs 4.9 ± 1.6, p = 0.0002). Early mobilization was delayed in patients with drains (18.7 ± 6.3 h vs 14.9 ± 5.8 h, p < 0.0001), and the average hospital stay was prolonged by about 1.3 days (6.4 ± 2.3 vs 5.1 ± 1.9 days, p < 0.0001).

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Table 2: Postoperative morbidity parameters (N = 200)

Morbidity parameter	**Drain (n=100)**	**No-drain (n=100)**	**Test of significance**	**Effect size (95% CI)**	**p-value**
Surgical site infection (SSI), n (%)	29 (29.0)	17 (17.0)	$\chi^2(1)=4.07$	RD = +12.0 pp (+0.3 to +23.3)	**0.0438**
Seroma, n (%)	23 (23.0)	31 (31.0)	$\chi^2(1)=1.62$	RD = -8.0 pp (-20.0 to +4.3)	0.203
Wound dehiscence, n (%)	11 (11.0)	7 (7.0)	$\chi^2(1)=0.98$	RD = +4.0 pp (-4.3 to +12.4)	0.323
Intra-abdominal collection needing intervention, n (%)	9 (9.0)	6 (6.0)	$\chi^2(1)=0.65$	RD = +3.0 pp (-4.7 to +10.9)	0.421

Table 2 dissects individual morbidity outcomes. Surgical-site infection was significantly more frequent among drain users (29 %) compared with no-drain patients (17 %), yielding a 12 percentage-point excess risk (95 % CI 0.3 to 23.3, p = 0.0438). Rates of seroma formation (23 % vs 31 %), wound dehiscence (11 % vs 7 %), and intra-abdominal collections needing intervention (9 % vs 6 %) did not differ significantly (p > 0.20 for all).

Table 3: Recovery outcomes (N = 200)

Recovery outcome	**Drain (n=100)**	**No-drain (n=100)**	**Test of significance**	**Effect size (95% CI)**	**p-value**
Pain score on POD1 (0–10), Mean ± SD	5.8 ± 1.7	4.9 ± 1.6	Welch t(≈197.3)=3.86	MD = +0.90 (0.44 to 1.36)	**0.0002**
Time to first mobilization (h), Mean ± SD	18.7 ± 6.3	14.9 ± 5.8	Welch t(≈196.7)=4.44	MD = +3.76 (2.11 to 5.49)	**<0.0001**
Return of bowel function (h to first flatus), Mean ± SD	33.8 ± 9.7	29.1 ± 8.9	Welch t(≈196.6)=3.57	MD = +4.70 (2.10 to 7.30)	**0.0004**
Hospital stay (days), Mean ± SD	6.4 ± 2.3	5.1 ± 1.9	Welch t(≈191.2)=4.36	MD = +1.30 (0.71 to 1.89)	**<0.0001**

Table 3 details functional recovery metrics. Patients with drains experienced consistently slower convalescence across all parameters. Mean pain score on postoperative day 1 was almost 1 point higher (5.8 vs 4.9, p = 0.0002). Time to first mobilization averaged 18.7 hours compared with 14.9 hours for the no-drain group (p < 0.0001). Return of bowel function, assessed as hours to first flatus, was delayed by nearly 5 hours (33.8 vs 29.1, p = 0.0004). Mean hospital stay was also longer by about 1.3 days (p < 0.0001).

Table 4: Overall effectiveness/necessity of routine drain placement (summary by clinical outcomes; N = 200)

Summary metric	**Drain**	**No-drain**	**Statistical comparison**	**Effect size (95% CI)**	**p-value**
Any adverse outcome‡, n (%)	52 (52.0)	41 (41.0)	$\chi^2(1)=2.44$	RD = +11.0 pp (-2.8 to +24.2)	0.119
Net recovery burden§ (composite of pain, mobilization, stay)	Higher	Lower	Welch tests across components	MDs favor no-drain (see Table 3)	**≤0.0004**
Overall interpretation	-	-	Evidence synthesis	Routine drains **not** supported for average-risk cases	-

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Table 4 synthesizes all outcomes to judge the net value of routine drainage. Any adverse event occurred in 52 % of drain patients versus 41 % without drains-a non-significant 11 percentage-point difference ($p = 0.119$). When recovery indicators (pain, mobility, hospital stay) were combined as a composite burden score, results uniformly favored the no-drain group ($p \leq 0.0004$). Evidence synthesis therefore shows no meaningful reduction in postoperative complications with drains but a clear penalty in patient recovery.

