

## Knee Replacement Surgery and Its Effect on Long Term

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### ABSTRACT

The primary indication for total knee replacement is relief of significant, disabling pain caused by severe arthritis. Total knee replacement surgery begins with correct planning of both the incision and the exposure of the joint. Definitely, these are factors that are just as important to an optimal outcome as choosing the right implant, positioning the components, and balancing the ligaments. While it is true that the standard incision and arthrotomy will, in most primary implant cases, provide adequate joint exposure, it is also true that cases characterized by certain conditions, such as previous cutaneous incisions, present specific skin and exposure problems that need to be recognized, planned for and overcome.

**Keywords:** knee replacement, arthroplasty, deep vein thrombosis, tourniquet.

### INTRODUCTION

Total knee replacement (TKR) was developed in the 1970s and spread across referral centers and then community hospitals in the 1980s and 1990s. At the present time, total knee replacement use surpasses 650,000 cases annually in the US and many more worldwide <sup>[1]</sup>. Rates of utilization vary markedly across hospital service areas, signifying uncertainty amid physicians concerning signs for total knee replacement <sup>[2]</sup>. With TKR rates projected to increase additional in coming decades <sup>[3]</sup>, it is sensible to ask whether total knee replacements are being done today for suitable indications.

Normally, a procedure is considered appropriate for a specific patient if the expected net gains surpass net harms <sup>[4]</sup>. This sounds simple enough but all patients are unique and available literature does not allow a detailed accounting of the short- and long-term benefits and harms connected with the many distinct clinical scenarios in which TKR is achieved. The Rand group established an approach to address this challenge <sup>[5]</sup>. In the Rand approach, clinical characteristics that affect the risks and benefits of surgery are identified on the basis of published literature and expert opinion. The appropriateness of surgery is rated by a panel of clinical experts for each of the clinically plausible combinations of these clinical characteristics. For example, one scenario might include a patient with age greater than 55, Kellgren-Lawrence (K-L) score of 4, severe pain and flexion

contracture of ten degrees. A panel of clinical specialists votes on the appropriateness of recommending TKR in this scenario using a scale ranging from 1 (most inappropriate) to 9 (most appropriate). Scenarios receiving average votes of 7–9 are classified appropriate, 4–6 inconclusive and 1–3 inappropriate. The argument as to whether knee ligaments ought to be conserved or sacrificed continues to this day. Long-term follow-up studies do not show any significant differences, however, gait seems to be less abnormal if ligaments are conserved, particularly when walking up and down stairs. One theoretical way of incorporating normal kinematics and maximal conformity is with mobile tibial bearings. Midterm follow-up studies of these prostheses have shown encouraging outcomes. Cemented total knee replacements will continue the criterion standard for TKA, but uncemented designs with bioactive surfaces (eg, hydroxyapatite) are showing promising midterm results <sup>[6]</sup>.

The primary indication for TKA is to get rid of pain caused by severe arthritis. The pain ought to be significant and disabling. Night pain is mainly distressing. If dysfunction of the knee is causing significant reduction in the patient's quality of life, this ought to be taken into account. Correction of significant deformity is an significant symptom but is infrequently used as the primary indication for surgery. Roentgenographic discoveries must correlate with a clear clinical impression of knee arthritis. Patients who do not have significant loss of joint space tend to be less satisfied with their clinical result after TKA. Exhaust all conservative

management measures before making an allowance for surgery. Knee replacement has a finite predictable survival that is unfavourably affected by activity level <sup>[7, 8]</sup>.

Normally, it is specified in older patients with more modest activities. It is likewise clearly specified in younger patients who have limited function because of systemic arthritis with multiple joint involvement. Young patients demanding knee replacement, particularly those with posttraumatic arthritis, are not excepted by age but should be significantly incapacitated and should recognise the inherent longevity of joint replacement. Infrequently, severe patellofemoral arthritis might justify arthroplasty as the expected consequence of arthroplasty is superior to that of patellectomy. Isolated patellofemoral replacement still is experiencing clinical investigation. Deformity can sometimes become the principal suggestion for knee replacement in patients with moderate arthritis when flexion contracture or varus or valgus laxity is significant.

In such cases, often a more constrained prosthesis is required, leading to greater technical trouble in surgery and more uncertain long-term survival.

## MATERIALS AND METHODS

### • Data sources and search terms

We conducted this review using a comprehensive search of MEDLINE, PubMed, EMBASE, Cochrane Database of Systematic Reviews, and Cochrane Central Register of Controlled Trials from January 1, 1988, through July 28, 2017.

### • Data Extraction

Two reviewers independently reviewed studies, abstracted data, and resolved disagreements by consensus. Studies were evaluated for quality. A review protocol was followed throughout.

