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A comparative study between Blood Loss in total Synovectomy versus partial Synovectomy in total knee replacement surgery

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Abstract

Introduction: Total knee replacement is done in cases where severe Osteoarthritis (OA) changes are seen. During the process of surgery severe synovial hypertrophy is noticed. Some cases total synovectomy is done and some cases partial synovectomy is done. Amount of blood loss in these cases post operatively for period of 48 hours is measured through drain collected.

Methods: This study was conducted in Balaji Institute of Surgery Research and Rehabilitation for Disabled, Tirupati for period of 6 months from January 2019 to June 2019. Randomly 50 patients with severe OA knee changes were selected. Total synovectomy done cases were kept in Group A (25) and Partial synovectomy (25) cases were kept in Group B. In Group A, 13 are male patients and 12 are female patients. In Group B 11 are male patients and 14 are female patients. In Group A, age group ranges from 60 to 75, Average being 65. In Group B age group ranges from 65 to 75, Average being 68.

Results: The mean estimated total blood loss in TKA patients was lower in patients who underwent partial synovectomy than it was total synovectomy group (193 ml vs 207 ml, $p < 0.001$). There were no cases of infection. This study does not have any other complications. Intra-operative and postoperative blood loss higher in male patients than in female patients.

Conclusion: According to current results, it cannot be concluded that the performance of a synovectomy involves a significant blood loss requiring transfusion. Hence, in terms of its influence on blood loss, it cannot be recommended or ruled out in patients with osteoarthritis who require total knee replacement. Hence, more studies would be highly recommended to confirm the findings.

Keywords: Osteoarthritis, synovectomy, total knee replacement, blood loss

Introduction

Osteoarthritis is the most prevalent joint pathology which is affecting 10–15% of those over 60 years of age. Furthermore, it is expected that its prevalence will continue to increase due to the higher life expectancy as well as certain risk factors such as obesity. The knee is the most affected joint, and its osteoarthritis by itself is the pathology that most impacts on the quality of life and functional status of those over 65 years^[1, 2]. Since the 1990s, implantation of total knee replacement (TKR) has proven to be one of the most efficient and frequent interventions in the current orthopedic surgery^[3, 4]. It is estimated that its incidence will continue to increase in the coming years for the good long-term outcomes, with survival rates over 90% to 10–15 years. For those reasons, it is one of the procedures whose cost has increased most in recent years and it is expected to continue to do so^[5, 6, 7].

This surgery leads to a significant loss of blood, which, in many cases, requires blood transfusions, mainly allogeneic, with very variable rates ranging from 9 to 84%. In this way, numerous strategies have been developed to reduce transfusion requirements, either prior to surgery or during the performance of it.

On the other hand, synovial proliferation is a rather frequent intraoperative finding. Its excision has been shown to be an effective treatment in reducing pain in patients with inflammatory diseases such as rheumatoid arthritis^[8]. Orthopedic surgeons administering synovectomy claim that synovitis is the main cause of knee joint swelling and pain. In addition, synovial inflammation is a risk factor for unsatisfactory results after TKA, because it restricts the range of motion, and is associated with recurrent knee hemarthrosis and impingement^[9-17].

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Thus, the influence of synovectomy on blood loss has been largely focused on the volume of blood lost in the immediate postoperative period, and not so much whether the completion of synovectomy results in a greater need for blood transfusion [18].

The aim of this study is to determine whether the performance of total synovectomy and partial synovectomy during the total knee replacement surgery procedure and their associated blood loss.

Materials and Methods

A prospective cohort study was carried out at Balaji institute of surgery research and rehabilitation for disabled tirupati for period of 6 months from January 2019 to June 2019. The total population studied was 50 patients.

Prior to data collection, all patients were informed of the study, obtaining written informed consent to operate.

Inclusion criteria

The patients included in this study were all of them diagnosed with osteoarthritis on a surgical waiting list for a total knee arthroplasty.

Exclusion criteria

Those patients with a previous diagnosis of synovial disease (rheumatoid arthritis, systemic lupus erythematosus, pigmented villonodular synovitis or synovial neoplastic disease), with indication for a revision or constrained arthroplasty, were excluded.

Randomly 50 patients with severe OA knee changes were selected. They were divided in to groups, group A and group

B. Total synovectomy done cases were kept in Group A (25) and Partial synovectomy (25) cases were kept in Group B.

In Group A, 13 male patients and 12 female patients were included. In Group B, 11 male patients and 14 female patients were included.

The variables measured and analyzed corresponded to personal characteristics (age, gender, preoperative hemoglobin, and preoperative INR), the performance of the synovectomy, blood loss (in mL) in both groups at 24hrs post surgery and the two following days during hospital admission. Statistical analysis was performed with SPSS software (version 15.0; SPSS Inc., Chicago, IL) for Windows. Quantitative variables were described by mean and standard deviation as dispersion measures for parametric variables and median and quartiles for nonparametric variables. The study of associations between qualitative variables was initially performed by a bivariate analysis using the Chi-square test. Differences at a level of $p < 0.05$ were considered statistically significant.

Results

A total of 50 patients with osteoarthritis were included and upon 50 patients, 25 patients underwent partial synovectomy and other 25 patients underwent total synovectomy.

In Group A, age group ranges from 60 to 75, with mean age of 65 years. In Group B age group ranges from 65 to 75, with mean age of 68 years.

In the analysis (table 1), the mean estimated total blood loss in TKA patients was lower in patients who underwent partial synovectomy than it was total synovectomy group (193 ml vs 207 ml, $p < .001$).

