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Original Article

Autologous Transfusion after Total Knee Arthroplasty

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ABSTRACT

Objective: To determine whether the blood lost in total knee arthroplasty surgery can be salvaged and reused using the auto-transfusion technique without adverse effects and need more blood requirement.

Study Design: Prospective longitudinal study.

Place and Duration of Study: Department of Orthopaedic Surgery, Combined Military Hospital Rawalpindi from Aug 2020 to Dec 2021.

Methodology: The study included all the candidates undergoing total knee replacement surgery. Fifty-five patients underwent autologous transfusion using blood bags attached to drains and reusing them within 4-6 hours. All the transfusions were recorded.

Results: Out of 55 patients, 49(89%) underwent unilateral knee replacement, and 6(11%) underwent bilateral knee replacement. All 49 patients (89%) received a single blood transfusion, and all 6(11%) bilateral knee replacements received two blood transfusions each. Out of 61 transfusions, no adverse reaction was noted. One patient needed additional blood transfusion while undergoing bilateral knee replacement.

Conclusion: Blood autologous transfusion during knee replacement surgeries is a practical and cost-effective measure, especially in rare blood groups. Autotransfusion is a simple and hassle-free approach that can be used routinely while avoiding adverse blood reactions.

Keywords: Autologous transfusion, Blood products, Total knee replacement (TKR) arthroplasty.

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INTRODUCTION

Total knee arthroplasty (TKA) is one of the most commonly performed arthroplasties in orthopaedic surgery. Arthroplasty is the replacement of joint surfaces.[1,2] This surgery is increasing daily because of better technique, implant availability and social awareness. The most common indication of knee arthroplasty is osteoarthritis. A planned surgical technique, post-operative management and follow-up should be excuted.[3,4]

Keeping in view the complications and higher costs and complications associated with allogeneic transfusions, all efforts must be made to minimize this practice fraught with risks, as mentioned above.[5,6] In knee arthroplasty, collecting autologous blood and reinfusion is safe, and it decreases the need for stored blood transfusion and its associated complications.[7,8] This study was needed since there was no measure to counteract the urgent need for rare blood groups during surgery. Since all over Pakistan, total knee arthroplasty is done daily, an effective and consensus protocol for autologous transfusion is direly needed.

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METHODOLOGY

The study was conducted at the Department of Orthopaedic Surgery, Combined Military Hospital Rawalpindi from August 2020 to December 2021 after Ethics Committee approval (ERC-105). The sample size was calculated using the WHO sample size calculator, taking a complication rate of 16.1%.[9]

Inclusion Criteria: Patients with osteoarthritis, ASA Class 1 & 2, haemoglobin more than 7g/dl, and with rare blood groups undergoing unilateral or bilateral knee replacement were included after informed consent.

Exclusion Criteria: Patients with severe anaemia, severe terminal disease, uncontrolled diabetes, hypertension, other comorbidities and patients with blood clotting diseases were excluded.

In the first case, the blood was collected in a redivac drain, which was then immediately shifted to a blood bag, and the blood bag was sent to a laboratory to get fit for transfusion. After they found fit, it was transfused to the patient and observed for any reaction. The patient made a normal routine recovery, and no untoward reaction occurred. This first case of TKR was in the AYE-negative group and underwent bilateral TKR. His blood was used from the drain to

replace blood. However, in later cases, after further going through the literature, we started collecting the drained blood directly into the blood bags, and even getting a fitness certificate from the lab was considered unnecessary.

As a routine, two empty blood bags were arranged from the lab. Preoperatively, the TKR procedure was performed as per routine; 2 drains were placed, one deep intra-articular and the other in the subcutaneous plane. Post operatively, the superficial drain was kept closed while 20ml of the blood drained through the deep drain was collected separately and sent for C/S. Then, the deep drain was connected to the first empty blood bag, and the blood from the deep drain was collected in the bag using gravity. After dressing, the procedure was started right in the OT at the end of the operation and continued in the recovery. If the first bag was filled, the second bag was attached. The first full bag transfusion was usually started in recovery. On average, 400-600ml of blood was collected and transfused in all cases in one or two bags and transfused to the patient without doing any cross-match or viral studies. An additional blood unit was required in only one bilateral knee replacement case.

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 23.00 and MS Excel 2016 software. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages.

RESULTS

Fifty-five participants who underwent arthroplasty were selected; the distribution of the type of arthroplasty is shown in the Figure.

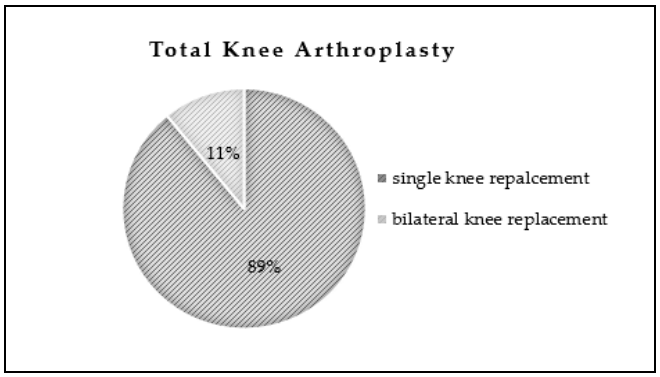

Figure: Distribution of Cases (n=55)

Out of 55 total knee replacements in 49(89%) unilateral cases, autotransfusion was sufficient, and no transfusion was required, whereas, among 6(11%) bilateral knee replacements in one go, an additional blood transfusion was required in only one (16%) case. Sixty-one auto-transfusion blood bags were used, and no reaction was noted during and after the transfusion. Demographic findings and the blood volume transfused in the Table.