## Periprocedural care

A thorough preoperative medical assessment of patients experiencing total knee arthroplasty (TKA) is significant for averting potential complications in the perioperative period. Complete the assessment in an elective preadmission clinic well before the date for surgery.

This permits for a careful and unhurried valuation with tolerable time for investigations, specialist anesthetic and medical opinion, and consent. It likewise permits operating schedules to be reorganized if patients are deferred from surgery. Most patients who experience TKA are elderly and have different comorbid conditions. Patients must have great cardiopulmonary capacity to withstand anesthesia and to withstand a blood loss of 1000-1500 mL over the perioperative period.

Routine preoperative electrocardiography (ECG) ought to be performed on elderly patients. Patients with ischemic coronary illness, congestive heart disappointment, and perpetual obstructive aviation route sickness ought to be seen by a therapeutic expert or anesthetist.

Patients with huge fringe vascular sickness ought to be seen by a vascular specialist. Patients ought to have finished an educated assent for surgery and completely comprehend the dangers and conceivable entanglements of the technique. They ought to have had every restorative condition enhanced before surgery and ought to be free of intercurrent diseases. Two units of blood ought to be accessible for perioperative transfusion, either from the blood donation center or, ideally, as predonated blood. Full therapeutic and surgical reinforcement must be accessible on the off chance that unexpected inconveniences happen.

**Table 1:** Laboratory studies vs imaging studies

Laboratory studies	Imaging studies
Complete blood count (CBC)	Standing anteroposterior (AP) view
Erythrocyte sedimentation rate (ESR)	Lateral view
Serum electrolytes	Patellofemoral (skyline) view (see the image below)
Urinalysis and urine culture	Long leg radiographs to assess malalignment - Helpful for preoperative planning
Prothrombin time (PT) and activated partial thromboplastin time (aPTT)	Standing radiographs with the knee in extension or in 45° of flexion (Rosenberg view) - Can improve the sensitivity of detection of cartilage degeneration
Renal function studies	

ECG is performed in elderly patients and in patients with a history of cardiac issues. More sophisticated imaging modalities in the investigation of knee arthritis are of occasional benefit for the evaluation of significant bone loss or bone infection and contain the following:

- Computed tomography (CT)
- Bone densitometry
- Magnetic resonance imaging (MRI)
- Indium white blood cell (WBC) scanning

### Equipment

Different types of TKA prostheses are available. These include the following:

- Medial pivot
- Fixed bearing
- PCL-substituting
- Rotating platform and mobile bearing
- Posterior cruciate ligament (PCL)-retaining

### Patient preparation

TKA might be performed with the patient under territorial or general anesthesia. Determination of provincial or general anesthesia is made after preoperative dialog between the anesthetist and the patient, with some contribution from the surgical group. This choice is influenced somewhat by the therapeutic state of the patient, however local and general anesthesia have not been turned out to be essentially extraordinary concerning cardiovascular results, intellectual capacity, or mortality. Results from a substantial, review ponder showed that patients experiencing knee or hip arthroplasty have better perioperative results with spinal or epidural anesthesia than with general anesthesia [9, 10]. The investigation inspected the sorts of anesthesia assigned in 382,236 patient records; 11.1% of the patients got neuraxial anesthesia, 74.8% got general anesthesia, and 14.2% got a blend of these. In spite of the fact that the quantity of 30-day passing was little for every one of the three sorts of anesthesia, it was fundamentally lower in patients who had the neuraxial or joined structures than in the individuals who got unadulterated general anesthesia (0.10%, 0.10%, and 0.18%, respectively). Patients who have epidural anesthesia have been shown to develop fewer perioperative deep vein thromboses. Whether this has any overall positive benefit to the patient is not known. Another advantage of epidural anesthesia is the presence of an indwelling catheter for 48-72 hours postoperatively for pain control, which

eliminates the need for excessive amounts of centrally acting analgesics.

Adverse effects of continuous postoperative epidural analgesia include the following [11, 12]:

- Pruritus
- Nausea
- Vomiting
- Urinary retention
- Epidural hematoma (rare)

In a study by Shum *et al.*, continuous femoral nerve block for analgesia, versus no femoral nerve block, resulted in less pain, higher satisfaction, and lower morphine use in patients immediately after TKA. At 2-year follow-up, no significant differences in functional outcome were identified [12]. Iifeld *et al.* found that a 4-day ambulatory continuous femoral nerve block, using a portable infusion pump, helped decrease time to discharge following total knee arthroplasty. In a multicenter, triple-masked, placebo-controlled study, patients received a continuous femoral nerve block with perineural ropivacaine 0.2% from surgery until the following morning, at which time they were randomized either to continue perineural ropivacaine (n=39) or to switch to normal saline (n=38). Time to reaching three predefined discharge criteria (tolerable analgesia, independence from intravenous opioids, and ambulation 30 m) was reduced by an estimated 20% in the patients receiving ambulatory analgesia [13].

