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Original Article

Medium-term evaluation of total knee arthroplasty without patellar replacement

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ABSTRACT

Objective: To mid-term evaluate patients who were submitted to total knee arthroplasty without patellar resurfacing. *Methods:* It was realized a retrospective cross-sectional study of patients who were submitted to total knee arthroplasty without patellar resurfacing. In all patients clinical examination was done based on the protocol of the Knee Society Scoring System, which assessed pain, range of motion, stability, contraction, knee alignment and function, and radiological evaluation. *Results:* A total of 36 patients were evaluated. Of these, 07 were operated only on left knee, 12 only on right knee and 17 were operated bilaterally, totaling 53 knees. Ages ranged from 26 to 84 years. Of the 53 knees evaluated, 33 (62.26%) had no pain. The maximum flexion range of motion averaged 104.7°. No knee had difficulty in active extension. As to the alignment for anatomical axis twelve knees (22.64%) showed deviation between 0° and 4° varus. Thirty-nine (75.49%) knees showed pace without restriction and the femorotibial angle ranged between 3° varus and 13° valgus with an average of 5° valgus. The patellar index ranged from 0.2 to 1.1. *Conclusion:* Total knee arthroplasty whitout patellar resurfacing provides good results in mid-term evaluation.

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Introduction

Total knee arthroplasty (TKA) is indicated to treat advanced osteoarthritis and other severe cartilage degeneration conditions. TKA has been increasingly utilized due to benefits in pain reduction and in reestablished knee function. Resurfacing techniques were first utilized in the 1940s, and further technological development led to knee modular implants that are still used today. The first knee modular implant, the precursor of current models, was developed by Freeman.[1,2]

TKA is one of the most effective surgical procedures in the treatment of osteoarthritis[3,4], as it corrects deformities and instabilities, promotes pain relief and improves function in most patients.[5,6]

Patellar resurfacing is known as one of the greatest contributors to complications of total knee arthroplasty, due to the combination of high loading, the action of multiple muscle groups, a small contact surface and poor vascularization.[7,8] Complications include fractures, avascular necrosis, wear, laxation and component luxation.[7,9]

Because of the potential for these complications, many authors recommend femoral and tibial arthroplasty resurfacing without patellar resurfacing, which may be followed by synovectomy and peripatellar denervation, which are cartilage preserving.[10-14]

The femoropatellar joint can be easily evaluated with both clinical exam and imaging and is also accessible by arthroscopic examination. The availability of these methods helps with diagnosis of several conditions including alignment variations, dysplasia and degeneration of both cartilage and subchondral bone.[15]

Recently, the number of patients who seek medical treatment for functional knee impairment due to arthrosis has increased. Associated with this escalation is the increased longevity and physical activity levels among the older population.

This study aims to clinically and radiologically evaluate patients undergoing total knee arthroplasty without patellar resurfacing.

Materials and Methods

A retrospective cross-sectional study was performed at the Outpatient Clinic of the Orthopedic Service of the Hospital Universitário at the Universidade Federal do Maranhão (HU-UFMA), the Hospital Centro Médico and UDI Hospital, in São Luís, Maranhão, Brazil. The study was conducted from 2004 to 2007 and included patients who had undergone total knee arthroplasty without patellar surfacing.

The patients were initially contacted by mail or telephone, and those who agreed to participate were provided with further information regarding the study. All patients who chose to voluntarily participate gave informed consent.

The same surgeon operated on all patients. The operation was a cemented total knee arthroplasty using an anterior medial parapatellar approach, with lateral luxation of the patella under pneumatic tourniquet, under antibiotic and thromboembolism prophylaxis. In all cases, the patella was preserved and denervation and peripatellar synovectomy were performed. The posterior cruciate ligament (PCL) was preserved in 35 knees (66.04%) and sacrificed in 18 knees (33.96%).

Evaluation used the Knee Society Scoring System protocol, which consists of two parts. One part assesses alignment, movement and joint stability preservation while the other assesses knee function while walking on both flat ground and stairs. The final score varies between a negative outcome and 100 in each one of the parts, totaling a score of 200. The results are considered excellent when the score is greater than 170, good when it ranges between 140 and 169, fair when it ranges between 120 and 139 and poor when the score is less than 120.

