Feature Article

A 4- to 10-Year Follow-Up Study of the Tricon-M Noncemented Total Knee Replacement

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ABSTRACT

This study reviews the clinical and radiographic results of 207 consecutive noncemented Tricon-M (Smith & Nephew Inc, Memphis, Tenn) total knee replacements (TKRs) in 189 patients. The patella was surfaced in 119 cases, and mean follow-up was 8 years (range: 4-10 years). At final follow-up, mean Hospital for Special Surgery score improved 45 points in 187 cases. Survivorship, with failure defined as the need for revision, was 98% at 4 years, 97% at 7 years, 94% at 8 years, and 90% at 10 years. Twenty-one (11.3%) patients went on to revision. Results for overweight and obese patients did not differ significantly from normal-weight patients. The noncemented Tricon-M TKR prosthesis yields acceptable results; however, patella surfacing and the use of a tibial polyethylene insert ≥12 mm thick are recommended.

Uncemented Tricon-M (Smith & Nephew Inc, Memphis, Tenn) total knee replacement (TKR) is still in the stages of evolution compared to cemented Tricon-M TKR. A semiconstrained prosthesis, the Tricon-M has slightly cup-shaped tibial articulating surfaces to allow for rotation of the prosthesis and flanged polyethylene pegs for immediate fixation to maintain stability. It has the same degree of rotational and translational movement as the normal knee, although the kinematics are different.1 This implant has a multilevel porous surface to facilitate biologic ingrowth. The main reported complication using this device is subsidence of the tibial component in patients taking steroids in whom there was inadequate coverage of the tibial plateau surface.2

This article evaluates the 4- to 10-year clinical and radiographic results of TKR using the Tricon-M prosthesis.

MATERIALS AND METHODS

Between 1984 and 1994, a total of 207 knees in 189 patients (105 women and 84 men) were replaced with the Tricon-M uncemented prosthesis. Patient age ranged from 38-92 years (mean: 69 years) for women and 32-83 years (mean: 64 years) for men.

The main indication for surgery was knee pain during both activity and rest that did not respond to conservative treatment, which consisted of analgesia, activity modification, and physiotherapy. The primary diagnosis was osteoarthritis in 171 (83%) knees, posttraumatic arthritis in 9 (4.2%) knees, and inflammatory arthritis (24 patients) including seropositive rheumatoid arthritis in 7 knees, systemic lupus erythromatosis in 3, psoriasis in 5, and ankylosing spondylitis in 9. In the remaining 3 patients, arthritis was secondary to inflammatory bowel disease.

Patients were classified into different categories according to height and body weight using the Royal College of Physicians' report on obesity (Table).3 Patient body weight ranged between 56 and 112 kg (mean: 70.7 kg), and height ranged between 5'1" and 6'3" (mean: 5'7"). Eleven (5.3%) patients were obese (body mass index [BMI] 30-34.9) and 60 (29%) patients were overweight (BMI: 25).

One surgical team performed the operations. The femur was resected at 5°-7° valgus to the anatomic axis of femur. The tibial cut was perpendicular to its anatomical axis in both the coronal and sagittal planes to align the joint line perpendicular to the mechanical
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*Without shoes.  †Without clothes.

The Royal College of Physicians’ Guidelines for Obesity

axis of the leg and parallel to the floor. After press-fit insertion of the prosthesis, soft-tissue tension was checked and adjusted if necessary.

Three doses of prophylactic perioperative antibiotics (cephalosporin) were administered, and mechanical leg compression devices were used to prevent deep venous thrombosis. Early in the postoperative period, active knee movement exercises were begun.

During the early years of the study period (1984-1987), the importance of inserting thick polyethylene tibial insert was not well appreciated, and a tibial insert of 8-10 mm was used (101 patients). Some of these knees went on to revision as the tibial insert wore out; therefore, from 1987 on, a 12-mm thick polyethylene tibial insert was used. This was possible in 88 patients after proper soft-tissue release. We believe the tibial insert of the Tricon knee wears out because of the flimsy metalback, and a relatively thick tibial insert seems to compensate for this.

For the first 70 patients, the senior author (A.A.F.) preferred not to surface the patella. Four of these 70 patients developed anterior knee pain requiring revision. Therefore, since 1986, the patella has routinely been surfaced.

**RESULTS**

No patient was lost to follow-up. Operative time, blood loss, and length of hospitalization were similar in both overweight and obese patients compared to normal-weight patients. Postoperative complications included three early deep wound infections that were revised in a two-stage procedure after antibiotics and surgical debridement failed to resolve the infection; the offending micro-organism was Escherichia coli in all three cases. Two patients, one of whom was obese, were treated for deep venous thrombosis.

Follow-up ranged from 4-10 years (mean: 8 years). The Hospital for Special Surgery (HSS) rating system was used to assess results. Patients were examined clinically and radiographically at 3, 6, and 12 months postoperatively and then annually thereafter. Serial anteroposterior and lateral radiographs were compared at final follow-up. Position and alignment of the prosthesis as well as sinking and wear were assessed using the Knee Society radiographic analysis.