DISCUSSION

Overall impact (Table 1): Composite morbidity was numerically higher with drains (47% vs 38%) but not significant, while recovery metrics (POD1 pain, time to first mobilization, and length of stay) were *consistently worse* with drains and reached strong statistical significance. This pattern mirrors high-level evidence across abdominal surgery showing little prophylactic benefit from routine drainage and, in several settings, a signal toward harm or delayed recovery. Abu A *et al.*(2022)[6] seminal meta-analysis concluded many GI procedures can be performed safely without prophylactic drains, with drains associated with increased infectious complications and longer hospitalization in some subgroups. longer length of stay in the drain arm aligns with those observations.

In colorectal surgery specifically, the classic meta-analysis by Yang J *et al.*(2020)[7] found no advantage to routine drainage after elective colorectal anastomosis-particularly no reduction in anastomotic leak-supporting finding that composite morbidity didn't improve with drains. ERAS Society colorectal guidelines further discourage routine drains and emphasize early mobilization and multimodal analgesia; data (higher pain and slower mobilization with drains) fit squarely with that paradigm.

Morbidity endpoints (Table 2): Surgical-site infection (SSI) was significantly *higher* in the drain group (+12 percentage points). That's concordant with multiple reviews showing prophylactic drains can be a conduit for ascending infection without preventing clinically relevant collections. The Cochrane review for uncomplicated laparoscopic cholecystectomy and subsequent summaries similarly report no benefit and possible increases in infective complications with drains-again resonating with SSI signal. Evidence syntheses in colorectal surgery arrive at the same conclusion: routine drains do not reduce key complications and may increase wound problems. Veziant J *et al.*(2021)[8]

non-significant differences in seroma, wound dehiscence, and intra-abdominal collections are also consistent with prior work: drains seldom reduce seromas meaningfully in clean/clean-contaminated abdominal surgery, and they do not reliably avert deeper collections requiring intervention. Studies in acute cholecystitis echo this-routine drains add little and can delay discharge. Kushner B *et al.*(2021)[9]

Recovery outcomes (Table 3): Higher POD1 pain, delayed mobilization, slower return of bowel function, and a longer stay with drains strongly align with ERAS principles and contemporary trials in emergency and elective settings. By avoiding unnecessary drains, ERAS pathways achieve earlier mobilization and shorter hospitalization without increasing readmissions or reoperations-precisely what dataset shows for the no-drain group. Trials in peptic-ulcer perforation repair have similarly demonstrated less pain and shorter stays when drains are omitted, providing convergent evidence beyond colorectal and biliary cohorts. Miller BT *et al.*(2023)[10]

Bottom line (Table 4): synthesis (no reduction in "any adverse outcome" with drains and a clear recovery penalty) reinforces a selective-not routine-approach to drainage in average-risk abdominal operations. This aligns with meta-analyses and ERAS recommendations: reserve drains for specific high-risk scenarios (e.g., therapeutic drainage of known collections or certain complex upper-GI reconstructions) rather than prophylactic placement. Lee SJ *et al.*(2022)[11]

CONCLUSION

The present study demonstrated that routine placement of drains after abdominal surgeries did not confer any significant advantage in reducing postoperative morbidity. Although the composite morbidity and reoperation rates were comparable between the two groups, patients with drains experienced significantly higher postoperative pain, delayed mobilization, prolonged return of bowel function, and longer hospital stay. Furthermore, the incidence of surgical site infections was significantly higher in the drain group, suggesting that drains may act as potential sources of infection rather than preventive devices. Overall, the findings indicate that the routine use of drains in clean or clean-contaminated abdominal surgeries is unnecessary and may hinder recovery. Drain placement should therefore be selective, reserved for specific clinical indications such as contaminated fields, uncontrolled bleeding, or suspected leakage. Adopting a no-drain approach in appropriate cases can enhance patient comfort, facilitate early mobilization, and align with modern enhanced recovery after surgery (ERAS) principles for improved postoperative outcomes.

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LIMITATIONS OF THE STUDY

1. **Single-center design:** The study was conducted at one tertiary care hospital, which may limit the generalizability of results to other centers with different patient demographics or surgical expertise.
2. **Limited follow-up period:** Only short-term postoperative outcomes were evaluated; long-term complications such as late-onset collections or incisional hernias were not assessed.
3. **Heterogeneity of procedures:** Although grouped under abdominal surgeries, the spectrum of operations varied (e.g., cholecystectomy, hernia repair, colectomy), which might have influenced outcome variability.
4. **Non-randomized allocation:** Despite efforts to ensure comparability, selection bias may have occurred in deciding whether to place a drain based on intraoperative judgment.
5. **Subjective assessment of pain:** Pain scores were self-reported and might be influenced by individual perception and analgesic requirement variations.

Future multicentric randomized controlled studies with longer follow-up and standardized procedure groups are recommended to confirm these findings and refine criteria for selective drain use.

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