Evaluation included assessment of pain, range of motion, stability, contracture presence, knee alignment and function. Radiological evaluation was also performed, generating anteroposterior (AP), profile (AP) and patellar axial images.

Patients were evaluated for the presence, incidence and severity of pain as well as the presence of pain with walking on flat ground and/or stairs. We also evaluated for pain present in the anterior face of the knee (patellar pain). The mild-moderate-severe range was a subjective measure based on patient response.

Range of motion was assessed by measuring the range of flexion-extension of the arc of motion.

Anteroposterior stability was assessed through anterior and posterior drawer tests and was measured in millimeters. Mediolateral stability was evaluated using the extended-knee varus and valgus stress tests and was measured in degrees.

A flexion contracture was considered present if the angle was equal to or greater than five degrees.

Articular alignment was measured along the anatomic axis between the long femoral and tibial axis. A five to ten degree valgus angle was considered normal.

We evaluated the AP alignment using radiographic studies. The patellar index and any patellar lateral inclination were evaluated in profile and axial patellar images, both performed with the knee joint at approximately 30° of flexion. The patellar index used was suggested by Blackburne and Peel,[16] and considers the relation between two measures found on the in absolute profile radiography of the knee: the length of the lower pole of the articular cartilage of the patella, measured in a vertical line that forms a 90° angle with the horizontal articular line (femoral component interface and polyethylene) (line b), and the length of the articular surface of the patella (line a) (Fig. 1). Normal values range from 0.6 to 1.0.

The lateral inclination of the patella was evaluated by means of the Laurin angle, which uses the most prominent points of the femoral component. This angle is measured on an axial radiograph image with the knee in 30° flexion,

and consists of the meeting of the line that passes through the superior ridge of the femoral condyles, and the line of the lateral articular surface of the patella. The opening angle should always be lateral; if the angle is medial, it is sufficient for a diagnosis of the lateralization of the patella (Fig. 2).

The present study was approved by the Research Ethics Committee of the Universidade Federal do Maranhão through the protocol of the Brazilian National Research Ethics Committee (CONEP) under the number 898/10.

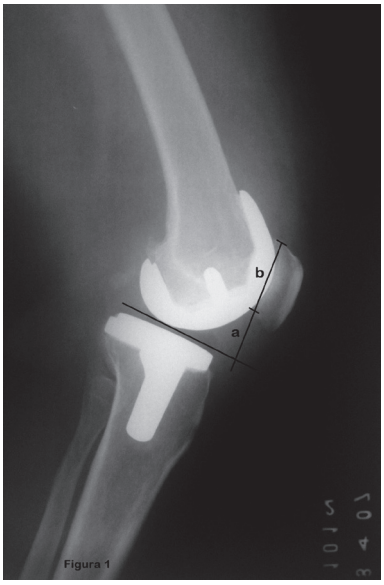


Fig. 1 - Radiography in absolute profile of the knee

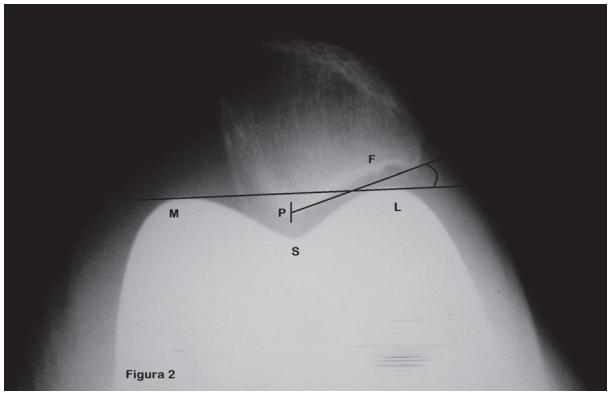


Fig. 2 - Patellar lateralization.

Results

Between 2004 and 2007, our team performed 147 knee arthroplasty procedures on 102 patients in the study hospitals. Thirty-six of those patients consented to participate in the study and were later evaluated on the study measures. Seven patients had left knee operations, 12 had right knee operations and 17 had bilateral operations, totaling 53 knees.

