Acta Orthopaedica et Traumatologica Turcica xxx (2017) 1–5

Contents lists available at ScienceDirect

Acta Orthopaedica et Traumatologica Turcica

journal homepage: https://www.elsevier.com/locate/aott

Posterior cruciate-retaining versus posterior-stabilized total knee arthroplasty for osteoarthritis with severe varus deformity

Ethem Ayhan Ünkar [a], Yusuf Öztürkmen [b, *], Erhan Şükür [b], Engin Çarkçı [c], Murat Mert [d]

[a] Kartal State Hospital, Department of Orthopedics and Traumatology, Istanbul, Turkey
[b] Istanbul Training and Research Hospital, Department of Orthopedics and Traumatology, Istanbul, Turkey
[c] Medipol University Sefakoy Hospital, Department of Orthopedics and Traumatology, Istanbul, Turkey
[d] Yeni Yuzyil University Gaziosmanpasa Hospital, Department of Orthopedics and Traumatology, Istanbul, Turkey

ARTICLE INFO

Article history:
Received 27 February 2016
Received in revised form
19 June 2016
Accepted 2 September 2016
Available online xxx

Keywords:
Posterior cruciate ligament-retaining
Posterior cruciate ligament-stabilization
Total knee arthroplasty
Varus deformity

ABSTRACT

Objective: The aim of this study was to compare the radiological and functional results of posterior cruciate ligament (PCL) – retaining and posterior-stabilized total knee arthroplasties in patients with severe varus gonarthrosis.
Methods: Medical records of 112 knees of 96 patients who underwent total knee arthroplasty for severe varus (≥15°) were reviewed. PCL-retaining and PCL-stabilizing groups consisted of 58 and 54 knees, respectively. Mean follow-up time was 56.6 months (range: 24–112 months). Knee Society (KS) clinical rating system was used in clinical evaluation. Range of motion, degree of flexion contracture, post-operative alignment, and complication rates were compared between the groups.
Results: Mean preoperative mechanical tibiofemoral angle was 20.1° in varus alignment, and was restored to 4.6° in valgus postoperatively. No statistically significant differences were found between PCL-stabilizing and PCL-retaining groups when KS knee scores, function scores, and flexion arc were evaluated. Two patients in PCL-retaining group underwent revision surgery due to aseptic loosening of tibial component. One patient in PCL-stabilizing group needed arthrotomy due to patellar clunk syndrome.
Conclusion: There were no notable differences between the 2 groups and PCL-retaining design had outcomes as good as PCL-stabilizing total knee implant in osteoarthritic knees with severe varus deformity.
Level of evidence: Level III, Therapeutic study.

Patients with pain and restrictions to daily functions that impair quality of life, have deformity, or instability of arthritic knee joint can be successfully treated with total knee arthroplasty (TKA).[1,2] Performing TKA in severe varus knees is technically more challenging than routine primary TKA of neutrally aligned knees. It remains controversial, and the literature is also indecisive about fate of posterior cruciate ligament (PCL) in TKA with severe varus deformity of knee.[3–7] Some surgeons decide to preserve or sacrifice PCL preoperatively based on their experience and training, while others decide intraoperatively after evaluating morphology of PCL, knee alignment, range of motion (ROM) and stability of knee. Several papers have been published comparing outcomes of PCL-retaining and PCL-stabilizing types of prostheses in neutrally aligned knees,[8–23] but as far as we know, there are no novel studies comparing results of the 2 designs in severe varus knees. Although supporters of PCL-stabilizing type of prostheses claim that use of PCL-retaining TKA in severe varus deformity is relatively contra-indicated, the present study was performed to test the hypothesis that it is possible to have comparable results with PCL-retaining designs.

Patients and methods

Between March 2002 and December 2013, 2158 TKA were performed at our institution. When our institutional computerized

* Corresponding author.
E-mail address: yozturkmen@gmail.com (Y. Öztürkmen).
Peer review under responsibility of Turkish Association of Orthopaedics and Traumatology.

http://dx.doi.org/10.1016/j.aott.2016.12.008

database was reviewed, 176 patients (214 knees) who underwent TKA due to severe varus deformity of the knee were identified.

Patients who had previous distal femoral or proximal tibial osteotomies, defects in the cut proximal tibia condyle that needed bone grafting or metal wedges to achieve stable axial implantation of tibial prosthesis, previous knee arthroplasty, diagnosis of malignant disease or infection, previous patellectomy, extra-articular deformity, or less than 2 years of follow-up were excluded from the study. In 6 patients (5 female, 1 male), metal wedges were implanted due to bone defects in proximal tibial condyle to achieve stable axial implantation of tibial component. Tibial trays of both implants evaluated in this study were not suitable for application of metal wedges, therefore revision-type, long-stemmed tibial components were used in these patients. Stem extension changes biomechanical design of the prosthesis and may affect implant survival rate.[24] Using just one particular prosthetic design is a strength of our study and eliminated bias. Design of the components was dissimilar, and though it was rather small number of patients, we found it more convenient to exclude these patients from the study.

Total of 96 patients (112 knees) with preoperative and postoperative clinical and radiological assessments and minimum 2 years of follow-up were included in this study. Of the 96 patients, 64 were female (72 knees) and 32 were male (40 knees), with mean age of 69 ± 6.4 years (range: 48–83 years).

Knee alignment was defined mechanically on long-standing radiograph as the angle between mechanical axes of femur and tibia (Fig. 1). Knee Society (KS) criteria group severity of knee deformity as: mild (≤5°), moderate (6–10°), marked (11–15°), or severe (>15°).[25] According to these criteria, we defined participant knees with coronal angle ≥15° in varus direction as severe varus deformity.

