Original Research

POSTOPERATIVE OUTCOME IN OPEN REDUCTION AND INTERNAL FIXATION OF FEMUR FRACTURES WITH AND WITHOUT CLOSED SUCTION WOUND DRAINAGE – A COMPARATIVE STUDY

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ABSTRACT

Background: The routine use of closed suction wound drainage (CSD) following orthopedic surgeries remains controversial. While drains are traditionally believed to reduce postoperative hematoma and surgical site infection (SSI), emerging evidence questions their routine application, particularly in fracture fixation surgeries.
Objectives: To compare postoperative outcomes following open reduction and internal fixation (ORIF) of femur fractures with and without closed suction wound drainage.
Methods: This prospective randomized comparative study was conducted on 56 adult patients undergoing ORIF for closed femur fractures at a tertiary care center. Patients were randomized into two groups: Group A (with closed suction drain, n=28) and Group B (without drain, n=28). Outcomes assessed included incidence of surgical site infection, wound soakage, perioperative blood loss, need for blood transfusion and duration of hospital stay.
Results: There was no statistically significant difference between the two groups regarding surgical site infection, postoperative pain scores, blood loss, or length of hospital stay ($p>0.05$). Dressing soakage was more frequent in the non-drain group, but this difference was not statistically significant. The use of closed suction drainage did not demonstrate any additional benefit in reducing postoperative complications.
Conclusion: Routine use of closed suction wound drainage following ORIF of femur fractures does not significantly improve postoperative outcomes and may be safely omitted in uncomplicated cases.

Keywords: Femur fracture, ORIF, closed suction drain, surgical site infection, and postoperative outcome.

INTRODUCTION

A large percentage of high-energy skeletal injuries seen in orthopaedic treatment are femoral fractures, which are linked to considerable morbidity, extended hospital stays, and socioeconomic burden. These fractures are frequently caused by low-energy falls in the older population with osteoporotic bone and traffic accidents in young adults. In the majority of femur fracture patterns, surgical therapy with open reduction and internal fixation (ORIF) has emerged as the gold standard for attaining anatomical alignment, early mobilization, and maximal functional recovery.

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 29-12-2025
Date Acceptance: 08-01-2026
Date of Publication: 09-02-2026

Complications from postoperative wounds, however, continue to be a significant issue that affects clinical results and medical expenses [1, 2]. Following ORIF, seroma development and postoperative wound hematoma can hinder wound healing and act as a potential source of surgical site infection (SSI). Closed suction wound drainage devices have been used frequently in orthopaedic procedures to minimize wound tension, reduce dead space, and remove accumulated blood and exudate. The routine use of closed suction drains for femur fracture repair is still debatable despite their widespread use.

Wound drainage proponents contend that drains speed up healing by lowering postoperative pain, wound swelling, hematoma development, and infection rates. On the other hand, drains may increase postoperative blood loss, prolong hospital stays, delay wound healing, and serve as a conduit for retrograde bacterial contamination, according to

a number of studies [3, 4]. In addition, the presence of drains has been associated with increased need for blood transfusion and patient discomfort without providing significant clinical benefit in certain surgical settings [5]. The habitual use of closed suction drainage has been called into question by recent evidence from orthopaedic trauma and joint replacement procedures, stressing selective rather than universal application [6, 7]. Focused comparison studies comparing the postoperative results of femoral fracture fixation with and without wound drainage are still scarce, nonetheless, especially when it comes to ORIF procedures. The interpretation of current data is made more difficult by variations in patient comorbidities, surgical time, soft tissue management, and fracture type. It is crucial to thoroughly assess the function of closed suction wound drainage in femoral fracture procedures due to the continuous discussion and lack of agreement.

Aims & objectives: This study aims to compare the postoperative outcomes in patients undergoing ORIF for femur fractures with and without closed suction wound drainage, focusing on parameters such as wound complications, infection rates, postoperative pain, blood loss, duration of hospital stay, and overall functional recovery.

