

Original Research Article

Evaluating functional recovery post-total knee replacement, a WOMAC based comparison of synovectomy versus non-synovectomy approaches in a tertiary care hospital in South India

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ABSTRACT

Background: Synovectomy is commonly performed during total knee arthroplasty (TKA) for patients with osteoarthritis (OA) and inflammatory arthritis to address synovial inflammation. However, its impact on long-term functional outcomes remains unclear. Objective of this study was to evaluate the effect of synovectomy during TKA on postoperative pain, stiffness, and functional outcomes in patients with OA and inflammatory arthritis.

Methods: A hospital-based retrospective cohort study was conducted with 86 patients who underwent TKA one year prior (43 with synovectomy, 43 without). The Western Ontario and McMaster osteoarthritis index (WOMAC) was used to assess pain, stiffness, and physical function at follow-up.

Results: The mean age of patients was 65.4 years. No significant differences were found in pain ($p=0.638$) and stiffness ($p=0.647$) between the two groups. However, physical function was significantly better in the group without synovectomy ($p=0.004$), with significantly fewer difficulties in activities such as standing, bending, and getting in/out of bed ($p<0.05$). The mean total WOMAC score was significantly lower in the group without synovectomy ($p=0.045$).

Conclusions: Synovectomy during TKA had no impact on postoperative pain or stiffness and was associated with poorer functional outcomes compared to TKA without synovectomy. These findings suggest that synovectomy may not offer additional benefits for patients with OA and inflammatory arthritis. Further research with larger samples is recommended to better understand its role in TKA.

Keywords: Functional outcomes, Inflammatory arthritis, Osteoarthritis, Synovectomy, Total knee arthroplasty, WOMAC

INTRODUCTION

Acute or chronic joint inflammation that frequently coexists with pain and structural damage is known as arthritis.¹ One of the most often affected anatomical areas is the knee, which leads to a significant financial and health burden associated with physical disability.² Different types of arthritis have different etiologies. The main risk factors for osteoarthritis include obesity, joint trauma, female sex, and ageing. Mutations in the genes encoding types II, IV,

V, and VI collagens are among the genetic factors that have been described.^{3,4} In contrast, rheumatoid arthritis (RA) is a systemic inflammatory disease that is autoimmune. Inflammation in RA is caused by the interaction of multiple environmental variables (smoking) and genetic factors (HLADRB1 and others), which activate and malfunction the immune system.⁵ Prolonged hyperuricemia in gout causes uric acid buildup in the joints, which in turn causes inflammation.⁶ Septic arthritis is acute arthritis that is rare in the general population, but

patients with pre-existing risk factors such as immunodeficiency, advancing age, diabetes mellitus, prosthetic joints, rheumatoid arthritis, and intravenous drug abuse are at a higher risk.⁷ Individuals with systemic lupus erythematosus (SLE) often have arthritis, which is also one of the most prevalent clinical characteristics in individuals with other autoimmune disorders. Inflammatory bowel disease, psoriasis, coeliac disease, Sjogren syndrome, systemic sclerosis, dermatomyositis, mixed connective tissue disease (MCTD), and other conditions are often linked to arthritis.⁸

One of the most effective therapies for people with end-stage knee arthritis is without a doubt total knee arthroplasty (TKA). Impressive gains have been made in pain, function, patient happiness, and quality of life.⁹ The primary reason for surgery is still osteoarthritis in the knee, which is painful and lowers function and quality of life. Numerous factors, such as the surgeon's and patient's preferences, affect the poorly defined threshold for intervention.¹⁰ Total knee arthroplasty has been shown to be the most effective treatment for rheumatoid arthritis patients with advanced disease, reducing knee discomfort and improving physical function. Nevertheless, individuals with rheumatoid arthritis are more susceptible to late consequences.¹¹