Table: Demographic findings and Blood Volume transfused (n=55)

Parameters	Minimum	Maximum	Mean	SD
Age (years)	55	71	64.3	3.8
weight (kg)	70	89	77	3.9
BMI (kg/m2)	24	29	26.5	1.05
Blood Volume transfused (ml)	270	1200	466	152.02

DISCUSSION

Many techniques have been investigated and compared to decrease blood loss and complications. Tranexamic acid (TXA) is an antifibrinolytic drug widely known to reduce blood loss in different surgical procedures. The surgeons are still reluctant to use this drug as it may increase the risk of thromboembolism. This thromboembolism risk is even more concerning in major surgeries of lower limbs like total knee arthroplasty.[10,11] Tranexamic acid can be given intravenously, topical, or combined. One meta-analysis suggests that the combined intravenous and topical tranexamic acid is more effective than intravenous tranexamic acid or the control group. Different studies have also been conducted on the effect of preoperative administration of erythropoietin, per operative cell saver, and post-operative autologous blood transfusion in total knee arthroplasty.[12] Besides reducing the need for blood transfusions, reducing blood loss during surgery in total knee arthroplasty decreases intra-articular haemorrhage, reduces leg swelling, post-operative pain and the need for post-operative blood transfusion.[13]

Like all other surgical procedures, Total Knee Arthroplasty has complications as well. Wound infection is a dreadful complication, and every effort should be made to avoid this. Being a major surgical procedure, total knee arthroplasty often causes significant blood loss during perioperative and post-operative periods. This leads to a fall in the haemoglobin oxygen-carrying ring capacity of the blood.[14] This may lead to an increase in the need for allogeneic blood transfusions. Allogeneic blood transfusions have associated complications such as infection, allergic reaction, mismatch transfusion, coagulopathy, fluid overload, increased length of hospital stay and thus an overall increase in the cost of treatment. All these

factors lead to increased morbidity, and the ability of blood is also an important issue, as it can only be obtained from a living human being. It becomes a challenge, especially in rare blood groups. With increasing total knee arthroplasties, orthopaedic surgeons must learn effective blood management techniques.[15]

We used the technique of autologous transfusion. In our first case, it was done as a compulsion, as negative blood was not available. Fortunately, the patient had no complications, so we started it as routine in every case of total knee arthroplasty. Autologous blood transfusion is done within 5 hours; the maximum transfusion amount was 700ml in bilateral knee arthroplasty. The advantages are no cross-match, screening, allergic reaction, and chance of mismatch and transfusion errors. Fresh autologous transfusion blood is more oxygenated. Most important is that it should be collected by aseptic technique, and it should be free of any clots. Pan *et al*. demonstrated that in total knee arthroplasty, this auto-transfusion system is a cost-effective method as it reduces the need for and quantity of allogenic transfusion.[13]

Autotransfusion is not a new idea in surgery. Usually, it is used in emergencies, saving time until the routine blood is available. We used this technique slightly modified for elective surgery of total knee replacement. Our first case was a compulsion in which AYE –VE blood could not be arranged. After this successful autologous transfusion, the literature was reviewed, and then we started doing that as a mandatory procedure after all total knee replacements. The advantages are that no cross-match is required, no screening is needed, and there are no chances of blood mismatch reaction. Most important is that blood is to be collected by aseptic technique and should be free of any clots causing thromboembolic phenomenon. Supplementary blood transfusion can also be given if required.[16,17]

Benefits of autologous blood transfusion include immediately available, riddance from allogenic blood reaction, no transmission of viral disease, no transfusion reaction, low transfusion cost, low transfusion errors, readily available, hospital stay decreased. Autologous transfused blood is more oxygenated as compared to stored blood. This technique is very simple for the staff to comprehend and apply and has the following logistic advantages: Post operation blood loss is utilized, No cross-match or donors are required, and blood is immediately available. Risks are risk of contamination, non-immunological reaction, non-hemolytic transfusion reaction, coagulopathy, contamination with drugs and cytokine reaction. The main disadvantage may be a breach in maintaining the sterilization chain throughout blood collection.[18]

In this study, all blood cultures sent were negative for any growth. No patient developed any transfusion reaction or infection.

CONCLUSIONS

In summary, in the knee, arthroplasty surgery, collection of autologous blood, and autotransfusion island safety decrease the force of stored blood transfusion and its associated complications. This can be a lifesaving and sustainable approach towards patient management in third-world countries like ours with limited resources and rare blood groups.

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Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

FAO: Conception, study design, drafting the manuscript, approval of the final version to be published.

SH, & RD: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AAM, & SR: Data acquisition, critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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