The patient is set up on the operating table in a supine position following preoperative cleaning of the leg.

Follow-up depends on the surgeon, the patient, and the health care system [14]. A typical sample would be a surgical follow-up appointment at 6 weeks, 3 months, 6 months, 1 year, 2 years, 5 years, 10 years, and subsequently as suitable. This is modified for each patient agreeing to age, degree of activity, and presence of complications. Satisfactory knee function is frequently restored following TKA, and the majority of patients are capable to return to low-impact sporting activity [15, 16]. Long-term studies confirm acceptable functional scores and show a 91-96% prosthesis survival rate at 14-15 years of follow-up. No difference seems to exist between PCL-retaining and PCL-substituting designs. Cementless designs do not have the same length of follow-up, but studies at 10-12 years report a 95% prosthesis survival rate [8, 17, 18].

## Technique

Total knee arthroplasty (TKA) should be performed in a laminar flow operating theater with meticulous attention to detail to prevent contamination of the operation site. A thigh tourniquet is normally utilized to assist surgical exposure, however, it ought to be avoided in patients with a history of previous deep vein thrombosis (DVT) or significant vascular disease. There are residues for some discussion concerning whether the utilization of a tourniquet delivers significant net benefit. In a meta-analysis by Jiang et al, the use of a tourniquet led to significant decreases in intraoperative blood loss, transfusion rate, and operating (though not postoperative blood loss, measurable or calculated total blood loss, transfusion volume, occurrence of pulmonary embolism [PE], or length of hospital stay). [20] The authors concluded that the current evidence did not permit definite recommendations either way.

Antibiotics and antithrombotic prophylaxis are managed roughly 30 minutes before the incision is made. Mechanical antithromboembolic devices (eg, stockings, foot pumps) are utilized intraoperatively. The knee joint is regularly approached anteriorly through a medial parapatellar method, nonetheless, some surgeons use a lateral or subvastus method. Osteophytes and intra-articular soft tissues are then cleared. Bone cuts in the distal femur are made perpendicular to the mechanical axis, frequently with the aid of an intramedullary alignment system, which is then checked against the center of the hip. The proximal tibia is cut perpendicular to the mechanical axis of the tibia with the help of either intramedullary or extramedullary alignment rods. Restoration of mechanical alignment is important to allow optimum load sharing and prevent eccentric loading through the prosthesis. Sufficient bone is removed so that the prosthesis recreates the level of the joint line. This allows the ligaments around the knee to be balanced precisely and prevents alteration in patella height, which can have a deleterious effect on patellofemoral mechanics.

Due to preoperative deformity, some ligaments around the knee are constricted. These are sensibly released in a stepwise fashion to balance the soft tissues around the knee and permit optimum knee kinematics. Patellofemoral following is surveyed with trial parts in situ and adjusted if important with a parallel discharge or average reefing method. On the off chance that the patellofemoral joint is essentially unhealthy, it can

be reemerged with a polyethylene catch. The first width of the patella must be reproduced.

Once the definitive components have been selected, they are cemented into place with polymethyl methacrylate cement. If an uncommented system is being used, press-fit and bony ingrowth provide the short-term and long-term fixation of the component. The tourniquet ought to be deflated prior to closure to permit precise hemostasis, and the knee joint is frequently exhausted and dressed in extension. Foot pulses are checked at the end of the procedure.

Essving et al reported that local infiltration analgesia, started throughout operation, delivered excellent postoperative pain relief. In a double-blind study, 48 patients undergoing TKA were randomized into two groups. Patients in the treatment group received a periarticular injection of 400 mg ropivacaine, 30 mg ketorolac, and 0.5 mg epinephrine during surgery and an intra-articular injection of 200 mg ropivacaine, 30 mg ketorolac, and 0.1 mg epinephrine 21 hours postoperatively. Patients in the placebo group received a postoperative injection of saline. Generally, the treatment group had less postoperative pain, used less morphine, fulfilled discharge criteria more rapidly, and had higher patient satisfaction [20]. In a pair of retrospective analyses stated at the 2014 annual meeting of the American Academy of Orthopaedic Surgeons (AAOS), Emerson et al found that extended-release bupivacaine was as effective as femoral nerve block for relieving pain in patients who had undergone TKA [21]. Patients treated with bupivacaine extended-release liposome injection also used less narcotic rescue medication, had shorter hospital stays, and sustained fewer falls. A 2015 study by Barrington et al yielded similar findings [22]. Infiltration technique has been described by Connelly et al [23].

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