MATERIALS AND METHODS

Study Design

This was a prospective randomized comparative study conducted in the Department of Orthopaedics at ESIC Medical College & Hospital, Faridabad over a period of 17 months from July 2023, to November 2024

Study Population

Patients with femur bone fractures attending the OPD and the Emergency areas of the department of Orthopedics, ESIC Medical College, and Hospital Faridabad.

Sample Size

A total of 56 patients were enrolled and divided into two groups:

- Group A patients of open reduction and internal fixation of femur fracture with closed suction drainage
- Group B patients of open reduction and internal fixation of femur fracture without closed suction drainage

Inclusion Criteria

- Patients aged 18 years and above
- Closed femoral fractures or Gustilo-Anderson type I open fractures
- Fractures treated with open reduction and internal fixation
- Patients willing to give informed written consent

Exclusion Criteria

- Pathological fractures
- Polytrauma patients requiring multiple surgical procedures
- Open fractures of Gustilo-Anderson type II and III
- Patients with bleeding disorders or on long-term anticoagulant therapy
- Patients with immunocompromised states, or active infection

Surgical Procedure

All patients underwent ORIF under standard aseptic precautions using appropriate fixation devices such as plates, screws, or intramedullary nails, depending on fracture configuration. Surgical technique, antibiotic prophylaxis, and postoperative rehabilitation protocols were standardized for both groups.

In Group A, a closed suction drain was placed at the surgical site and removed after 24–48 hours depending on drain output. In Group B, no drain was used.

Postoperative Management

All patients received standard postoperative care, including:

- Intravenous antibiotics as per hospital protocol
- Analgesics and thromboprophylaxis
- Early mobilization and physiotherapy as tolerated

Outcome Measures

Patients were assessed postoperatively for:

- Wound complications (hematoma, seroma, infection)
- Postoperative pain using the Visual Analog Scale (VAS)
- Hemoglobin drop and need for blood transfusion
- Duration of hospital stay
- Time to wound healing

Patients were followed up during hospital stay and at regular intervals during outpatient visits.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee, and informed written consent was obtained from all participants prior to enrollment.

Statistical Analysis

Data were collected and analyzed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test. Categorical variables were analyzed using Chi-square or Fisher's exact test. A *p*-value of <0.05 was considered statistically significant.

RESULTS

A total of 56 patients included in the study, 28 (50%) were assigned to Group A and 28 (50%) were assigned to group B. The mean age of patients in Group A was 48.68 ± 14.54 years, while in Group B it was 55.93 ± 13.12 years, no statistically significant difference was observed. Male patients

predominated in both groups (Group A comprised 71.4% and Group B had 53.6% males). The difference in gender distribution was not statistically significant (p = 0.16).

Table 1: Comparison of Demographic Variables

Variable	Group A (n=28)	Group B (n=28)	p-value
Mean age (years)	48.68 ± 14.54	55.93 ± 13.12	0.05
Male	20 (71.4%)	15 (53.6%)	
Female	8 (28.6%)	13 (46.4%)	0.16

Road traffic accidents were the most common mode of injury, accounting for 60.7% of cases in Group A and 42.9% in Group B. Slip and fall injuries were observed in 32.1% of Group A patients and 50.0% of Group B patients. Falls from stairs constituted a small proportion in both groups (7.1% each). The distribution of mode of injury between the two groups did not show a statistically significant difference (p = 0.37)

Table 2: Mode of Injury among Both the Groups

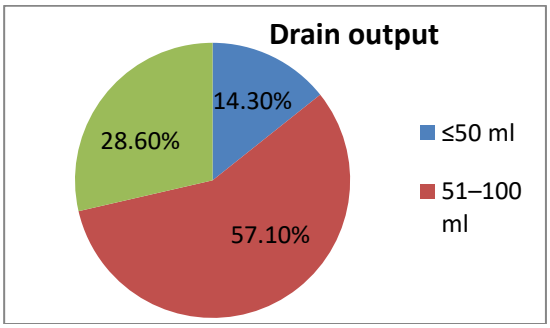
Mode of Injury	Group A	Group B	p-value
Road traffic accident	17 (60.7%)	12 (42.9%)	0.37
Slip and fall	9 (32.1%)	14 (50.0%)	
Fall from stairs	2 (7.1%)	2 (7.1%)	

