

Allogenic Blood Transfusion in Total Knee Replacement Surgery at SMS Blood Centre

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Abstract: Background: Total knee replacement (TKR) is a widely used elective procedure and one of the most common procedures performed in orthopedic departments. Significant requirement of allogenic blood transfusion during or after total knee replacement (TKR) have been reported. Incidence of blood transfusion in TKR is highly variable and depends on various other factors. We observed the blood utilization in patients undergoing TKR in our hospital and depicted what are the important risk factors that determine the need of allogenic blood transfusion in TKR. Materials and Methods: The study included 120 consecutive patients undergoing primary unilateral total knee arthroplasty. Patient and disease details were obtained from patient file and hospital information system. This study is a retrospective study of all adult patients (age ≥ 18 at time of surgery) who had a primary TKR procedure between January 2020 to January 2021. Results: Allogenic blood transfused was needed in 77.9% patients. Diabetes mellitus, hypertension, thyroid disorders, and chronic heart diseases were the major comorbid conditions. Conclusion: All centers should establish standard operating procedures describing the surgical procedure and transfusion support in TKR developing specific blood management strategy to rationalize blood transfusion in TKR and overall successful care in TKR.

Keywords: TKR, Allogenic Blood, Retrospective Study, Hypertension, Rationalize

1. Introduction

Significant blood loss and requirement of allogenic blood transfusion during or after total knee replacement (TKR) have been reported. Incidence of blood transfusion in TKR is highly variable and depends on several factors. Study conducted to assess the allogenic blood transfusion and multiple factors affecting the blood utilization in patients undergoing TKR in the hospital and depicted the important risk factors that determining the need of allogenic blood transfusion in primary unilateral TKR. Total knee replacement is performed to treat various joint pathologies, the common being osteoarthritis, osteonecrosis, and posttraumatic degenerative joint diseases, rheumatoid or inflammatory arthritis.

For the prevention of risk of blood transfusion, various perioperative blood management algorithm used for rational utilization of blood and blood components in total knee replacement (TKR). Some of the important factors were American Society of Anesthesiologists (ASA) grade, patient age, preoperative hemoglobin (Hb), associated medical comorbidities, and postoperative drainage volume. Being a tertiary care hospital with specialty knee and hip clinics, the number of patients referred for TKR is high. As per hospital protocol for every patient planned for TKR, a routine blood sample to be sent for reservation of two units of compatible PRBC in the blood bank. Maximum Surgical Blood Ordering Schedule dictates blood reservation, packed red blood cell (PRBC) units before total knee replacement.

2. Materials and Methods

The retrospective study included 120 consecutive patients undergoing primary total knee replacement. All the surgeries were performed by a single surgical team of Orthopedician

following standard procedure. Patient and disease details were obtained from patient file between February 2020 to February 2021 and hospital information system. Compatibility test was performed before blood reservation in blood banks following mandatory guidelines. Details of test using gel card coombs test [BioRad Company], blood issue, and blood transfusion were documented in the blood bank. Consent of patient was taken before blood transfusion. Patients with hematological diseases, trauma, coagulopathies, were excluded from the study. All surgeries were performed using the medial parapatellar arthroscopy approach and with application of pneumatic tourniquet before skin incision and released after cementing the prosthesis.

Autologous blood and medications such as tranexamic acid were not used in the patients. A closed drainage system was used in all patients after operation and kept for an average of 3 to 4 days. Patient disease details such as clinical and surgical profiles, demographic profile, LOS, including postoperative complications were obtained from patient file. Blood samples for blood grouping and cross matching were sent to the blood bank for compatibility test and blood reservation before surgery. Details of blood issue, and blood transfusion were documented in the respective blood bank. All the transfusions were subjected to haemovigilance, and any adverse events observed during or after blood transfusion were documented.

Results were calculated as mean \pm standard deviation, and $P < 0.05$ was considered statistically significant. Demographic, surgical and clinical variables were compared between transfused and non transfused blood groups. Quantitative and qualitative variables were analyzed using the Chi-square test and t -test. Risk factors with $P < 0.05$ were statistically analyzed through multivariate logistic regression to identify the independent risk factor for blood transfusion.

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Results were calculated in terms of odds ratio and corresponding 95% lower control limit and 95% upper control limit.

