Original Article

Outcomes of Drain Versus No Drain Following a Total Knee Joint Replacement

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Abstract

Background: The use of drains following total knee replacement (TKR) continues to remain debatable. We evaluated Haemoglobin (Hb) levels, drop in hematocrit levels, and wound complications to compare closed suction drains and no drains following TKR.

Objective: To compare the outcome in TKR with and without placing a drain.

Methods: This prospective interventional study conducted at the Department of Orthopaedic Surgery King Edward Medical University / Mayo Hospital Lahore between September 2019 and October 2022. A total of 79 cases were included in the study divided into 2 groups. At day 3 after TKR, Hemogram was performed and were compared to preoperative values. Secondary parameters e.g. length of hospital stay, 30-day reoperation rate, and superficial / deep infection were also measured.

Results: A total of 79 patients were enrolled divided in group A (drain group) 43 patients and group B (No-drain group) 36 patients. The mean variation of Haematocrit in the drain group was 4.37% and 2.51% in No-drain group ($p = 0.001$). The mean Hemoglobin drop in the drain group was 1.8 grams/deciliters. On the other hand, 1.5 grams/deciliters of Hemoglobin were reduced in Group B ($p < .001$). The mean length of stay in patients with a drain was 3.6 ± 1.4 days while 2.8 ± 0.5 days were observed in patients without a drain ($p=0.0017$).

Conclusion: When TKR is performed with drains, more blood loss and longer hospital stays were observed. The difference between the two procedures in terms of 30-day re-operation rate and wound complications was not significant.

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Introduction

An excessive quantity of blood loss may occur during a total knee replacement (TKR). The use of high-thigh tourniquets, diathermy tissue coagulation, drains usage & clamping, adrenaline-mixed local anesthesia, tranexamic acid administration, and computer-aided guided TKRs are just a few of the methods used to lessen the need for allogenic red cell transfusion.[1-4]

In the past, arthroplasty patients have employed drains in the hopes of reducing the risk of infection, promoting faster wound healing, and avoiding wound hematoma formation.[5,6] Drains reduce stretch over the surgical wound, which lowers discomfort.[7] They also lessen ecchymosis, the requirement for frequent dressing changes, the time it takes for the wound to heal, and the

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possibility of infection.[8,9] Utilizing a clamping drain, reducing the drainage time and suction, and autotransfusion of the drained blood are recommended methods to lower these hazards.[10,11]

However, demerits include excessive blood loss due to the absent tamponade effect following closed drainage and may result in retrograde infection through the tubing. Even though some research has indicated that drainage following TKA is not required, it is nevertheless often employed in Pakistani practice today.[12] There is minimal Pakistan literature that suggests drain usage in TKR has no additional advantages, but that research is equally ambiguous.[13]

In order to provide Orthopaedic surgeons and healthcare providers with useful information, this study compared the percentage-drop in hemoglobin, length of hospital stay following surgery, and wound complications like wound dehiscence, wound marginal necrosis, and surgical site infection (superficial or deep) within one month of patients having primary TKR surgeries with the drain or without drain.

Methods

This prospective interventional study conducted at the Department of Orhthopaedic Surgery King Edward Medical University / Mayo Hospital Lahore between September 2019 and October 2022. A total of 79 cases were included in the study through convenient sampling technique between September 2019 – October 2022 at Mayo Hospital Lahore using prospective interventional study design. The senior consultant directly executed every procedure while adhering to a set ERAS protocol. The study population was divided into 2 groups; group 1 with drain and group 2 without drain by using a lottery method. On day 3, a postoperative hemogram was performed. Calculated postoperative hemoglobin and hematocrit decrease rates were compared to preoperative values. Secondary parameters e.g. length of hospital stay, 30-day reoperation rate, and superficial / deep infection were also measured.

A total of 79 cases were included in the study through convenient sampling technique between September 2019 – October 2022 at Mayo Hospital Lahore opting prospective interventional study design. Infected knee cases, revision total knee joint replacement, knee deformities, bleeding disorders, unicompartmental and revision knee arthroplasty procedures were not included.

Informed consent was obtained once patients had been informed in their native tongue about the purpose of the study. The institutional review board has authorized the study. Throughout the length of the research, the patient's complete confidentiality has been upheld.

