Patelloplasty without resurfacing of the patella in total knee replacement in patients without severe patellofemoral osteoarthritis

Mohamed G. Montaser, Alhusseiny Moustafa

Department of Orthopedic Surgery, Benha University Hospital, Faculty of Medicine, Benha University, Benha, Egypt

Correspondence to Mohamed G. Montaser, MD, 1 Nassaj St Benha Eljadeeda, PO Box 13111, Benha, Qalyubia, Egypt
Tel: +20 100 228 2522;
e-mail: mgoda71@yahoo.com

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Purpose
The aim of this prospective study was to assess the clinical results of nonresurfacing patelloplasty in total knee arthroplasty for osteoarthritis in middle-aged active patients with less erosion of the patellar articular cartilage, based on the hypothesis that patellar denervation provides pain relief and improvement in clinical results.

Patients and methods
The study was conducted during the period between June 2009 and December 2013 on 59 knees of 55 patients (four bilateral) who met the criteria. The procedure was performed in three hospitals using the same technique. We used the Knee Society Knee Scoring System for overall assessment of patients' knees. For patellofemoral status, we used the Outerbridge Grading System and we used the scale of Stern and Insall to assess anterior knee pain.

Results
The mean Knee Society Scores for the patients were improved from 15.2 preoperatively to 91.3 at postoperative follow-up. Fifty-one patients could use stairs without symptoms or with mild pain (grades 0 and I), and four patients were unable to use stairs due to severe symptoms (grade II); one of them was able to use stairs after 2 years of follow-up.

Conclusion
The results of patelloplasty without resurfacing of the patella in selected patients, clinically, radiologically, and intraoperatively are comparable to the results of patellar resurfacing, but with fewer hazards and complications.

Keywords:
anterior knee pain, patellar denervation, patelloplasty, total knee arthroplasty

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Introduction

The optimal treatment of the patella during total knee replacement is resurfacing, but complications after resurfacing, including wear of the patellar polyethylene, loosening of the patellar component, patellar fracture, and rupture of the patellar tendon, lead to difficult surgical revisions and uncertain results [1,2]. These problems were considered so important that some authors decided to conduct studies that kept the patella nonresurfaced [3]. Investigators of these noncomparative studies concluded that, in specific conditions, it was advisable to leave the patella nonresurfaced. Picetti *et al.* [4] and Soudry *et al.* [5] considered the nonresurfacing for patients with osteoarthritis with good cartilage on the patella and who were young active and nonobese. Kim *et al.* [6] proposed this option for knees with the same characteristics but that also had a congruent patellofemoral tracking, a normal anatomic patella shape, and no evidence of crystalline disease or inflammatory synovitis. In contrast, Ranawat [7], Rae *et al.* [8], Harwin [9], and Larson and Lachiewicz [10] using various types of prostheses advocated routine patellar replacement based on 10 years of excellent clinical results and low morbidity attributable to patellar replacement. A definite conclusion cannot be drawn from these different studies. Randomized studies represent the best design to compare patellar resurfacing and nonresurfacing. However, different outcomes and variable conclusions were reported by the investigators. Nizard *et al.* [11] published the results of a meta-analysis of 12 randomized, controlled trials between 1966 and 2003, and they concluded that the resurfaced patella had better performance and the nonresurfaced patella had a higher relative risk for reoperation due to significant anterior knee pain and significant pain when climbing stairs; however, no differences were observed between the two groups with regard to the functional score of the International Knee Society, the score of the Hospital for Special Surgery, and patient satisfaction. Another meta-analysis of 14 studies was published by Parvizi *et al.* [12]. The

incidence of anterior knee pain was higher when the patellae were not resurfaced; secondary resurfacings due to anterior knee pain were required in 8.7% of the nonresurfaced knees, and there were no differences in reported complications [12].

