Effectiveness of Synovectomy in TKA- A Comparative Study between Complete and Partial Synovectomy

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ABSTRACT

BACKGROUND
Surgical management of late stage Osteoarthritis knee is Total Knee Arthroplasty. During this surgery, hypertrophied synovial membrane is noticed. In some patients, total synovectomy was performed. In some patients, partial synovectomy was performed. The main objective is to consider the amount of blood loss, assess recruitment rates and protocol adherence in these patients.

METHODS
We performed a single-centre pilot RCT. Patients with inflamed synovium were randomised to receive synovectomy versus a control group that did not undergo synovectomy. By measuring patient enrolment, completeness of follow-up, and safety via haemoglobin decrease and documentation of adverse events, feasibility was determined.

RESULTS
We screened 187 patients’ eligible patients, who progressed through to randomization. All made it to the 12-month follow-up, indicating good protocol adherence. There were no major differences in adverse events or haemoglobin decrease demonstrating acceptable safety. Outcomes relating to satisfaction were reliably obtained.

CONCLUSIONS
Patients with inflamed synovium of the knee who are due to undergo TKA can be reliably recruited to a randomised trial and synovectomy can be performed safely. To assess whether routine synovectomy would improve outcomes in these patients, large number is needed to be screened to identify eligible participants, and therefore, a multi-centre trial would be required.

KEYWORDS
Osteoarthritis, Knee, OA Knee, Advanced OA Knee, Synovectomy, Effectiveness of Synovectomy
In the middle- to old-age population, osteoarthritis (OA) is the most common disease affecting synovial joints. Massive health economic burden related to physical disability is OA knee. Severe pain not controlled with regular analgesic medication accompanied by radiographic evidence of joint space narrowing, osteophyte formation and subchondral sclerosis is defined as Late-stage osteoarthritis of the knee. Common intraoperative finding in patients with osteoarthritis (OA) or rheumatoid arthritis (RA) of the knee is synovial proliferation. Following Synovectomy combined with other specific surgical procedures have reported favorable results in most of the studies. Surgery in the form of total knee arthroplasty (TKA) remains the most effective method of managing late-stage cases due to a complete lack of disease-modifying osteoarthritis agents. It is the surgeon’s decision to do synovectomy while doing total knee replacement. Minimal amount of synovium as possible should be removed as recommended by Krackow et al. Because of improving knee implant designs and a lowering of thresholds for surgeons to offer surgery, there are an increasing number of patients receiving TKA.

### METHODS

This study was undertaken at BIRRD hospital, Tirupati between September 2010 and September 2011, a total of 187 patients with primary OA undergoing TKR were included in the study. The patients were divided into two groups according to a random number table generated by a computer (Microsoft Office Excel 2003; Microsoft Corp., Seattle, Washington). All patients and the clinicians who assessed them before and after the surgery were blinded to the randomisation. Group 1 (synovectomy plus TKR) comprised 96 patients (66 women and 30 men) with a mean age of 65.4 years (50 to 88). Group 2 (TKR alone) comprised 91 patients (73 women and 18 men) with a mean age of 64.9 years (50 to 88). Exclusion criteria were bilateral TKR, patients with a history of oral antilipatelet medication, fasting blood glucose > 10 mmol/l, and revision TKR. Routine blood tests and coagulation screening were completed before the operation. Stature, body weight were evaluated preoperatively for all patients. The KSS comprises two sub scores, one assessing the knee joint itself and the second assessing function. All operations were performed by a different surgeon (SK) using an anterior midline incision and medial parapatellar approach with a tourniquet (pressure of 260 mmHg for all patients). All operations were performed under Spinal anaesthesia.