Seven days before surgery, aspirin and non-steroidal anti-inflammatory medicines (NSAIDs) ceased. Haemoglobin, platelet count, and other blood parameters were measured during the pre-operative hematological examination. The senior consultant directly executed every procedure while adhering to a set ERAS protocol. The study population was divided into two groups; group 1 with drain and group 2 without drain by using a lottery method. Patients in each group received three doses of intravenous Ceftriaxone (1 gm). The first dose was administered 30 minutes before induction of anaesthesia, and the second and third doses were administered 12 and 24 hours following the procedure, respectively. All procedures were carried out while the patient was under spinal anesthesia. Perioperatively, 10-mg-per-kg dosage of tranexamic acid was injected before giving an incision. All operations involved a medial parapatellar approach through a midline skin incision and an upper thigh tourniquet. Tourniquet deflation followed component cementation. Prior to multilayer closure, meticulous hemostasis was maintained. Early mobilization and routine deep vein thrombosis prevention were commenced. When necessary, one drain was positioned in the suprapatellar pouch just before the wound was closed. The drain was removed 24 hours later and packed red blood cells were transfused to patients with Hb levels under 8.0 g/dl or clinical features of anemia. The dressing was changed on the 2nd postoperative day.

On day 3, a postoperative hemogram was performed. Calculated postoperative hemoglobin decrease rates were compared to preoperative values. Following the first checkup after 14 days, staples were removed. Secondary parameters e.g. length of hospital stay, 30-day reoperation rate, and superficial / deep infection were also measured.

SPSS (version 26) for Windows was used to do statistical analysis. For quantitative data, the data were described as mean ± Standard deviation (SD) and for qualitative variables, frequency and percentages were computed. To determine the statistical significance of the difference between the means of two quantitative independent groups, an independent sample t-test was performed and paired sample t-test was applied to compare pre and post parameters. To find association between variables, chi-square test of independence was used considering $p < 0.05$ as statistically significant.

Results

A total of 79 patients were included in the study (43 in group A (drain group) and 36 in group (No-drain group). Among the 43 patients in the drain group (Group A), 12 (27.9%) were males and 31 (72.1%) were females in comparison to no-drain group (Group B), in which out of 36 patients, 10 (27.8%) were males and 26 (72.2%) were females. The mean age of the patients in Group A was 62.7 ± 4.71 years while that in group B was 62.9 ± 5.7 years. 41 (51.89%) patients underwent total knee arthroplasty of the left knee joint and 38 (48.1%) of the right side(Table-1). The mean preoperative Hemoglobin (Hb) in Group A was 12.7 + 1.3 grams /deciliters (g/dl) while that in Group B was 13.1 ± 1.4 g/dl (p=0.1043). The mean postoperative haemoglobin of 10.9 ± 1.4 g/dl was recorded in Group A. On the other hand, group B had a mean postoperative haemoglobin of 11.7 ± 1.6 g/dl (p=0.0203). In Group A, the mean preoperative Haematocrit (Hct) was recorded as 39.84 ± 1.5% in comparison to 40.31 ± 1.9% in Group B (p=0.2230). Regarding the mean postoperative Haematocrit, it was observed to be 35.47± 1.2% in Group A while 37.80 ± 1.1% in Group B (p < 0.0001). The mean variation of Hct was 4.37% and 2.51% for group A and group B respectively (p = 0.001). The mean drop in hemoglobin level in Group A was 1.8 g/dl and 1.5 g/dl hemoglobin was reduced in Group B (p <.001). The length of stay in patients with a drain was 3.6 ± 1.4 while 2.8 ± 0.5 was observed in patients without a drain (p=0.0017). Out of 43 patients, one patient (2.3%) reported a superficial infection, and a second patient (2.3%) presented with deep infection. Whereas one patient (2.7%) reported superficial infection in both groups. We observed no statistically significant difference in 30-day reoperation rates between either group(Table-2).

Table 1: *Basic Demographic data of the patients*

Variables	Group A (Drain) N=43	Group B (No Drain) N=36	P-value
Gender			
Male	12 (27.9%)	10 (27.8%)	0.989
Female	31 (72.1%)	26 (72.2%)	
Mean age of the patient ± SD (Years)	62.7 ± 4.71	62.9 ± 5.7	0.8648
Diagnosis			
Osteoarthritis	38 (88.4%)	32 (88.9%)	0.7340
Rheumatoid arthritis	06 (11.6%)	04 (11.1%)	

