Influence of the Pneumatic Tourniquet on Patella Tracking in Total Knee Arthroplasty

A Prospective Randomized Study in 100 Patients

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Abstract: One hundred consecutive patients with osteoarthritis of the knee joint and scheduled for primary total knee arthroplasty performed in a bloodless field were prospectively randomized to have the tourniquet inflated on either straight leg or maximally flexed knee. There was no difference in the number of lateral releases between the groups, and position of the knee in maximal flexion during inflation of the tourniquet did not decrease the number of lateral releases. There was no difference in clinical or radiological patella tracking between groups. If the patella was maltracking, tourniquet deflation led to better patella tracking and saved 5 (31%) of 16 releases with no difference between groups. We recommend tourniquet deflation and reevaluation of patella tracking before performing lateral release in patellar maltracking. **Key words:** total knee arthroplasty, lateral release, tourniquet, patella tracking.

Proper tracking of the patella in total knee arthroplasty is essential. To ensure centralization of the resurfaced patella in the middle of the trochlear groove on the femoral component, surgery includes positioning of the femoral component in external rotation [1] and medialization of the patella [2]. If this does not suffice, a lateral release may be performed. However, 2 studies have revealed another tool to diminish the number of lateral releases, that is, deflating the tourniquet and reevaluation of the patellar tracking [3,4]. In 1 of the studies, the tourniquet was applied on maximally flexed knees [3], whereas the tourniquet in most other studies was either applied on straight knees or unaccounted for. No published study has focused on whether application of tourniquets on maximally flexed knees diminishes the number of lateral releases compared with inflation of tourniquets on extended knees. The present study investigates this aspect and also whether tourniquet deflation and reevaluation of patellofemoral maltracking in the 2 groups lead to fewer lateral releases.

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Materials and Methods

One hundred consecutive patients having osteoarthritis, who were scheduled for primary total knee arthroplasty in a bloodless field, were randomized into 2 groups: to have the tourniquet inflated on either straight leg or maximally flexed knee. Randomization took place in the operating theater, was performed by equal/unequal numbers from a machined randomization list, and was not blinded from the surgeon (as he puts the tourniquet on).

Before operation, all patients had biplanar digitalized radiographs taken on which the angle between the femur and the tibia was measured. Knees with angles below 5° were considered in varus, 5° to 8° were normally aligned, and angles above 8° were in valgus. All operations were performed by 2 experienced orthopedic surgeons (authors) specialized in performing arthroplasties on knees.

The limb was exsanguinated with an Esmarch bandage, and the tourniquet was inflated to 350 mm Hg. All operations were performed with the tourniquet inflated just before incision of the skin and deflated after skin closure and draping of the wound. All skin incisions were done with the knee flexed approximately 45°, and the capsule was opened medially and proximally through the quadriceps tendon (medial parapatellar approach). The surgical procedure included positioning the femoral component in 3° of outward rotation, placing the tibial plateau in slight outward rotation, and medialization of the patella component, all procedures minimizing the need for lateral release.

The prostheses used for all operations were AGC (Biomet-Merck, Warsaw, Ind, USA); all patellas were resurfaced, and all components were cemented.

The surgeon made an initial evaluation of the tracking of the patella against the trochlear groove on the femoral component when the trial components were in place, and a final evaluation of the patella tracking was performed after cementing the prosthesis. The evaluation was based on the "no-touch test" [4] where it was observed whether the patella tracked properly in the middle of the groove on the femur component and whether the patella tilted laterally. The surgeon graded the tracking of the patella as either satisfactory or not, and if not, the maltracking was graded as major or minor. Major maltracking was diagnosed if the patella slid upon the lateral edge of the femoral groove during flexion and minor maltracking if the patella tilted laterally or lifted off during flexion. If maltracking was detected, the tourniquet was deflated, and the underlying dressing loosened. Patella tracking was then reevaluated, and the surgeon noted whether the patella now tracked properly or whether the maltracking had diminished. If any maltracking was present after deflating the tourniquet, a lateral release was performed (inside out with identification and preservation of the superior lateral genicular artery).

All patients began mobilization with crutches and full-weight bearing on the first postoperative day and did active ROM exercises supervised by a physiotherapist. After discharge, patients were seen by the surgeons after 3 months to a clinical follow-up including evaluation of patella tracking and standard anteroposterior and lateral radiographs. The last 50 patients in the study had their patellar tracking evaluated with merchant view (skyline) radiographs of the patella as well. The knee was flexed to 60°, and radiographs were taken tangentially on the femoral component. On these pictures, the patellar translation (the distance from the middle of the patellar component to the middle of the femoral groove) was measured [5]; if the center of the patella button was within 0.5 cm of the middle of the femoral groove, the patella was found to be properly tracking [6]; if the center was more than 0.5 cm off, the patella was found to be radiologically maltracking. The patella component (tilt) angle (the angle between the patellar component and the anterior flange of the femoral component) was measured as well [5] and regarded as satisfactory with values below 5° [6]. All merchant views were taken within a week after the operation.

Table 1. Data on the 100 Patients

	Tourniquet on extended knee	Tourniquet on flexed knee
Sex (women/men)	35/15	30/20
Age	68 (38-89)	68 (46-87)
Knee alignment (preoperative)		
Varus	37	41
Normal	10	7
Valgus	3	2
Surgery		
Operations	50	50
Patellar maltracking with tourniquet	9	7
Patellar maltracking without tourniquet	6	5

Sixty-five patients were women, 35 were men. Mean age was 68 (38-89) years. Preoperatively 78 knees were in varus, 17 were normally aligned, and 5 were in valgus (Table 1).

Statistics

Fisher exact test was used, $P < .05$.

Results

Sixteen patellas were found to be maltracking with the tourniquet inflated at the end of operation. Eleven patellas had major maltracking, whereas 5 had minor maltracking. After deflation of the tourniquet, all patellas tracked better; the 11 major maltrackings were now considered minor,