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Impact Of Drain Use On Postoperative Outcomes: A Prospective Study Comparing Drain Placement Versus No Drain In Surgical Patients

Dr. Hemant Deshpande[1], Dr. Shrestha Saha[2*]
[1,2]Professor and HOD, Department of Obstetrics and Gynaecology, Dr. D Y Patil Medical College, Hospital and Research Centre, Pune, Maharashtra India

Abstract

Background: *The use of surgical drains in post-operative recovery remains controversial, with conflicting evidence on their efficacy in reducing complications and improving healing.*

Objective: *To compare the efficacy of drain placement versus no drain in post-operative recovery among surgical patients.*

Methods: *A prospective comparative study was conducted with 100 patients divided into two groups: Group A (with drain, n=50) and Group B (without drain, n=50). Parameters assessed included post-operative pain, wound infection, seroma formation, hospital stay duration, and time to return to normal activities.*

Results: *Group A had a significantly lower incidence of seroma formation ($p < 0.05$) but a higher incidence of wound infection (12% vs. 6%, $p = 0.18$). Pain scores were higher in Group A on post-operative days 1 and 2 ($p < 0.05$). Hospital stay was comparable between groups ($p = 0.42$).*

Conclusion: *The use of drains reduces seroma formation but may increase post-operative pain and infection risk. Selective use of drains is recommended based on surgical context.*

Keywords: *seroma, outcome, surgical drains*

INTRODUCTION

The use of surgical drains in post-operative care has been a traditional method designed to avert fluid buildup, decrease dead space, and mitigate problems such as seroma, hematoma, and surgical site infections (SSIs).[1] Notwithstanding their prevalent use, the effectiveness of drains continues to be a contentious issue in contemporary surgical practice. Some surgeons support the common installation of drains to improve healing, while others contend that drains may elevate post-operative discomfort, extend hospital stays, and act as a possible source of infection.[2] The justification for drain insertion is founded on the idea that fluid collection at surgical sites may hinder wound healing, elevate stress on sutures, and facilitate bacterial proliferation.[3] Closed suction drains, including Jackson-Pratt and Blake drains, are often used to remove blood, lymph, and inflammatory exudate. Nonetheless, accumulating research indicates that in some procedures, drains may not provide any advantages and might even exacerbate post-operative morbidity.[4] Numerous studies have examined the function of drains across several surgical disciplines, including general surgery, orthopedic surgery, and plastic surgery, with inconclusive findings. A meta-analysis by Gurusamy et al.[5] indicated no significant difference in surgical site infection rates between drained and non-drained groups in abdominal operations, whereas a randomized controlled study by Petrowsky et al.[6] demonstrated decreased seroma development with the use of drains in thyroidectomy patients. These disparities underscore the need for guidelines tailored to particular procedures and individual patients regarding drainage. Moreover, patient-reported outcomes, including pain and comfort, are essential determinants in post-operative recovery. Drains may induce pain, limit movement, and need supplementary nursing care, thereby hindering recovery. A judicious approach is essential to ascertain whether drain placement is really advantageous as opposed to being an extraneous intervention.[7] This research seeks to enhance the current literature by evaluating the effectiveness of drain vs no-drain methods in post-operative recovery within a homogeneous cohort of surgical patients. Through the assessment of objective outcomes (seroma, infection, duration of hospitalization) and

subjective indicators (pain, resumption of normal activities), we aim to provide evidence-based suggestions for the best use of drains in clinical practice.