In all cases, standard medial parapatellar approach was used. Distal femoral cuts were made using intramedullary alignment jig at 6° of valgus. After determining epicondylar axis for anatomic rotation of femur, posterior referencing instrumentation was used. Tibial cuts were made with extramedullary guiding. Sequential ligament releases were done starting from deep medial collateral ligament (MCL), then superficial MCL, and posteromedial capsule, if needed, until well-aligned and stable knee was obtained. Flexion contractures were corrected with removal of posteromedial tibial osteophytes and, when necessary, by elevation of capsule from posterior femur. Surgery was not terminated unless flexion and extension spaces were balanced and leg and components were thought to be properly aligned. No residual flexion contracture was observed. With trial components in place, limb stability and balance were evaluated.

All procedures were performed by 3 experienced staff surgeons using standardized approach, and all patients received 1 of 2 designs of cemented, fixed-bearing total knee replacement. PCL-stabilizing prostheses used in this study comprised 21 Performance Total Knee System (Biomet Spain Orthopaedics, Valencia, Spain) and 33 Vanguard Complete Knee System (Biomet Inc., Warsaw, IN, USA). PCL-retaining designs used were 19 Performance Total Knee System (Biomet Spain Orthopaedics, Valencia, Spain) and 39 Vanguard Complete Knee System (Biomet Inc., Warsaw, IN, USA). Implant selection was at the discretion of the surgeon. One of the operating surgeon preferred PCL-stabilizing type of prosthesis, believing that it theoretically confers advantages such as joint stability and physiological kinematics.

In 18 patients (13 female, 5 male), 22 patellae were resurfaced. Cemented, polyethylene components were used. Remaining patients underwent osteophyte resection and patellar denervation.

All patients received 1 gr cefazolin intravenously 60 min before the procedure, and antibiotics prophylaxis, which was discontinued within 24 h postoperatively. For venous thromboembolism prophylaxis, low-molecular-weight heparin was administered to all patients for 21 days. Identical rehabilitation program was administered for all patients. They were allowed to bear weight as tolerated at first postoperative day and ROM increased in the following days.

Clinical evaluation was done using KS clinical rating system in preoperative assessment and throughout follow-up. Anteroposterior and lateral knee radiographs were taken preoperatively, once again 1, 3, and 6 months postoperatively, and then annually. Postoperative periprosthetic radiolucency was evaluated in order to determine any aseptic loosening. All patients were assessed with orthoroentgenographs preoperatively and at last follow-up visit, and analog goniometer was used for mechanical tibiofemoral angle measurements. Postoperative varus alignment was recorded as negative degrees. Radiolucent lines and their progression were noted using KS radiographic evaluation system. Radiological evaluation of patients was performed only by the senior surgeon. Preoperative and postoperative flexion arc measurements were recorded using standard manual goniometer.

This study was approved by our institutional ethics committee (approval number 380/2013) and written, informed consent was obtained from all patients for their demographic and radiological data to be used.

SPSS software version 15.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for statistical analyses. Descriptive statistics have been stated as number and percentage, and numerical statistics have been presented as mean, standard deviation, minimum, and maximum values. Since numerical values between 2 independent groups were not normally distributed, Mann–Whitney U test was used to compare these groups. Ratios of categorical variables between the groups were analyzed using chi-square test. As conditions for parametric tests were not met, Spearman's correlation analysis was used to evaluate numerical variables. Alpha level for statistical significance was accepted as less than 0.05 ($p<0.05$).

Results

Mean follow-up with complete clinical and radiological data was 56.6 ± 19.8 months (range: 24–112 months). There were no significant differences in patient demographics (Table 1). Among the 96 patients, indication for TKA was idiopathic arthritis in 88 (101 knees), rheumatoid arthritis in 5 (8 knees), and post-traumatic arthritis in 3 patients (3 knees).

Preoperative mean mechanical tibiofemoral angle was 20.1 ± 3.0° (range: 15–28°) in varus alignment. Tibiofemoral angle was restored to mean of 4.6 ± 2.1° (range: −2–8°). Of 112 knees, 76 (68%) were in acceptable range of 4–6° of valgus. Mean preoperative and postoperative alignments according to implant designs are provided in Table 2.

Mean KS knee score was 45 ± 5.5 (range: 22–56) preoperatively. Mean postoperative KS knee score was 90 ± 7.9 (range: 40–100). Mean KS function score was 32.1 ± 8.1 (range: 5–45) preoperatively and 83.6 ± 11.4 (range: 20–95) postoperatively. Scores distributed according to prosthesis design are given in Table 3.

Both mean KS knee score and mean KS function score were significantly improved postoperatively ($p = 0.022$, $p = 0.018$). Since patients were grouped according to design of prosthesis implanted, there were no significant difference between the 2 groups based on postoperative KS knee scores ($p = 0.823$) and KS function scores ($p = 0.269$).

Patients were then grouped based on postoperative alignment: neutrally aligned (4–6° valgus) and others. There was no statistically significant difference between PCL-stabilizing and PCL-retaining design with regard to postoperative neutral alignment

Please cite this article in press as: Ünkar EA, et al., Posterior cruciate-retaining versus posterior-stabilized total knee arthroplasty for osteoarthritis with severe varus deformity, Acta Orthop Traumatol Turc (2017), http://dx.doi.org/10.1016/j.aott.2016.12.008