The mean duration of surgery was 93.04 ±27.83 minutes in Group A and 71.96 ± 22.20 minutes in Group B. This difference was found to be statistically significant (p = 0.01), with surgeries lasting longer in patients where closed suction drainage was used. The mean peri-operative blood loss in Group A was 234.07 ± 87.67 ml, compared to 208.93 ± 93.72 ml in Group B. Although the blood loss was higher in the drain group, not statistically significant (p = 0.24). Pre-operative blood transfusion was required in 3.6% of patients in Group A and 21.4% of patients in Group B (p=0.10). Post-operatively, 32.1% of Group A patients and 28.6% of Group B patients required transfusion of one unit of blood. Multiple blood transfusions were required in 3.6% of Group A patients and 10.7% of Group B patients. The difference was not statistically significant (p = 0.58).

Table 3: Comparison of Surgical Parameters among Both the Groups

Variables	Group A	Group B	P value
Mean Surgery duration (minutes)	93.04 ± 27.83	71.96 ± 22.20	**0.01**
Mean blood loss (ml)	234.07 ± 87.67	208.93 ± 93.72	0.24
Pre-operative blood transfusion			**0.10**
Yes	1 (3.6%)	6 (21.4%)	
No	27 (96.4%)	22 (78.6%)	
Post-operative (Units transfused)			
None	18 (64.3%)	17 (60.7%)	0.58
1 units	9 (32.1%)	8 (28.6%)	
≥2 units	1 (3.6%)	3 (10.7%)	

In Group A, the median drain output was 87 ml, with values ranging from 20 ml to 150 ml. Drain output between 51–100 ml was observed in 57.1% of patients, while 28.6% of patients had a drain output exceeding 100 ml.



Graph 1: Drain Output from Group A

Dressing soakage was observed in 17.9% of patients in Group A and 35.7% of patients in Group B. Although dressing soakage was more frequent in the group without drainage, the difference was not statistically significant. No patient in either group had purulent or seropurulent discharge.

Table 4: Dressing Soakage among Both the Groups

Dressing Soakage	Group A	Group B	p-value
Present	5 (17.9%)	10 (35.7%)	0.13
Absent	23 (82.1%)	18 (64.3%)	

All three SSIs were superficial. Incidence of SSI in group A was 3.57 and in group B was 7.14. The difference of these incidence between the 2 groups was not statistically significant as per the Fisher exact test (p = 1.0).

Table 5: Comparison Of SSI Between Both Groups

SSI	Group A	Group B
Present	1(3.6%)	2 (7.1%)
Absent	27 (96.4%)	26 (92.9%)

The majority of patients in both groups were discharged within 7 days of admission. In Group A, 60.7% of patients stayed for up to 7 days, while 50.0% of Group B patients had a similar duration of stay. Prolonged hospital stay beyond 14 days was observed in 10.7% of Group A patients and 7.1% of Group B patients. The difference in total duration of hospital stay between the two groups was not statistically significant (p = 0.52).

Table 6: Comparison of Total Duration of Hospital Stay

Hospital stay	Group A	Group B	p-value
≤7 days	17 (60.7%)	14 (50.0%)	0.52
8–14 days	8 (28.6%)	12 (42.9%)	
>14 days	3 (10.7%)	2 (7.1%)	

DISCUSSION

The demographic characteristics, including age and gender distribution, were comparable between the two study groups, with no statistically significant differences. This suggests effective randomization and minimizes selection bias. A male predominance was observed in both groups, which is consistent with the higher incidence of femoral fractures among males due to increased exposure to road traffic accidents and occupational hazards, as reported in previous studies by Akinyoola et al [8] and Muoghalu et al [10].

Road traffic accidents were the most common mode of injury in the present study, aligning with global epidemiological trends for femur fractures reported in developing countries [10].