A typical intraoperative finding in individuals with knee osteoarthritis (OA) or rheumatoid arthritis (RA) is synovial proliferation.¹² Synovectomy, which removes the inflammatory or proliferative synovial membrane during total knee arthroplasty (TKA) for primary OA, improves joint function and lessens pain in patients with RA and other inflammatory diseases.¹³ The effect of synovectomy as a stand-alone treatment for OA is still unknown, despite the fact that numerous inflammatory cytokines have been identified from the knee and blood in patients with moderate to severe primary osteoarthritis.¹⁴ Whether or not a synovectomy is performed during total knee arthroplasty (TKA) depends on the surgeon. Unsatisfactory results following total knee arthroplasty have been attributed to a number of causes, including synovitis.¹⁵

Our study aimed to evaluate the effect of synovectomy during TKA on postoperative pain, stiffness, and functional outcomes in patients with OA and inflammatory arthritis. The authors hope that this study contributes towards understanding the role of synovectomy in TKA and would help to refine treatment strategies for knee arthritis in the future.

METHODS

Study type

Hospital based retrospective cohort study conducted in the department of orthopedics, Lourdes Hospital Post Graduate institute of Medical Science and Research, Ernakulam in patients who underwent total knee

arthroplasty from 1st January 2023 to 31st August 2023 and approved by the institutional ethics committee.

Study participants

A total of 86 consenting patients with history of total knee replacement done 1 year ago coming to OPD for review.

Inclusion criteria

Patients above the age of 18 years with a diagnosis of osteoarthritis and inflammatory arthritis.

Exclusion criteria

Unwillingness or incapacity to give informed consent. Those with cognitive impairments who were unable to respond to surveys. Patients having a neuromuscular condition that would impair their mobility; those who are very obese (BMI>40). Patients having synchronous bilateral knee replacement surgery. Patients who underwent more complex surgery requiring an implant with increased constraint.

Follow up

Patients were followed up with Western Ontario and McMaster osteoarthritis index (WOMAC). Four questions concerning pain relief, two questions regarding stiffness, seventeen questions about participation in leisure activities, daily living activities, and overall satisfaction with the results are included in this questionnaire. Responses are on a 4-point Likert scale, which ranged from none to extreme. One year after surgery, the WOMAC score was calculated.

Data analysis

Data was coded and tabulated for analysis. Categorical and quantitative variables were expressed as frequency and mean±standard deviation respectively. Binary logistic regression was used for comparing categorical variables between groups and Mann-Whitney test for comparing numerical variables between groups. For all statistical interpretations, $p < 0.05$ was considered the threshold for statistical significance. Statistical analysis was performed by using a statistical software package SPSS, version 20.0.

RESULTS

Eighty-six patients with total knee replacement done 1 year ago coming to OPD for review were followed up. Of this, 43 patients had undergone Total Knee Replacement with synovectomy (Figure 1) and 43 patients had undergone total knee replacement without synovectomy. Mean age of those who underwent synovectomy was 65.4 years and those without synovectomy was 65.3. There were 42 males and 44 females in the study. Total Knee Replacement was done on right side for 44 patients and left side for 42 patients (Table 1).

Table 1: Distribution of demographic variables.

Demographic variables	Synovectomy		Total (%)
	Done (%)	Not done (%)	
Age (years)			
≤60	10 (23.3)	7 (16.3)	17 (19.8)
61-70	25 (58.1)	26 (60.5)	51 (59.3)
71-80	8 (18.6)	10 (23.3)	18 (20.9)
Mean (SD)	65.4 (5.09)	65.3 (6.00)	65.4 (5.53)
Sex			
Male	20 (46.5)	22 (51.2)	42 (48.8)
Female	23 (53.5)	21 (48.8)	44 (51.2)
Occupation			
Homemaker	21 (48.8)	19 (44.2)	40 (46.5)
Blue collar	5 (11.6)	5 (11.6)	10 (11.6)
White collar	6 (14.0)	7 (16.3)	13 (15.1)
Unemployed	11 (25.6)	12 (27.9)	23 (26.7)
Side			
Right	21 (48.8)	23 (53.5)	44 (51.2)
Left	22 (51.2)	20 (46.5)	42 (48.8)
Total	43	43	86

Table 2: Relationship between functional outcome and synovectomy.

