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REVIEW ARTICLE
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VARIABLES AFFECTING INCREASED BLOOD LOSS, DURING TOTAL KNEE REPLACEMENT SURGERY.

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ABSTRACT

Background: A safe, cost-effective operation that improves the quality of life for those with advanced knee arthritis is total knee arthroplasty (TKA). Rheumatoid arthritis and osteoarthritis, which are characterized by pain, deformity, and instability, are the most common causes of total knee replacement. Significant blood loss happens during the TKA operation, which may necessitate a blood transfusion. A gauge of blood loss is the volume of blood that accumulates in drains. In total knee replacement (TKR) surgery, orthopedic surgeons typically use a tourniquet to reduce bleeding and improve surgical visibility. Nonetheless, questions have been raised about how well a tourniquet works to stop blood loss.

Objective: To determine the variables affecting increased blood loss during total knee replacement surgery.

Study design: A retrospective study

Place and Duration: This study was done at, Zimri Orthopedic Hospital Islamabad Pakistan for the period of one year.

Methodology: There were 40 patients in each group, for a total of 80 patients engaged in the study. Both groups had their blood loss assessed; the case group had a tourniquet applied during the procedure, while the control group had surgery performed without tourniquet. People with persistent osteoarthritis, of both genders, diagnosed between the ages of 40 and 70 years, were included in the study.

Results: A total of 80 patients were enrolled for this research. All of them were equally divided into 2 groups having 40 patients each. One was a tourniquet group while the other was a non-tourniquet group. The average age, height, and weight of the patients in both groups did not differ significantly. However, at a significance threshold of 0.01, a significant difference in the mean blood loss between the two groups was found. The tourniquet group lost less blood than the control group, which showed somewhat greater amounts.

Conclusion: Using a tourniquet during total knee replacement (TKR) is advised since it is linked to lower blood loss, shorter operating times, and fewer instances of blood transfusions.

Keywords: tourniquet, total knee replacement, blood loss

INTRODUCTION

A safe, cost-effective operation that improves the quality of life for those with advanced knee arthritis is total knee arthroplasty (TKA) [1]. Rheumatoid arthritis and osteoarthritis, which are characterized by pain, deformity, and instability, are the most common causes of total knee replacement [2]. Significant blood loss happens during the TKA operation, which may necessitate a blood transfusion [3]. A gauge of blood loss is the volume of blood that accumulates in drains [4]. In total knee replacement (TKR) surgery, orthopedic surgeons typically use a tourniquet to reduce bleeding and improve surgical visibility [5]. Nonetheless, questions have been raised about how well a tourniquet works to stop blood loss.

A meta-analysis revealed that although the group using a tourniquet experienced a considerable reduction in intraoperative bleeding, the use of a tourniquet did not actually reduce the overall blood loss in TKA [6]. This finding is significant because it suggests that surgeons may have underestimated the true surgical blood loss because the total blood loss recorded in drainage records only accounts for a small portion of the real blood loss [7]. The study found that while the average intraoperative bleeding was lower in the tourniquet group than in the non-tourniquet group, there was no statistically significant decrease in the overall blood loss [8].

Bilateral total knee replacement is an option to think about when both knees are damaged. This method allows for the simultaneous completion of two treatments under a single anesthesia, saving time as well [9]. Furthermore, rehabilitation activities can be directed towards both knees at the same time, resulting in a shorter recovery period overall. It is imperative to acknowledge several disadvantages, including a prolonged duration of anesthesia and a possible escalation in blood loss. This method also carries a higher chance of infection affecting both knees. Furthermore, there is a more chance of blood clot formation, if surgery takes longer time. The downside of a longer process duration can be mitigated by having two surgeons execute the procedures on each knee concurrently or sequentially, to lessen these difficulties.

After total knee replacement, the majority of patients report significant improvements in pain relief and functional improvement, with scores between 90 and 95 percent [10]. Blood loss is an unavoidable consequence of surgical procedures. In Europe, TKR has been practiced since the middle of the 1800s [11]. The methods used to restore function after TKR have shown a great deal of variation. Modern technology and cutting-edge methods have a big impact on the unique path that each surgeon chooses [12]. Advances in TKR treatments have been largely attributed to advancements in X-ray technology, biocompatible material development, antibiotic discovery, and the emergence of specialists specializing in the musculoskeletal system.

Osteoarthritis (OA) of the knee is more common in females than in males and tends to worsen with age, especially after age of 50 years [13]. According to numerous published research, the illness affects 6% to 13% of men 45 years of age and older, and 7% to 19% of women in the same age group [14]. Men are 45% less likely than women to get osteoarthritis in the knee [15]. Joint hypermobility or instability, participation in certain jobs or sports that put stress on the joints, peripheral neuropathy, prior joint injuries, a history of immobilization, heavy lifting or repetitive knee bending, and a sizable family history of the condition are risk factors [16].