According to Fu *et al*. [13], certain criteria should be met to use patelloplasty as an option during total knee replacement (TKR), including absence of inflammatory synovium either rheumatoid-induced or crystalline-induced synovitis, presence of symmetrical joint space in the preoperative skyline radiograph for the patella, absence of eburnated bone in the articular surface of the patella upon inspection of its surface, a normal anatomic shape of the patella congruent with the prosthetic trochlea groove, and a normal patellar tracking, which may be achieved by means of lateral release. In addition, they concluded that there are relative indications for not resurfacing the patella, which include the patella being too small or eroded to accept prosthesis [13], the patient being obese (with resurfacing, patellar pain, and complications being more frequent in obese patients), and younger patients with higher functional demands (due to higher complication rates of patellar resurfacing in young active patients). Anterior knee pain was reported in 4–49% of patients after primary total knee replacement [14,15]. In some studies, both the peripatellar soft tissue, such as retinaculum and synovium, and the infrapatellar fat pad were implicated as the source of anterior knee pain [16,17]. Several studies on innervations of the anterior part of the knee found substance-P nociceptive afferent fibers in the peripatellar soft tissue [18]. Disabling these pain receptors using electrocautery could theoretically achieve desensitization or denervation of the anterior knee region [19–21]. In general, denervation of the patella using electrocautery and patelloplasty with removal of osteophytes have been used for the treatment of anterior knee pain in total knee arthroplasty (TKA); this attitude also has the advantage of easy implementation and fewer additional surgical procedures.

The purpose of this prospective study was to assess the clinical results of nonresurfacing patelloplasty in TKA for osteoarthritis in middle-aged patients with less erosion of the patellar articular cartilage.

Patients and methods

The study was conducted during the period between June 2009 and December 2013. All patients who underwent total knee replacement and met the inclusion criteria were included in this study and for all of them patelloplasty was performed without resurfacing. For other patients who did not meet the inclusion criteria, patellar resurfacing was performed and the patients were not included in this study. During this period, 59 knees of 55 patients (four bilateral) who met the criteria underwent the procedure in three hospitals, Al-Mebara Insurance Hospital (Port-Said), Benha University Hospital (Benha), and Al-Helal Hospital (Cairo), and the surgery was performed by either one or both authors using the same technique.

We used the Clinical Rating System of the Hospital for Special Surgery [22] and the clinical [23] and radiological [24] scoring systems of the Knee Society. For patellofemoral status, we used the Outerbridge Grading System [25] and we used the scale of Stern and Insall to assess anterior knee pain [26]. The patients were seen at regular follow-up visits every 4 weeks for the first 3 months and then every 3 months for the first year and then every 6 months. Preoperative data including age, sex, BMI, operative time, patient satisfaction, joint range of motion, and incidence of postoperative anterior knee pain were recorded. Preoperative plain radiography in the anteroposterior standing view, lateral view for both knees, and skyline views for the patella were performed for all patients, and for some patients MRI study or computed tomography scanning of the knee was carried out. Postoperative radiographs and follow-up visit radiographs were assessed for limb alignment, anatomic tibiofemoral angle, component size, position (mediolateral), inclination (anteroposterior, varus–valgus), tibial surface coverage, cementation, ligamentous laxity, femoral notching, posterior tibial slope, femoral component flexion–extension, patellar position in relation to the joint line, graft, metal augment, and recurvatum or flexion deformity. Both femoral and tibial component alignment were assessed radiologically according to the Knee Society Score [23,24].

Inclusion criteria and basis of case selection

Active patients younger than 55 years scheduled for total knee replacement and suffering from tibiofemoral osteoarthritis, mainly with mild-to-moderate patellofemoral osteoarthritis with absence of inflammatory synovium either rheumatoid-induced or crystalline-induced synovitis, presence of symmetrical joint space in the preoperative skyline radiograph for the patella, absence of eburnated bone in the articular surface of the patella upon inspection of its surface, a normal anatomic shape of the patella congruent with the prosthetic trochlea groove, and a normal patellar tracking that may be achieved with lateral release were included in the study. The patients who did not meet all of these criteria were excluded from the study.

Surgical procedure

The prosthesis used was either a posterior cruciate-retaining or posterior stabilized cemented prosthesis. All surgeries were performed using a standard medial parapatellar approach. All patients were treated with patelloplasty (removal of all osteophytes) and patellar denervation.