Functional outcome	Synovectomy		P value
	Done (%)	Not done (%)	
Pain when walking	5 (11.6)	3 (7.0)	0.456
Pain when climbing stairs	5 (11.6)	7 (16.3)	0.533
Pain when sleeping at night	4 (9.3)	2 (4.7)	0.393
Pain when resting	1 (2.3)	0 (0.0)	0.237
Pain when standing	1 (2.3)	0 (0.0)	0.237
Stiffness in the morning	3 (7.0)	2 (4.7)	0.644
Stiffness in the evening	0 (0.0)	0 (0.0)	--
Difficulty when descending stairs	6 (14.0)	2 (4.7)	0.130
Difficulty when ascending stairs	7 (16.3)	2 (4.7)	0.071
Difficulty when rising from sitting	4 (9.3)	3 (7.0)	0.693
Difficulty when standing	4 (9.3)	0 (0.0)	0.017
Bending to floor	4 (9.3)	0 (0.0)	0.017
Walking on even floor	5 (11.6)	2 (4.7)	0.230
Getting in/out of car	6 (14.0)	5 (11.6)	0.747
Going shopping	4 (9.3)	1 (2.3)	0.153
Putting on socks	2 (4.7)	0 (0.0)	0.093
Rising from bed	0 (0.0)	0 (0.0)	--
Taking off socks	5 (11.6)	2 (4.7)	0.230
Lying in bed	2 (4.7)	2 (4.7)	1.000
Getting in/out of bed	3 (7.0)	0 (0.0)	0.039
Sitting	0 (0.0)	0 (0.0)	--
Getting on/off toilet	6 (14.0)	2 (4.7)	0.130
Doing light domestic duties	4 (9.3)	3 (7.0)	0.693
Doing heavy domestic duties	10 (23.3)	4 (9.3)	0.076

Binary logistic regression was performed.

There was significant difference in both groups in comparing difficulty while standing ($p=0.017$), bending to floor ($p=0.017$) and while getting in/out of bed ($p=0.039$) (Table 2).

There was no significant difference in terms of pain ($p=0.638$) and stiffness ($p=0.647$) in both groups. However physical functions ($p=0.004$) were found to be better in those without synovectomy. Mean total WOMAC

score with SD was 2.12 ± 3.16 in group with synovectomy and 0.98 ± 1.60 in group without synovectomy. Those without synovectomy showed significantly ($p=0.045$) better functional outcome in comparison to those with synovectomy (Table 3).

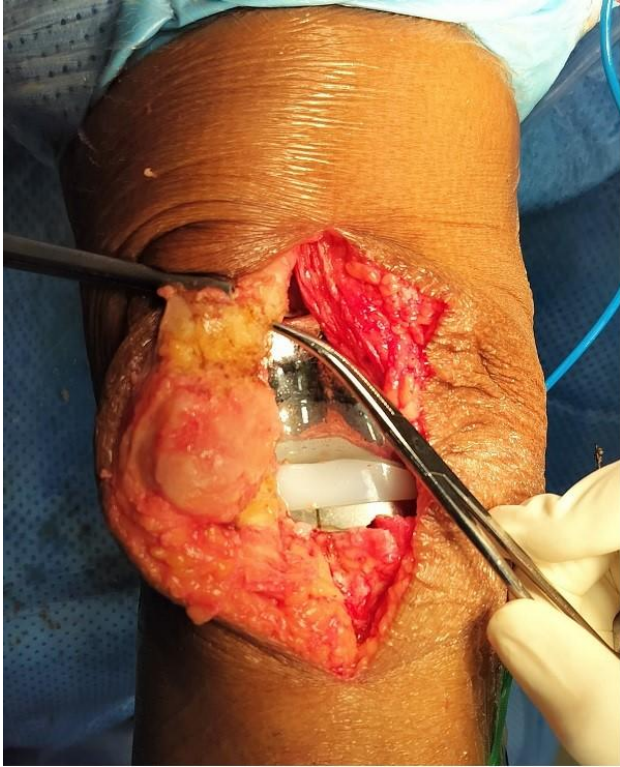


Figure 1: Synovectomy in total knee arthroplasty.