METHODOLOGY

Computerized randomization software was used to randomly assign participants to the case or control groups. There were 40 patients in each group, for a total of 80 patients engaged in the study. Following informed permission, patients who were recommended for knee replacement were included in a sequential non-probability sampling strategy. Both groups had their blood loss assessed; the case group had a tourniquet applied during the procedure, while the control group had surgery performed

without tourniquet. People with persistent osteoarthritis, of both genders, diagnosed between the ages of 40 and 70 years, were included in the study.

Exclusion criteria: Participation was restricted to those with a history of cancer, coagulopathies, or bleeding problems.

Patients who gave informed agreement to participate in the study were randomized into one of two study groups prior to surgery. In Group A, a tourniquet was raised to 350 mmHg, deflated following wound closure, and a bandage was applied when the leg was elevated and exsanguinated. In Group B, electric coagulation was used to quickly stop the bleeding in place of a tourniquet. After these treatments, a compressive dressing was applied to the knee in each group and fastened with a wool and crepe bandage.

The regular procedure for replacing the wound dressing was adhered. Cold packs were placed to the wounded knees and the affected limb was raised above the level of the heart. Hemoglobin levels were measured on the 24th postoperative hour, and as per the protocol, a blood transfusion was only given if the hemoglobin level was less than 9 g/dl.

To determine the estimated blood loss, the study took complete blood counts (CBCs) before and after surgery on the first and fifth days following the procedure. Pre-operative weight and height of the patient were gathered to determine the total volume of blood. Any postoperative blood transfusions provided as a result of hemoglobin levels falling below 9 g/dl were noted in the medical file. Data input and analysis were undertaken using SPSS version 21.0. The mean and standard deviation of age, weight, and estimated total blood loss were calculated for each group. The percentage and frequency of gender were also ascertained. The T-test was used to compare the total blood loss in the two groups. The post-stratification t-test was used after stratification based on gender, weight, and age was completed. $P < 0.05$ was used as the statistical significance threshold.

RESULTS

A total of 80 patients were enrolled for this research. All of them were equally divided into 2 groups having 40 patients each. One was a tourniquet group while the other was a non-tourniquet group. Table number 1 shows the distribution of patients according to gender.

Table no. 1: distribution of patients according to gender

Gender	N	%
Male	28	35
Female	52	65

Table number 2 shows the mean values for variables. The average age, height, and weight of the patients in both groups did not differ significantly. However, at a significance threshold of 0.01, a significant difference in the mean blood loss between the two groups was found.

Table no. 2: mean values for variables

Variables	Mean
Blood loss (ml)	701
Age (years)	51.8
Weight (kg)	75
Height (cm)	162.7

A significant difference was found when comparing the two groups' blood loss: the tourniquet group lost less blood than the control group, which showed somewhat greater amounts. Table number 3 shows the comparison of both groups.

Table no. 3: comparison of both groups

Variables	Group A	Group B
Blood loss (ml)	408	528
Age (years)	49.2	50.1
Weight (kg)	54.8	58.1
Height (cm)	169.2	170.1

DISCUSSION

It is better to use a tourniquet when the predicted blood loss is known. Patients in this trial were randomized at random to either Group A or Group B. The results showed that the mean blood loss in the two groups differed significantly. With the use of a tourniquet, Group A lost a less blood. These results are consistent with those of another study that found a significant difference in blood loss between the two groups. In addition to a lower estimated blood loss in the tourniquet group (p-value = 0.003), the study found a significant fall in hemoglobin (p-value = 0.001) and hematocrit (p-value = 0.001) levels [17].

The total measured blood loss (TMBL) was significantly higher in the non-tourniquet group. It is interesting to note that, using the Gross approach to measure blood loss, we found that the tourniquet group had a considerably higher loss (p-value=0.02). Our investigation carefully addressed bilateral knees and calculated the estimated blood loss, in contrast to a previous study that concentrated on a unilateral knee for TKR and excluded bilateral knees [18]. A large number of patients should be included in the study, and extra factors like operating time and postoperative problems should be included for a thorough analysis.

It is not customary in our setting to perform TKR without a tourniquet. But as we get more experience, we hope to be able to perform TKR without the need for a tourniquet, which will minimize blood loss in comparison to our earlier results [19, 20]. Although we do not often perform TKR without a tourniquet, we see it as a learning curve. Our goal is to improve blood loss during TKR without the need for a tourniquet with continued practice.

CONCLUSION

Setting up a standard operating procedure for total knee replacement is essential because of the significant blood loss that this surgery entails. According to our research, using a tourniquet during total knee replacement is advised since it is linked to lower blood loss, shorter operating times, and fewer instances of blood transfusions.

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