METHODOLOGY

This research is a prospective, randomized controlled trial (RCT) evaluating two post-operative treatment approaches: drain installation (Group A) vs no drain (Group B). Patients were randomly assigned using a computer-generated randomization process to guarantee impartial group distribution. The research used a parallel-group approach, with results evaluated at predetermined intervals after surgery.
Inclusion Criteria: Age ≥18 years. Elective surgery under general anesthesia.
No active infection at the surgical site. Willingness to provide informed consent.
Exclusion Criteria: Emergency or trauma-related surgery. Coagulopathy or bleeding disorders.
Immunosuppression (e.g., HIV, chemotherapy). Previous radiation therapy at the surgical site.
Allergy to drain materials (if applicable). Sample Size Calculation Primary Outcome: Seroma formation (anticipated 20% in no-drain vs. 5% in drain group based on prior studies). Power Analysis: 80% power, $\alpha = 0.05$ (two-tailed). Formula: Used Cochran's formula for comparative studies.
Final Sample: 50 per group (total N=100) accounting for 10% attrition.
Procedure for Data Collection Pre-operative: Baseline data (demographics, comorbidities) collected.
Randomization to Group A or B.
Intra-operative:Standardized surgical technique.Drain placement (if Group A) per protocol.
Post-operative:Daily assessments: Pain (VAS), wound inspection.Imaging: Ultrasound for seroma (day 3, 7).Infection monitoring: Culture if purulent discharge.
Discharge criteria: Afebrile, tolerating oral intake, pain controlled.
Follow-up:Outpatient visit at 2 weeks for wound check.Telephone survey for activity resumption.
Statistical Analysis:Descriptive statistics (mean, percentages). Inferential tests (t-test, chi-square, logistic regression for confounders). Software: SPSS v26.

RESULTS

Table 1: Baseline Characteristics of Study Groups

Characteristic	Group A (Drain, n=50)	Group B (No Drain, n=50)	p-value
Age (years), Mean ± SD	52.3 ± 10.2	50.8 ± 11.5	0.48
Gender (Male:Female)	28:22	26:24	0.72
BMI (kg/m²), Mean ± SD	26.1 ± 3.4	25.7 ± 3.8	0.56
Diabetes Mellitus, n (%)	8 (16%)	10 (20%)	0.61
Smokers, n (%)	12 (24%)	15 (30%)	0.51

The study groups showed comparable demographic and clinical profiles at baseline, with no significant differences in age (52.3±10.2 vs 50.8±11.5 years), gender distribution (28:22 vs 26:24 male:female), BMI (26.1±3.4 vs 25.7±3.8 kg/m²), or prevalence of diabetes (16% vs 20%) between drain and no-drain groups (all $p>0.05$), confirming successful randomization and group matching.

Table 2: Primary Outcomes (Drain Efficacy)

Outcome	Group A (Drain)	Group B (No Drain)	p-value	RR (95% CI)
Seroma Formation, n (%)	4 (8%)	12 (24%)	0.02	0.33 (0.12–0.94)
Surgical Site Infection, n (%)	6 (12%)	3 (6%)	0.18	2.00 (0.53–7.56)

Drain use demonstrated significant clinical benefits in preventing seroma formation (8% vs 24%, p=0.02, RR=0.33), though no statistically significant difference was observed in surgical site infection rates (12% vs 6%, p=0.18), suggesting drains effectively reduce fluid accumulation without markedly increasing infection risk in this patient population.

Table 3: Secondary Outcomes (Recovery Parameters)

Parameter	Group A (Drain)	Group B (No Drain)	p-value
Pain Score (VAS, Day 1), Mean ± SD	6.2 ± 1.1	4.8 ± 1.3	<0.01
Pain Score (VAS, Day 3), Mean ± SD	3.5 ± 0.9	2.9 ± 1.0	0.03
Hospital Stay (Days), Mean ± SD	4.5 ± 1.2	4.3 ± 1.0	0.42
Return to Normal Activity (Days), Mean ± SD	14.6 ± 2.8	13.1 ± 3.2	0.04

Patients with drains reported significantly higher pain scores during early recovery (Day 1: 6.2±1.1 vs 4.8±1.3, p<0.01) and took longer to resume normal activities (14.6±2.8 vs 13.1±3.2 days, p=0.04), while hospital stay duration remained similar between groups (4.5±1.2 vs 4.3±1.0 days, p=0.42), indicating drains may prolong recovery despite their protective effects.

Table 4: Subgroup Analysis (Seroma Risk Factors)

Factor	Seroma (n=16)	No Seroma (n=84)	p-value
BMI >30 kg/m², n (%)	10 (62.5%)	22 (26.2%)	0.01
Drain Use, n (%)	4 (25%)	46 (54.8%)	0.02
Diabetes, n (%)	6 (37.5%)	12 (14.3%)	0.03

Obesity (BMI>30) and diabetes emerged as significant independent risk factors for seroma development (62.5% vs 26.2%, p=0.01 and 37.5% vs 14.3%, p=0.03 respectively), while drain use showed protective effects against seroma formation (25% vs 54.8%, p=0.02), highlighting patient-specific factors that may influence drain utility.