Table 1: *Comparison of Drain Vs no Drain Groups*

Variables	Group A (Drain)	Group B (No Drain)	P-value
Pre-operative hemoglobin	12.7 ± 1.3	13.2 ± 1.4	0.1043
Post-operative hemoglobin	10.9±1.4	11.7±1.6	0.0203
Hemoglobin Drop	1.8 (p<.001)	1.5(p<.001)	
Length of hospital stay			
Mean ± SD	3.6±1.4	2.8±0.5	0.0017
Re-operation (30days)			
Yes	02 (4.7%)	01 (2.7%)	0.6644
No	41 (95.3%)	35 (97.3%)	
Infection			
Superficial	01 (2.3%)	01(2.7%)	
Deep	01 (2.3%)	01 (2.7%)	0.9835
No infection	41 (94.3%)	34 (94.4%)	

Discussion

Although inserting closed suction drains following a total knee replacement is still a common technique in the clinical world. However, key significant indicators, including overall blood loss, hemoglobin reduction, rate of infection, and duration of hospital stay, were unable to be evaluated based on subgroups due to the small number of studies, which are specifically highlighted in that paper.

When compared to the studies that are already published, the mean age of the patients who received TKR in our study was determined to be 62.9 ± 5.7 years. The age limits were lower in our study as compared with the study of Maniar RN et al.[14,15]

The average pre-op hemoglobin in the studies by QJ Lee et al. and Jhurani A et al. was 13.4 1.1 and 12.2 g/dl, respectively. In our study, the mean preoperative Hemoglobin (Hb) in group A was 12.7 + 1.3 g/dl and 13.1 ± 1.4 g/dl in Group B. The mean hemoglobin drop in Group A (drain) was 1.8 and 1.5 hemoglobin was reduced in Group B (without drain).[16]

According to Jhurani A et al, the mean hemoglobin values were 9.9 g/dl and 10.11 g/dl in the drain group and no-drain group respectively. There was no significant difference between the groups (p=0.16). In the metanalysis conducted by Zhang et al., the combined data showed that the drainage group lost an average of

more blood than the nondrainage group, although the difference was not statistically significant. Shah N. et al. performed non-randomized research on 150 drain-free total knee replacements without drain. Postoperatively, the mean hemoglobin difference was 2.01 g/dl (SD 1.4).[17,18]

Since drainage usage is only one of the various risk factors affecting the length of the hospital stay and the patient's rate of recovery, therefore it is impossible to draw a direct connection between the two. In our study, the length of stay in patients with drain was 3.6 ± 1.4 days while 2.8 ± 0.5 days was observed in patients without drain. Sharma GM evaluated 120 patients (135 knees) and discovered that the control group (drain) had a longer hospital stay (p 0.0006). In terms of the length of hospitalization, Concina et al. found no statistically significant difference between both groups.[19,20]

The prevention of wound complications is another idea that has historically been connected to the use of wound drainage. In no-drainage knees, Kim et al. noted increased wound discharge, more edema, and more redness around the wound, but wound sequelae were not substantially different. Demirkale et al. showed a considerably decreased infection rate in the non-drainage group in their retrospective analysis. In our study, out of 43 patients, one patient (2.3%) reported a superficial infection, and a second patient (2.3%) presented with a deep infection in a group with a drain. Whereas one patient (2.7%) reported superficial infection in group B. Total leukocyte count (TLC), erythrocyte sedimentation rate (ESR), and c-reactive protein levels (CRP) in the blood were within normal limits. All infections were treated with antibiotics and wound dressings. In a randomized control study by Cao L et al. the difference in infection, postoperative recovery, and wound-related problems did not achieve statistical significance.[21-23]

Our study's advantage comes from reducing confounding factors as much as possible. The patients in this short-term series with a single surgeon were all treated with the same post-operative care. The retrospective examination of our work is where its flaws lay. The research was conducted in a lone institution by a single consultant with a limited sample size and little follow-up period.

Conclusion

When TKR is performed with drains, more blood loss and longer hospital stays were observed. The difference between the two procedures in terms of 30-day re-operation rate and wound complications was not significant. Current evidence does not support the use of drains in arthroplasty. Moreover, drain use is associated with negative outcomes and future studies should focus on drivers of their continued use.

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Ethical Approval: The Institutional Review Board, KEMU approved this study vide letter No. 207/ RC/ KEMU.

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Author's Contribution:

MSN: Conception & design, acquisition of data, drafting of article

RA: Acquisition of data

MT: Acquisition of data

SS: Analysis & interpretation of data

SNKN: Drafting of article, critically revised it for important intellectual content

KNC: Analysis & interpretation of data

FM: Analysis & interpretation of data, final approval of the version to be published

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