



Lateral parapatellar approach with tibial tubercle osteotomy for the treatment of non-correctable valgus knee osteoarthritis

A retrospective clinical study



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ABSTRACT

Background: The aim of this retrospective study was to evaluate the efficacy of a lateral parapatellar approach combined with a tibial tubercle osteotomy (TTO) in patients undergoing total knee arthroplasty (TKA) with non-correctable valgus knee osteoarthritis.

Methods: We studied 53 consecutive patients (57 knees) who had a primary TKA via lateral parapatellar approach with a global step-cut “coffin” type TTO over a 10-year period. All patients had non-correctable grade II valgus deformity according to the Ranawat classification. The average age of patients was 71 years (45 to 77) and the mean follow-up was 39 months (20 to 98).

Results: Post-surgery, there was a significant improvement in knee extension ($p = 0.002$), flexion ($p = 0.006$), Knee Society Pain and Function Scores ($p < 0.001$) and WOMAC Osteoarthritis Index ($p < 0.001$). The tibiofemoral angle changed from a preoperative median value of 11 deg (10 to 17) to a postoperative value of 3.75 deg (0 to 9). Congruent patellar tracking was observed in all cases. All but one osteotomy united in a median period of 16.7 weeks (9 to 28) and no hardware removal was required. One knee developed infection treated with two-stage reconstruction. A proximal tibial stress fracture also occurred in a patient on long-term bisphosphonate therapy.

Conclusion: Lateral parapatellar approach along with TTO is an effective technique for addressing non-correctable valgus knee deformity during TKA.

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1. Introduction

Total knee arthroplasty (TKA) remains the gold standard for the treatment of end-stage knee osteoarthritis (OA). Usually the knee develops a varus deformity but valgus malalignment occurs in approximately 10% of cases [1,2]. The medial parapatellar approach is the most common surgical approach used in TKA. Lateral parapatellar approach is rarely indicated but is useful in the severe valgus knee deformities. It promises direct exposure and release of the contracted lateral soft tissues and straightforward correction of the patellar mal-tracking [3,4].

Under difficult circumstances, such as severe fixed deformities with joint stiffness, exposure of the surgical field is compromised. Patella subluxation and eversion, proper visualization of the joint, precise bone cuts and correction of ligamentous imbalance may be difficult to achieve without jeopardizing the integrity of the extensor mechanism [5–7]. According to the published data, patellar tendon

rupture occurs between 0.17% and 1.4% of the time during primary TKAs and more often during revision knee surgery [8].

Several techniques have been described to deal with these problems including rectus snip, quadriceps and patellar turndown, V-Y quadriceps-plasty and tibial tubercle osteotomy (TTO) [5,6,9,10]. The latter provides excellent exposure of the femoral and tibial sides. Moreover, it is possible to optimize the tension and alignment of the extensor mechanism by adjusting the re-attachment position of the tubercle— superior, inferior, medial or lateral. As it is a bony procedure, it does not affect the contractile ability of quadriceps muscle and it can be repeated if necessary [11]. However, many surgeons prefer not to routinely perform the osteotomy because of the perceived risk of nonunion, tibial tubercle migration, proximal tibial fracture or metalware prominence.

The combination of TTO along with the lateral parapatellar approach has been reported to date in small series of patients under diverse primary or revision knee conditions using different fixation techniques of the osteotomy fragment [3–5]. We describe the results of lateral parapatellar approach combined with a rectangular type TTO in a consecutive series of patients who had a primary TKA for non-correctable valgus knee OA.

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2. Methods

2.1. Demographics

Institutional review board approval was obtained for the study. We retrospectively evaluated 53 consecutive patients (34 females) who underwent 57 primary TKAs via lateral parapatellar approach and TTO over a 10-year period (1999–2009). A single surgeon (SM) performed all surgery using a cemented posterior stabilized knee prosthesis (Genesis II, Smith and Nephew, Memphis, TN). Patellar replacement was performed if there was excessive wear of the patellar surface (39 knees).

The mean follow-up was 39 months (range, 20 to 98 months). The average age of patients was 71 years (range, 45 to 77 years). There were 35 right and 22 left knees. 38 patients had idiopathic knee OA, 13 patients had rheumatoid OA, and one patient had Wegener's arthritis and one hemophilic arthropathy.

All patients had non-correctable grade II valgus deformity according to Ranawat classification [1]. Specifically, valgus knees are classified as grade I when there is minimal valgus and minimal soft tissue stretching; grade II consists of a valgus angle more than 10 degrees with stretching of medial structures; grade III is when there is severe osseous valgus deformity of more than 20 degrees and incompetent medial sleeve.

Patients with previous knee surgery such as arthroplasty, fracture osteosynthesis or osteotomy were excluded from the study.

All knees were scheduled to be evaluated clinically and radiographically preoperatively and postoperatively at 6 weeks, 3 months, and annually thereafter or at additional time intervals if symptoms and X-rays necessitated further examination. Anteroposterior, lateral and skyline views were done in all cases. The tibial tubercle fragment was considered to be healed when radiographic evidence of bone union was observed on the lateral radiograph.