Table 3: Relationship between functional outcome and synovectomy.

Synovectomy	Mean (SD)	Median (range)	P value
Pain			
Done	0.37 (0.72)	0.0 (0-4)	0.638
Not done	0.28 (0.50)	0.0 (0-2)	
Stiffness			
Done	0.07 (0.26)	0.0 (0-1)	0.647
Not done	0.05 (0.21)	0.0 (0-1)	
Difficulty			
Done	1.67 (2.57)	1.0 (0-12)	0.004
Not done	0.65 (1.65)	0.0 (0-7)	
Overall			
Done	2.12 (3.16)	1.0 (0-17)	0.045
Not done	0.98 (1.60)	1.0 (0-7)	

Mann-Whitney test was performed.

DISCUSSION

In recent years, the role of synovectomy during total knee arthroplasty (TKA) has been the subject of multiple studies, with varying conclusions regarding its impact on post-operative outcomes, such as pain relief, functional

improvement, and stiffness. In our study, there was no significant difference in terms of pain (p value =0.638) and stiffness (p value =0.647) between the groups. Also, in TKA where synovectomy was not done, physical function was found to be significantly better. In the study by Rankin et al, there was no significant difference between groups in mean WOMAC scores for pain ($p=0.448$), function ($p=0.131$) and stiffness ($p=0.531$) at 1 year post-operatively.¹⁶

In the study by Kasim Kilicarslan et al, there was no significant difference in pain relief and in the knee society score between the two groups.¹⁷

Zhaoning et al conducted a similar study and found that at four weeks and 12 months post-operatively, there were no statistically significant differences in any of the measured parameters using visual analogue score (VAS) for pain, knee society score (KSS).¹⁵

Tanavalee et al conducted a study on inflammation related to synovectomy during total knee replacement that could not demonstrate any difference in clinical outcomes, or in serial IL-6, ESR, CRP measurements and knee temperature, between patients who underwent TKA with or without synovectomy.¹⁸

The findings across these studies may also reflect a broader trend in the management of knee osteoarthritis and TKA. The benefits of synovectomy, which is intended to remove inflamed or damaged synovial tissue, may not be as pronounced as once thought, especially considering the complex biological and mechanical factors that contribute to knee joint function. The inherent nature of TKA surgery- focused on replacing the damaged joint with a prosthesis- may already address the primary issues, such as pain and functional limitations, without the need for additional procedures like synovectomy. Avoiding a synovectomy can in turn reduce surgical complexity, lower the risk of postoperative complications, help in preservation of joint function and natural knee anatomy and contributes towards a shorter recovery time.

Limitation of this study are small sample size and subjective nature of WOMAC score.

CONCLUSION

This study suggested that synovectomy, when performed during total knee arthroplasty (TKA) for patients with osteoarthritis and inflammatory arthritis, does not provide significant benefits in terms of overall functional outcomes. In fact, patients who underwent TKA without synovectomy demonstrated better physical function and lower WOMAC scores one year postoperatively, indicating improved daily functional activities.

Recommendations

Although synovectomy is commonly performed in TKA for patients with rheumatoid arthritis to address synovial

inflammation, our findings imply that it may not offer additional advantages in terms of long-term functional recovery. The results point toward the possibility that, in some instances, TKA without synovectomy could lead to better functional outcomes.

Given the limitations of this study, including the small sample size and the subjective nature of the WOMAC score, further research with larger sample sizes and longer follow-up periods is recommended to better understand the role of synovectomy in TKA and refine treatment strategies for knee arthritis.

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