In group 1 the synovial membrane was excised. Apart from this, the operations in both groups were the same. The cemented PS TKR implants of various company were used, and no patellae were replaced. A drain was implanted and then removed at 24 hours with the volume of drainage recorded. The tourniquet was not deflated until a pressure bandage had been applied. Continuous monitoring was used for 24 hours postoperatively. If a patient’s blood pressure fell and remained low (<90 mmHg) with symptoms consistent with hypovolaemia, which did not respond to crystalloid volume expansion, then blood transfusion was administered. Low molecular- weight heparin (strength 100 mg/ml, 40 mg/24 hours) was injected subcutaneously after a delay of 24 hours as routine thromboprophylaxis. After three days the heparin was replaced by rivaroxaban (10 mg/24 hours), which was continued for four weeks. At 24 hours after the operation, the patients were permitted to stand without walking and all patients subsequently underwent the same rehabilitation protocol. Briefly, knee flexion and extension exercises were started one day after the operation. These exercises were continued with the addition of graduated assisted walking from the second day. The blood loss of all patients at 24 hours Recorded and blood investigations were repeated. Concealed haemorrhage was calculated by the Gross equation and according to Sehat, Evans and Newman and Nadler, Hildalgo and Bloch.

Ballottement of the patella was performed as a crude estimate whether residual synovial membrane was associated with an effusion. In order to perform this test, the patient lies supine and the examiner places their proximal hand over the suprapatellar pouch and the distal hand (mainly the thumb and index finger of the distal hand) over the patella. The examiner compresses the suprapatellar pouch with the proximal hand and then compresses the patella into the femur. A positive result would be downwards movement of the patella then rebounding once the pressure on the patella is removed; hence the appearance of a floating or ballotable patella.

### RESULTS

There was a decrease in mean haemoglobin levels observed in both groups from pre-operatively to day one postoperatively. No patient received a blood transfusion. There were 5 adverse events reported during the study. One was serious adverse events due to hospitalisation of the participants, in the synovectomy group. In this case, the participant had developed a superficial wound infection. This was treated with antibiotics only and did not require surgical intervention. In synovectomy procedure, these serious adverse events were not classified. All the randomized patients completed follow-up to the 1-year end point. From 6 weeks, there was a significant improvement in knee range of motion.

Post-operatively to 1 year post-operatively for both groups there was a significant improvement in mean WOMAC scores for the no synovectomy and the synovectomy group. 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. There was no difference between groups in terms of patient satisfaction reported for pain relief, return to activities of daily living (ADL), return to recreational activities and overall satisfaction from at 1 year.
DISCUSSION

The evidence of an inflammatory component of knee OA at the early to late stages of disease is increasing and can even be tracked systemically. At the knee joint, apart from the synovium, there are studies indicating that other tissues such as the fat pad can be a source of inflammation. Further studies of various joint tissue types from patients with knee OA have implicated epigenetic effects that result in the up regulation of pro-inflammatory cytokines and the link from inflammation to the stimulation of pain pathways in knee OA is well established. TKA remains the treatment of choice for late-stage disease but the significant proportion of dissatisfied patients continues to be a challenge. Accurate identification of those patients who are at risk of residual pain due to persistent inflammation in the soft tissues following TKA is the aim of future therapy for knee OA, involving assessing clinical, radiological and possibly systemic parameters to define the level of inflammation in the joint prior to embarking on therapy. There have been three randomised controlled trials that have sought to assess the effect of synovectomy during TKA.

We found that synovectomy did not improve clinical outcomes after TKR. This strongly supports the contention that long-term post-operative recovery was not affected by retention or excision of the synovial membrane of the knee joint. In our series TKR was followed by variable and at times considerable blood loss and associated transfusion. In a prospective study of 4642 unilateral primary TKRs Bierbaum et al observed a blood transfusion rate of 36%, which was not dissimilar to our own findings. We accept that we had no specific thresholds for transfusion other than the clinical indications described earlier. There are many factors that influence the amount of blood lost at surgery, and there is both visible bleeding and concealed haemorrhage. The main reason for concealed bleeding is haemocytolysis and blood infiltrating into soft tissue. This study showed that statistically significant differences existed not only in the drainage volume between the two groups but also in the hidden blood loss. Perhaps it is not surprising that synovectomy adds to blood loss and our findings are also borne out by those of Kilicarslan et al. It should be noted that the surgical technique for synovectomy is important, because an accurate synovectomy technique that removes the subintimal and intimal layers but leaves the vascular layer intact will result in minimal haemorrhage if the precise tissue planes are identified and respected.

REFERENCES