The mean duration of surgery was significantly longer in the group where closed suction drainage was used. Although this difference was statistically significant, it is unlikely that drain insertion alone accounted for the increased operative time. More complex fracture patterns, soft tissue handling, and meticulous hemostasis may have contributed to prolonged operative duration. Similar observations have been noted by Varley and Milner, et al [11] who emphasized that operative complexity rather than drain usage primarily influences surgical time.

In the present study, peri-operative blood loss was marginally higher in the drain group, though the difference was not statistically significant. Likewise, post-operative blood transfusion requirements were comparable between the two groups. These findings are in agreement with

studies by Beer et al [12] and Esler et al [13], who reported no clear advantage of closed suction drainage in reducing total blood loss and, in some cases, observed increased transfusion requirements in drained patients.

The lack of significant difference suggests that modern surgical techniques, improved hemostasis, and standardized peri-operative care may mitigate the theoretical benefit of drains in reducing hematoma formation. In patients with closed suction drainage, the median drain output was modest, and a majority had output between 51–100 ml. Despite the absence of drains, a higher proportion of dressing soakage was observed in the non-drain group. However, this difference was not statistically significant, and importantly, no purulent or seropurulent discharge was noted in either group.

These findings suggest that while drains may reduce visible wound soakage, they do not significantly alter clinically meaningful wound outcomes. Similar conclusions were drawn by Akinyoola et al [8], who reported no significant difference in dressing soakage or wound healing between drained and non-drained groups.

In our study there was a no statistically significant difference in SSI rates in both groups. This indicates that closed suction drainage did not confer any additional protection against infection following ORIF of femur fractures. These findings are consistent with previous studies by Ikpeme et al. and Muoghalu et al., which demonstrated no statistically significant difference in infection rates between drained and non-drained groups [9, 10].

Furthermore, some authors have suggested that drains may even act as a conduit for retrograde bacterial migration, potentially increasing infection risk, though this was not observed in the present study [14]. The total duration of hospital stay was comparable between the two groups, with most patients discharged within one week postoperatively. The presence or absence of a drain did not significantly influence length of hospital stay. This finding aligns with studies by Zhang et al. and Kumar et al., who reported no meaningful reduction in hospitalization time with routine drain usage [15, 16].

The findings of this study suggest that routine use of closed suction wound drainage after ORIF of femur fractures does not provide significant advantages in terms of infection prevention, blood loss reduction, or shortened hospital stay. Given the additional cost, patient discomfort, and potential risk of infection associated with drains, their routine use may not be justified in uncomplicated femur fracture surgeries.

Limitations

The limitations of this study include a relatively small sample size and short follow-up period, which may limit the detection of late-onset infections. Additionally, functional outcomes and long-term fracture union rates were not assessed. Larger multicentric studies with longer follow-up are recommended to further validate these findings.

CONCLUSION

The findings of the study demonstrate that the routine use of closed suction drainage does not provide a significant advantage in terms of reducing surgical site infection, peri-operative blood loss, need for blood transfusion, or duration of hospital stay. Although a lower incidence of dressing soakage was observed in patients with closed suction drainage, this difference was not statistically significant and did not translate into improved clinical outcomes. Importantly, no significant difference in surgical site infection was observed in both groups, indicating that satisfactory wound healing can be achieved without the routine use of drains when meticulous surgical technique and appropriate peri-operative care are employed.

Further large-scale, multicentric studies with longer follow-up are recommended to evaluate long-term functional outcomes and to establish definitive guidelines regarding the selective use of closed suction drainage in femur fracture surgery.

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How to cite this article: Dr. Hitesh kumar Yadav, Dr. Deepak kumar Tanwar, Dr. Vinay kumar Gupta, POSTOPERATIVE OUTCOME IN OPEN REDUCTION AND INTERNAL FIXATION OF FEMUR FRACTURES WITH AND WITHOUT CLOSED SUCTION WOUND DRAINAGE – A COMPARATIVE STUDY, Asian J. Med. Res. Health Sci., 2026; 4 (1):61-66.
Source of Support: Nil, Conflicts of Interest: None declared.