2.2. Surgical technique

A curved lateral skin incision was followed by a standard lateral parapatellar arthrotomy. The tibial tubercle was identified and multiple drill holes were made around the tibial insertion of patellar tendon creating a 1 cm deep rectangular bone fragment of approximately 5 × 3 cm. Thin osteotomes were used to complete the osteotomy and separate the bone fragment. The tubercle fragment was lifted as a “coffin” graft (Fig. 1A). This created a shelf (rebate) superiorly, into which the fragment could lock when it was re-attached, resisting proximal migration. The medial periosteum was left intact to assist in stabilizing the later re-attachment of the tubercle. Retaining the soft tissues also preserved the vascularity of the fragment. At the end of surgery, the tibial tubercle was fixed to its initial position. The technique of wire fixation evolved over the years. The basic principle was to use two cerclage wires to retain the tubercle graft in its bed (36 knees). Early on we used two additional wires to longitudinally fix the distal part of the fragment to the tibial cortex to prevent proximal migration of the fragment (21 knees). We subsequently found that the rebating of the fragment was enough to prevent proximal migration, and so these two wires were discontinued (Fig. 1B).

2.3. Statistical analysis

Statistical analysis was carried out with use of the SPSS software package (SPSS 17.0, Chicago, Illinois). Since data histograms showed skewed distribution of the variables, nonparametric methods of analysis were chosen. Data are presented as number of cases or as median with range in round brackets. The Wilcoxon test was used for comparison of the numeric variables. Statistical significance was assumed for $p < 0.05$.

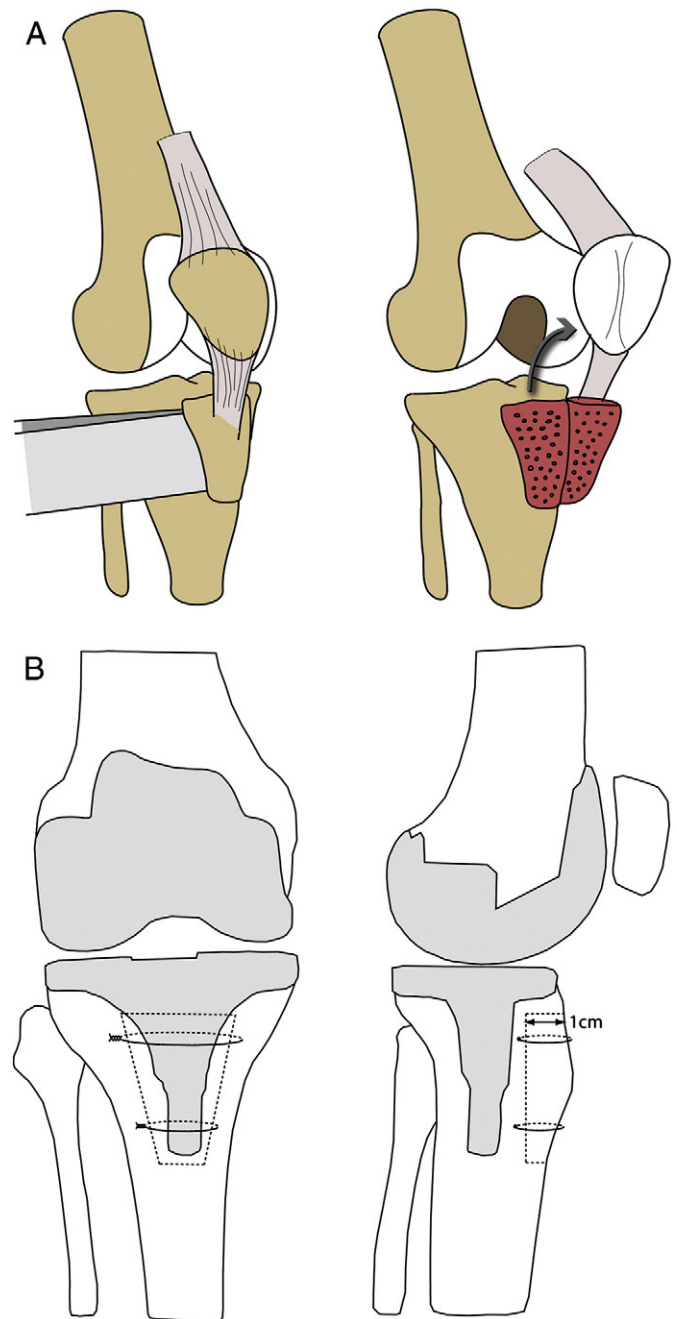


Fig. 1. (A) Drawing showing the lateral to medial tibial tubercle osteotomy (B) Fixation of bone fragment is achieved with two cerclage wires.

3. Results

3.1. Clinical outcome

Median knee extension improved from 7 degrees (0 to 30) preoperatively to 1.87 degrees (0 to 10) postoperatively ($p = 0.002$). Similarly, median flexion increased from 85.8 degrees (71 to 125) to 106.75 degrees (80 to 130) ($p = 0.006$). Total range of motion (ROM) was also significantly greater after operation [104.88 degrees (0 to 130)] compared to that before operation [78.8 degrees (0 to 125)] ($p = 0.003$).

Preoperatively, five knees had flexion contracture of more than 20 degrees and seven patients between 10 and 20 degrees. Postoperatively, only four knees had residual flexion contracture, but it was less than 10 degrees.

Knee Society Pain Score [12] increased from 40 points (30 to 52) preoperatively to 80.4 points (65 to 97) points postoperatively. Knee Society Function Score [12] increased from 35 (30 to 55) points preoperatively to 65 (35 to 80) points postoperatively ($p < 0.001$ for both parameters). The Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index [13] improved from 43.54 (15 to 75) points before surgery to 17.52 (0 to 89) points after surgery ($p < 0.001$).

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