Table 5: Complications

Complication	Group A (Drain, n=50)	Group B (No Drain, n=50)	p-value
Drain Dislodgement	3 (6%)	–	–
Wound Dehiscence	2 (4%)	1 (2%)	0.56
Readmission within 30d	4 (8%)	3 (6%)	0.70

The complication profile was favorable in both groups, with low rates of drain dislodgement (6%), wound dehiscence (4% vs 2%), and 30-day readmissions (8% vs 6%), all $p>0.05$, demonstrating comparable safety between approaches and absence of severe adverse events related to drain use or omission.

DISCUSSION

This study's results provide significant insights into the effectiveness of surgical drains in postoperative recovery, highlighting both advantages and disadvantages that need careful evaluation in clinical practice. Our findings demonstrate that drain insertion markedly decreases seroma development; yet, it correlates with heightened postoperative discomfort and a protracted return to normal activities, without significantly influencing hospital stay length or surgical site infection rates. These data complement to the current discourse on optimum drain use and underscore the need for a balanced, patient-specific strategy. The primary advantage of drain use in our research was the significant decrease in seroma development (8% compared to 24%, $p= 0.02$), reinforcing the conventional justification for drain insertion to avert fluid buildup. This discovery corroborates other studies in abdominal and breast operations, indicating that drains effectively reduce dead space and mitigate postoperative problems associated with seroma (Kuroi et al., 2005; Gurusamy et al., 2013).[8,1] Nonetheless, the therapeutic importance of this advantage must be considered in light of the noted rise in early postoperative discomfort (VAS 6.2 vs. 4.8, $p < 0.01$) and extended recovery duration (14.6 vs. 13.1 days, $p = 0.04$) in the drain cohort. These data indicate that whereas drains may reduce some surgical risks, they might also hinder patient comfort and recovery, possibly negating their benefits in certain instances. In contrast to apprehensions over drains acting as a source of infection, our investigation revealed no statistically significant difference in surgical site infection rates across the groups (12% vs. 6%, $p = 0.18$). This aligns with many meta-analyses that have challenged the correlation between drains and heightened infection risk (Zhang et al., 2018).[9] Nevertheless, the greater infection incidence in the drain group, while not statistically significant, necessitates vigilance, especially in high-risk patients or polluted surgical environments. The comparable lengths of hospital stays (4.5 vs. 4.3 days, $p = 0.42$) indicate that drains do not provide a definitive benefit in expediting release, hence questioning the assumption that they generally enhance recovery efficiency. Subgroup analysis indicated that obesity (BMI >30) and diabetes were independent risk factors for seroma development, underscoring the need of individualized patient considerations in drain installation choices. These results corroborate previous research indicating metabolic and structural parameters as significant predictors of postoperative fluid buildup (Sajid et al., 2012).[4] In high-risk patients, the advantages of using drains may surpass the disadvantages, but in low-risk people, frequent drain insertion may be superfluous. This corresponds with recent trends favoring selective over prophylactic drain use across several surgical fields (Wang et al., 2020).[10] The minimal overall complication rates (e.g., 6% drain dislodgement, 4% wound dehiscence) and the lack of severe adverse events endorse the safety of both methods. The little but significant rise in drain-related problems highlights the need of effective drain care and patient education throughout their use. This research has notable limitations, including its single-center design and concentration on a particular surgery cohort, which may restrict generalizability. Pain evaluations, albeit standardized, are intrinsically subjective. Extended follow-up may uncover further disparities in outcomes, including persistent pain or problems in wound healing.

CONCLUSION

In conclusion, surgical drains significantly diminish seroma production; nonetheless, they correlate with heightened postoperative discomfort and protracted functional recovery, without reducing hospital duration. The choice to use drains must be customized according to each patient's risk factors and surgical needs, highlighting a selected approach instead of a regular one. These results enhance the existing data supporting improved postoperative drainage techniques.

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