Patelloplasty for the nonresurfaced patellae consisted of the following:

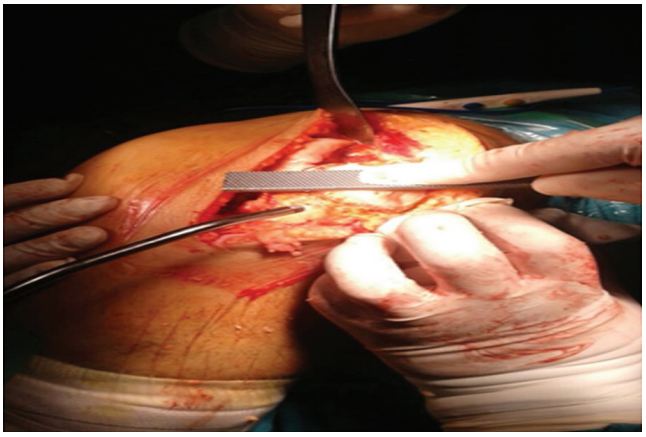
(1) Osteophyte removal to allow better seating of the patella on the trochlea (Fig. 1).
(2) Patellar rim cautery to a depth of 2–3 mm around the patella, to provide partial denervation (Fig. 2).
(3) Multiple drilling of the articular surface to decompress the subchondral bone in the presence of chondral ulcer.
(4) Release of the patellofemoral ligament when tight.
(5) Soft tissue release from the lateral patella to avoid tilting.
(6) Smoothening of rough areas using filer (Fig. 3).

Written informed consent was obtained from all patients, and approval to use their medical records and re-evaluate each patient was given by the Local Research Ethical Committee.

Results

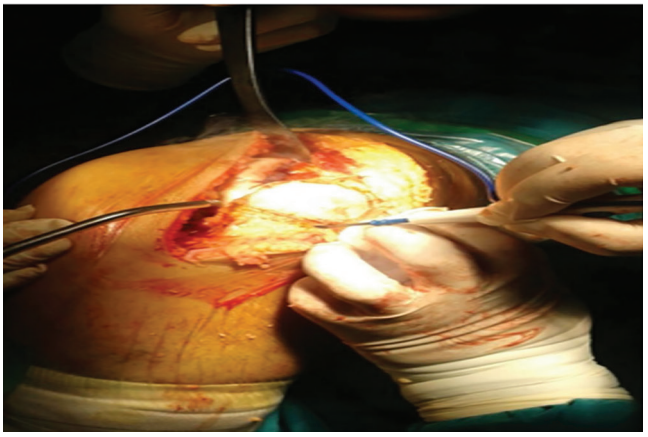
Three patients (three knees) were excluded from the study, one patient died from unrelated conditions, and two patients (two knees) were lost to follow-up. Thus, the final number of the patients who successfully completed the study was 52 patients with 56 knees, as four patients underwent bilateral replacement. As regards the knee score of the Knee Society Clinical Rating System, 49 patients were free of pain and seven patients reported mild or occasional pain at follow-up evaluation. The mean (range) Knee Society Scores for the patients were improved from 15.2 preoperatively to 91.3 at postoperative follow-up. All patients regained full extension, except one patient who lacked 10° of extension. In 47 patients, the knee flexion ranged from 80° to 120°; in one patient, the knee flexion was only 20° – the preoperative knee flexion was 10°. The knee flexion for the other six patients ranged from 60° to 80°. All patients had stable knees either anteroposterior or mediolateral. As regards the Clinical Rating System of the Hospital for Special Surgery, excellent results were seen in 16 patients, good results in 34 patients, fair results in five patients, and poor results in one patient. There was no evidence of postoperative tibiofemoral instability. The ability of patients to use stairs after surgery, which is correlated to patellofemoral joint symptoms, was recorded according to the scale of Stern and Insall [27]; 43 patients could use stairs without symptoms (grade 0), nine patients could use stairs but with mild pain (grade I), and four patients were unable

Figure 1



Osteophyte removal.