**Clinical Results**

Mean HSS improved from 45 points (range: 0-65 points) to 85 points (range: 65-100 points) at last follow-up. Results were rated as excellent (85-100 points) in 124 (65.6%) patients, good (70-84 points) in 32 (16.9%), fair (60-69 points) in 9 (4.7%), and poor (<60 points) in 3 (1.5%). Twenty-one (11.1%) patients went on to revision.

After mean follow-up of 8 years, 83.1% of the patients had no pain at rest, and 16.9% had mild pain on walking. Eighty-three percent of patients could climb stairs independently, 14% could climb one stair at a time, and the remaining 3% required support. Postoperatively, 95 patients were able to walk for unlimited distance, 60 patients could walk for a distance of 5-10 blocks, 32 patients could walk for 1-5 blocks, 9 patients could walk for <1 block, and 3 patients could not walk.

Mean range of motion improved from 80° (range: 30°-90°) preoperatively to 95° (range: 50°-130°) postoperatively. Thirteen patients had 10°-20° extension lag.

The outcome in overweight (29%) and obese (5.3%) patients did not differ significantly from normal-weight patients. Pain, walking distance, stair-climbing ability, and prosthesis survivorship were similar in obese and overweight patients compared to normal-weight patients.

**Radiographic Results**

Two hundred knees were aligned 7°±2° of valgus to the anatomical axis of the lower limb, 2 were >2° valgus, and 5 were 5° varus. The tibial and femoral components were aligned in an optimal perpendicular plane (90°-95°) to the coronal/sagittal plane orientation (±2°) (Figure 1). There was no evidence of radiolucent lines around any component in 176 knees, while 31 (15%) knees (30 patients) demonstrated radiolucent lines in at least one zone.
Anteroposterior radiographs showed tibial radiolucency. On the lateral radiographs, 3 patients had radiolucent lines in zones 1 and 2. Eleven femoral components also had radiolucencies in zones 2 and 4. Radiolucencies also were found in 3 patellas. None of these radiolucencies were present radiographically during the first 2 years of follow-up.

**Survivorship Analysis**

A confidence interval of 95% was used for the survivorship analysis. Failure was defined as revision or plans for revision. Survival was 90% at 10 years of follow-up, 98% at 4 years, 97% at 7 years, and 94% at 8 years (SE: 1.2) (Figure 2).

Thirteen knees in 13 patients were revised for knee pain and chronic knee effusion. At revision, the cause was found to be tibial insert wear, and all of the inserts were <10 mm thick. Four knees were revised for anterior knee pain in patients in whom the patella was not surfaced. These failures occurred in the first 101 TKRs; only 1 of these patients was taking steroids for rheumatoid arthritis. In this patient, the tibial component was revised to a cemented one, and the femoral component was stable and therefore left alone. Only 1 patient who was obese required revision.

**DISCUSSION**

The design and concept of prostheses for uncemented TKR are constantly changing. Because of this, there is a paucity of information regarding the long-term results of any particular design. Most reports have a short follow-up. Martini et al reported on 5-9 years of follow-up press-fit condylar TKR. Ninety-five percent of their 378 patients were satisfied with their functional results and achieved a good Knee Society scoring system.

Although perioperative morbidity in TKR is not increased in obese patients, the longevity of the implant and the factor of obesity is still not clear. Anterior knee pain in obese patients who undergo TKR without surfacing the patella has been reported. The revision rate in our series was much lower when the patella was routinely replaced in obese and nonobese patients. We recommend resurfacing, although there is no clear consensus in the literature. Resurfacing leads to less patellofemoral pain and better stair-climbing ability. Patellar thickness <15 mm is a relative contraindication for patellar resurfacing.

Our results in overweight/obese and normal-weight patients demonstrated no difference in implant longevity. The main cause for revision in our series was wear of the tibial insert; this complication was not encountered after we began using the thickest possible insert (≥12 mm thick).

In one patient with rheumatoid arthritis, the tibial component sank and was loose; however, this patient had osteoporosis secondary to systemic steroid use. While one case is not enough to conclude that cemented TKR should be used over uncemented TKR, with osteoporosis, there is a risk of tibial prosthetic sinking in patients undergoing uncemented TKR.

Series of cemented TKR have reported better 10-year results, and reported complications are higher in cementless compared to cemented TKR. The incentives for cementless fixation are the same theoretical advantages in hip arthroplasty, namely, to avoid a precipitous drop in blood pressure caused by cement monomer traveling through the bone marrow (when a tourniquet is not used) during insertion of the cement and to avoid polyethylene wear particles that can incite a macrophage response, leading to prosthesis loosening. Moreover, removal of cement can be difficult if revision is required.

There is no answer in the literature as to whether the tibial stem should be cemented. In vitro studies favor cementing the tibial stem to achieve stability; however, it is unclear whether a thicker cement mantle below the plate increases stability in the absence of cement at the stem. This would be difficult to produce clinically without compromising the joint gap.

Our patients achieved good correction of their flexion deformity and improved knee motion, with a resultant improvement in their activities of daily living. The survivorship in our series has been satisfactory compared to other press-fit TKRs. However, the increased tibial insert wear in our series could be the result of the thin metal backing of both the tibial and patellar components.
CONCLUSION

Our results using the noncemented Tricon-M TKR prosthesis were favorable. However, with this prosthesis, patellar surfacing and the use of a tibial polyethylene insert ≥12 mm thick are recommended.

REFERENCES