Age ranged from 26 to 84 years old (mean age: 71.52 years old). One patient with juvenile rheumatoid arthritis was 26 years old at the time of surgery; all other subjects were 54 years old or older. Eight patients (22.22%) were male and 28 (77.78%) were female.

With regards to diagnosis, one patient (2.77%) had gouty arthritis, one had (2.77%) juvenile rheumatoid arthritis and 34 (94.46%) suffered from primary osteoarthritis. With regards to deformity, five knees (9.43%) presented geno valgum, 12 (22.64%) geno varum and 36 (67.93%) did not present with an axis deviation.

Follow-up time was a minimum of 40 months and a maximum of 78 months (mean follow-up time 57.84 months).

After evaluation, eight knees (15.09%) were determined to have an excellent result, 32 (60.39%) a good result, seven (13.2%) a fair result and six (11.32) a poor result.

Of the 53 knees evaluated, patients did not report the presence of pain for 33 (62.26%). Twelve patients reported mild or occasional pain during physical exercise in a total of 15 knees (28.3%): three patients (5.66%) reported mild pain while going up or down the stairs, one (1.89%) reported occasional moderate pain and one (1.89%) reported continuous moderate pain. No patients reported severe pain. Nine patients reported patellar pain in a total of 13 knees (24.52%), 10 (18.8%) of those reported mild patellar pain, and three (5.6%) reported moderate patellar pain.

Active flexion varied from 90° to 145°, with mean flexion angle of 104.7°.

Forty knees (75.47%) had less than 5 mm of anteroposterior stability, 11 (20.77%) had between 5 and 10 mm and two (3.78%) had stability greater than 10 mm.

Thirty knees (56.6%) had a medial lateral articular opening smaller than 5°, 18 (33.96%) between 6° and 9° and five (9.44%) between 10° and 14°. None of the knees had an opening greater than 15°.

Forty nine (92.45%) knees did not have a flexion contracture while four (7.55%) had contracture less than 10 degrees.

None of the knees presented with difficulties in active extension. Regarding alignment by anatomic axis, 12 knees (22.64%) presented with a varus deformity of 0° to 4°, 39 (73.58%) with a valgus deformity of 5° to 10° and two (3.78%) with a valgus deformity between 11° and 15°.

For 39 (73.58%) knees, patients reported no walking restriction. For seven (13.2%) knees, patients reported that they were able to walk more than 10 blocks; for three (5.66%) knees, patients reported that they were able to walk between five and 10 blocks; for four (7.56%) knees, patients

reported that they could walk five blocks; no patients reported not being able to walk at al.

The measured femorotibial joint angle varied between 3 degrees of varus and 13 degrees of valgus, with mean of five degrees in valgus.

On radiological exam using AP views, two knees were found to have a valgus alignment of the tibial component in relation to the tibial diaphysis. No malpositioning of the femoral component was found.

Six (11.32%) knees presented a patellar index lower than normal and two (3.77%) presented an index greater than normal. The range of recorded patellar indices was between 0.2 and 1.1 with a mean index of 0.7.

One knee (1.88%) was found to have a lateral patellar inclination, with a 5-degree medial opening in the Laurin angle. However, the patient did not report associated symptoms.

Thirty-three patients (91.66%) were satisfied with the surgery results. No severe complications, such as infection or thromboembolism, occurred in any of the patients.

Discussion

Total knee arthroplasty, a very successful method to treat degenerative alterations of the knee, is used with increasing frequency worldwide due to aging populations and the desire to preserve quality of life. [17]

Keblish18 highlighted that the preservation of the patella is a practical and economical procedure that decreases the potential for patellar complications.

Some studies have found that patellofemoral complications after total knee arthroplasty are associated with the use of the patellar component. These complications include fracture and patellar subluxation, wear or patellar component loosening and extensor mechanism rupture. In addition, fewer treatment options are available for patients that have undergone patellar resurfacing[12,13,19-24]

Arnold et al.[12] published their results after performing more than 700 primary arthroplasty procedures over seven years, all performed without replacing the patellar articular surface. Researchers clinically observed the maintenance or improvement of knee function in these patients. They concluded that TKA without patellar replacement yields excellent long-term results.