Figure 2



Patellar rim cautery to provide partial denervation.

Figure 3

Smoothening of rough areas using filer.

to use stairs due to severe symptoms (grade II) – one of them was able to use stairs after 2 years of follow-up.

Discussion

Anterior knee pain is a major postoperative complication that compromises patient's satisfaction after total knee replacement. Some surgeons adhere to routine patella resurfacing, whereas others proceed with patellar denervation without resurfacing [28].

Some researchers believe that resurfacing reduces complication rates and guarantees a predictable outcome with less anterior knee pain, whereas others believe that it contributes to postresurfacing complications such as patella fracture, patella tendon injury, joint instability, failure of the patella components, patella clunk syndrome, and increased operative cost and time with no overall benefit to patients [27,29,30].

A prospective randomized controlled study by Rodríguez-Merchán and Gómez-Cardero [27] showed that the risk for resurgery for patellar resurfacing is 21.5 times greater in patients with Outerbridge grade IV patella than in those with grades I, II, and III. Hence, they recommended resurfacing in this group of patients. In another randomized controlled trial conducted by Beaupre *et al*. [31], after a 10-year follow-up period, they found out that ~10% of patients without initial patella resurfacing required resurfacing early in the postoperative period due to anterior knee pain.

In a retrospective study comparing the clinical outcomes between patella resurfacing and nonresurfacing in TKA, Li *et al.* [32] studied the clinical outcomes of 130 patients using anterior knee pain, Knee Society Score, patient satisfaction, revision rates, and radiograph findings; they found no statistically significant difference between the two groups with regard to any of the clinical outcome measures studied. A recent literature review also showed similarity of outcomes between resurfacing and nonresurfacing, and so the authors suggested that selective resurfacing will offer a better compromise using a reliable method of assessing the benefits of resurfacing before carrying it out, rather than randomly allocating patients to one group or the other [33].

Khan and Pradhan [34] carried out a review on the difference in postoperative patellofemoral pain, patella clunk, and crepitus in patients with or without resurfacing after 5 years of follow-up. Their results revealed a higher incidence of patellar clunk in patients with preoperative patellofemoral pain, who underwent patella resurfacing. In those without patellofemoral (PF) pain and who underwent resurfacing, there was a greater occurrence of crepitus. However, in patients without preoperative PF pain, there was a higher incidence of postoperative pain, clunk, and crepitus among patients who had patelloplasty, compared with other patients in the nonresurfacing group [34].

Smith *et al*. [35] also carried out a prospective randomized trial on 142 patients who underwent total knee replacement with and without patella resurfacing (159 procedures). The patients were followed up for 3–7 years, with a mean follow-up period of 4 years. They were assessed using the knee pain scale and the Knee Society Clinical Rating System. There was no demonstrable benefit of patella resurfacing compared with patients who were unresurfaced; both groups had comparable number of patients with postoperative anterior knee pain, with 30.1% in the resurfacing and 20.9% in the nonresurfacing group. There was no revision carried out in relation to the PF joint in both groups, but there was a strong link between knee flexion contracture and anterior knee pain in patients who underwent patellar resurfacing procedures [35].

In our study, although we performed patelloplasty for all patients of the study group, we selected patients who fulfilled the inclusion criteria. We included active patients below 55 years of age with minimal patellofemoral osteoarthritis and Outerbridge classification grades I, II, and III, without inflammatory synovitis and with normal patellofemoral tracking and excluded patients of grade VI. Our results are similar to the published results of TKR with resurfacing of the patella. Selective patella resurfacing or nonresurfacing is probably the best option, as long as the indications are carefully selected. Patella resurfacing should be carried out in patients with inflammatory arthritis, completely destroyed patellofemoral joint, or patella maltracking. The patella should be preserved when it is small, has normal articular surface, or when there is normal patella tracking.

Conclusion

Results of patelloplasty without resurfacing of the patella in selected patients, clinically, radiologically, and intraoperatively are comparable to the results of patellar resurfacing but with fewer hazards and complications.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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