3. Results

Out Of 120 enrolled patients, 86 [70%] were male. The median age of patients was 67 years with mean preoperative hemoglobin of 9.8 g/dl. Allogenic blood transfused was needed in 60 (50%) patients.

Table 1: Demographic, clinical, and surgical characteristics of patients undergoing total knee replacement (n=120)

Patient Characteristics	Statistical Values
Males	84 [70%]
Females	36 [30%]
Median Age 61+/- 4years	61+/- 4 Years
Preoperative Haemoglobin	9.8+/- 1.2GM/Dl
Patient with Comorbidities	72 [60%]

Allogenic blood transfused was needed in 22 (17.9%) patients, and among them, 7 (37.2%) patients received transfusion during surgery.

Table 2 Describes the risk factors affecting blood transfusion in TKR.

A total of 72 (61.2%) patients were more than 60 years. Diabetes mellitus, hypertension, thyroid disorders, and chronic heart diseases were the major comorbid conditions observed in 99 (83.1%) patients where the primary indication of TKR was osteoarthritis (93.3%); majority of patients belonged to ASA score 2 (65.4%). The operation time was less than 120 min in majority of patients.

Risk Factors	No. of Patients [N=120]	Transfused PT. [N=72]
Male PT.	84 [70%]	42 [50%]
Female PT.	36 [30%]	20 [55%]
Age>60YRS	75 [[62.5%]	32 [43%]
Diabetic	30 [25%]	9 [30%]
Abnormal Thyroid	18 [15%]	2 [11.11%]
Hypertensive	78 [65%]	15 [20%]
Smoker	24 [20%]	15 [62.5%]
Osteoarthritis	110 [91.6%]	33 [30%]
Rheumatoid Arthritis	13 [10.8%]	6 [46.1%]

Patients with intraoperative blood loss below 250 mL in 75 (63.7%) patients. Most of the TKR patients received spinal anesthesia (99.1%). Risk factors such as gender, ASA score, preoperative Hb values, intraoperative blood loss, and postoperative blood loss were significantly associated with blood transfusion.

On analyzing the predictors of intraoperative and postoperative blood transfusion, gender ($P = 0.0003$), preoperative Hb ($P < 0.001$), and intraoperative blood loss ($P = 0.0061$) were independent predictors of intraoperative blood transfusion. Factors such as preoperative Hb ($P = 0.032$) and postoperative blood loss ($P = 0.0245$) were independent predictors of postoperative blood transfusion.

4. Discussion and Conclusion

The past two decades have discovered a good sized growth within the number of patients undergoing TKR. Due to diverse underlying risk factors, blood transfusion is regularly wanted in TKR which at times makes the greater complex adding more burden to the blood bank inventory.

The present look at witnessed an expanded number of aged elderly female undergoing TKR. The median age became 66 years, with female patients as excessive as 86.2% due to the reality that the most common indication of TKR is osteoarthritis which normally impacts the elderly population. Females are extra affected by osteoarthritis of the knee than male populations, and thus causes particularly anatomic variations, previous trauma, genetic reasons, and hormonal issues. As high as 92.3% of our patients belonged to ASA classification 2 and 3, with most of them had mild - to - severe systemic diseases.

In the retrospective study, the mean preoperative Hb was 9.9 g/dL which was lower these variations may be attributed to average low Hb in our Indian population and patients, particularly the elderly female population. We also observed that 74.3% of our TKR patients were admitted with Hb ≤ 10 g/dL. Since the allogenic blood transfusion trigger was aHb level < 9 g/dL, therefore 72 of these patients received blood transfusion before or during operation.

Total blood loss could be visible or hidden. Approximately 55% of blood loss occurs during the postoperative period and the hidden blood loss was estimated to be 39%. Also we observed that in 34.6% of patients, the postoperative blood loss was > 510 ml. Multiple previous studies have shown that spinal anesthesia reduces the incidence of postoperative complications, morbidities, and mortalities. We also found that more than 98.9% of patients received spinal anesthesia during surgery. General anesthesia was opted for particular patients who had problems with coagulation, spine, or cardiac functions.

The risk factors determining blood transfusion in TKR vary from study to study, gender, preoperative low Hb level, as well as blood loss during or after surgery. All centers attached with SMS Blood Centre should establish standard operating procedures describing the surgical procedure and transfusion support in TKR. Each center may also develop specific blood management strategy which at recent times is which is a critical component of successful care in TKR.

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Conflicts of interest

There are no conflicts of interest.

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