Table 1: Baseline Characteristics

Characteristics	Total Synovectomy (N = 25)	Partial Synovectomy (N = 25)	P Value
Gender, n (%)			
Male	13	11	0.82
Female	12	14	
Mean age, y	65	68	0.52
Mean weight, Kg	68	70	0.035
Mean body mass index, kg/m ²	32	30.42	0.044
Total Blood loss mL	207 ± 83.7	193 ± 67.9	<.001
Hb% g/dl	12.4	12.9	0.56

In Group A, 13 are male patients and 12 are female patients. In Group B 11 are male patients and 14 are female patients. The gender of the patient played a role in post operative blood loss ($p < 0.05$) The total apparent post operative blood loss was significantly more in male patients, with a p value of 0.001.

The diagnosis (OA) significant difference in post-operative blood loss ($p < 0.001$). Overall, we did not have any complications. There were no cases of infection.

The comparative analysis on the personal characteristics between the group of patients with total synovectomy and Partial synovectomy group showed no significant differences in haemoglobin measures.



Fig 1: intra-operative and Post-operative pictures. X-ray.

Discussion

Osteoarthritis is the most common arthritis of the synovial joints. Deterioration occurs both at the articular cartilage and periarticular soft tissues in knee osteoarthritis. Clinically, pain is the dominant disabling symptom in patients suffering from osteoarthritis. The exact cause of the pain is still not well known [19].

Total knee replacement is an intervention in which a considerable blood loss occurs [18]. Several studies estimate this loss between 1000 and 1500 ml and a drop in hemoglobin levels of 3 g/dl. These data were calculated from the measurement of blood lost during the surgical procedure and the subsequent quantification observed in the drains, as well as a percentage of hidden blood loss that included either soft tissue extravasation or hemolysis, corresponding to hidden blood loss about 50% of the total blood loss. The result is the appearance of a general postsurgical anemia that could even require allogeneic transfusions. This study aims to know the influence of synovectomy on blood loss and blood transfusion requirements following the implementation of TKR [20, 21, 22].

The needs for allogeneic transfusion in total knee replacement vary widely according to the different studies. They have been

described rates from 9 to 84% with averages ranging from 39 to 44% [23, 24].

From the comparative analysis on blood loss and the need for transfusion of blood products and the performance of a synovectomy, our results showed significant difference between the both groups. These results are showing similar in terms of transfusion requirements with those observed in the literature on this subject [25, 26].

Whereas, a study done by Zhaoning *et al.* or Kilicarslan *et al.* demonstrates that the blood loss observed in drainage is greater than in those patients with synovectomy. However, there is a lack of studies due to the different techniques and selection of the patients employed [27, 28].

Normally, total knee arthroplasty can involve substantial blood loss. To date, risk factors influencing blood drainage after surgery including patient's gender, design of the prosthesis, tourniquet usage, femoral plug usage, additional medical comorbidities and thromboembolism prophylaxis have been deeply analyzed in the literature [29-32]. However, to our knowledge, there is no prospective report dealing with the effect of partial and total synovectomy on bleeding during total knee arthroplasty of the osteoarthritic patients. The blood loss from drains was found to be significantly higher in total synovectomy group when compared with partial synovectomy group. The blood loss in total knee arthroplasty is highly variable in the previous literature (200–2,500cc) [33, 34]. Many factors such as implant type, surgical technique, comorbidities, tourniquet deflation time, thrombo prophylaxis agents are all responsible with this variability. Concern about blood loss and hemarthrosis may be the main reason why most orthopedic surgeons prefer to avoid synovectomy in total knee arthroplasties. However, the baseline characteristics, general management and surgical techniques which were similar in both groups make our results comparable between groups.

We also confirmed that gender and age were not major determinants of blood loss, as per the previous other authors [35, 36] but in disagreement with authors who considered age [38]. The difference in our study may be patient age—mostly between 70 and 80 years in our series—which could make our series less sensitive when studying the age influence.

Our series shows that there is greater intra-operative and postoperative blood loss in male patients than in female patients. These results from our series support the conclusion in the study by Cushner and Friedman that gender does play a role in blood loss and that male patients experience greater loss [39].

The amount of blood loss in a primary cemented total knee arthroplasty (TKA) seems to vary in different reported studies. We carried out a prospective study to determine the factors affecting the peri-operative blood loss, hidden blood loss and blood transfusion requirements in a primary cemented total knee arthroplasty. The factors analysed were gender, diagnosis, tourniquet time and body mass index (BMI).

There are few studies aimed at reducing intra- and postoperative blood loss. In 1993, Raut *et al.* in their study observed that post-operative blood loss is lower in TKA after using a cemented press fit condylar prosthesis and a femoral intramedullary plug [31]. Page *et al.* studied the effect of TQ release and blood loss, and concluded that blood loss was lower with intra-operative TQ release and haemostasis with diathermy [40].

Of all the factors studied in this study, only the male gender and a haemoglobin concentration lower than 12 g/dl were

shown to be risk factors for requiring a transfusion. Nevertheless, the presence of low preoperative haemoglobin (≤ 12 g/dl) was shown to be an independent risk factor for the need for transfusion. The existence of lower baseline haemoglobin levels in male or in older patients may be one of the explanations for the lack of independence of their results. Patients undergoing total synovectomy are at risk for significant blood loss with a potential need for postoperative blood transfusions.

Conclusion

This study suggests that using partial synovectomy effectively reduced blood loss and the need for transfusions in patients undergoing TKA procedures at BIRRDS. Further prospective studies are needed to compare partial synovectomy and total synovectomy to minimize blood loss during these procedures.

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