Soudry et al.[25] also conducted studies in which the patellar component was not replaced, and based on their findings recommended maintaining the patellar surface in young, active, non-obese patients if the osteoarthritis had not damaged the patellar cartilage.

Barrack[14] reports that articular surface replacement of the patella is not beneficial for patients. According to the author, oblique super or sub-resection may lead to complications and subsequent surgeries may be necessary for correction. He also reports further advantages to not resurfacing the patellar surface: it is a faster and cheaper procedure, the risk of complication is lower and if symptoms appear, more surgical options may be available. Finally, the author concluded that common replacement of the patellar surface is unnecessary in more than 90% of the patients because of the increased risk of complications and the inevitability of some degree of post-surgical patellar pain with or without patellar resurfacing. He mentions that the most post-arthroplasty clinical predictors are surgical technique and implant design, not patellar resurfacing.

Turqueto et al.[11] conducted a study comparing a total of 54 arthroplasty procedures with or without the placement of the patellar component. They found out that for patients with osteoarthritis and slight alterations in the articular surface of the patella, short- and medium-term clinical outcomes were identical with or without patellar resurfacing. They concluded that standard replacement of the patella is not necessary and that avoiding the practice could prevent the possible complications associated with the procedure.

Carvalho Júnior et al.[13] compared outcomes for patients who had undergone TKA with the same implant model and diagnosis of osteoarthritis, but with either the use or non-use of the patellar component. They did not find significant differences between the two groups. They concluded that non-replacement of the patella is justified, due to the several complications described in the literature related to the patellar component.

Waters and Bentley[24] studied 474 primary and consecutive total knee arthroplasty procedures performed in 390 patients, with the articular surface of the patella being either preserved or replaced. They observed that patients who had resurfaced patellas had better clinical outcomes, while patients with non-surfaced patellas presented with greater peripatellar pain.

Kubota et al.[4] conducted a study of 30 patients who all underwent TKA with the use of a patellar component and preservation of PCL. They concluded that the application of the patellar component in TKA offers advantages compared with its non-use.

According to some authors, when the patellar component cannot be replaced, peripatellar pain is observed on follow-up, which renders the TKA non-successful and necessitates subsequent surgery.[6,14,24,25] According to Kulkarni et al.[22], however, the placement of the patellar component in these patients does not lead to resolution of the pain.

According to some authors,[21,26,27] the exact cause of the peripatellar pain is indefinite and multifactorial, and thus the probability of postoperative peripatellar pain is not influenced by the use or non-use of the patellar component

Pronounced pain reduction and improved functionality were achieved in most of our patients and our results show the important role of TKA in the reestablishing knee function for patients with diseases such as osteoarthritis. While some of our patients presented with patellar pain, in the majority of the cases it was of mild intensity and typically was observed in patients who also reported pain in other joint regions.

The mean arc of motion (104.7°) observed in our study is considered satisfactory and is similar to results found in the literature, such as a study by Carvalho Júnior et al,[28]

in which the reported mean of postoperative flexion arc was 108.6°.

Regarding flexion contracture, we found a lower incidence than those mentioned in the literature, including an incidence of 8.69% reported by Villardi et al.[29] and 11.43% reported by Kubota et al.[4]. All of the flexion contractures found in our study had an angle narrower than 10°.

Of the knees studied, only 11.32% were found to have a patellar index less than the normal range. This incidence was lower than that observed by Kubota et al.[4] in a study of cemented TKA with the preservation of the posterior cruciate ligament, in which 17.14% of the knees were found to have an index lower than normal.

Regarding patient satisfaction, our finding (91.66%) is similar to those in existing literature.[4,30]

The mean Knee Society Scoring System score found (145.06) was lower than that found by Carvalho Júnior et al.[13] in a study investigating TKA with and without the use of patellar component. In that study the mean score of the non-patellar component group was 158.08. Despite the difference in the values, both mean scores fall in the good result category.

In our study, there were no patellar complications, such as instabilities, extensor mechanism ruptures, fractures or luxations.

Conclusions

Total knee arthroplasty with preservation of the patellar component is a procedure that provides a high proportion of excellent and good results on medium-term follow-up.

Conflict of Interest

The authors have no conflicts of interest to declare.

REFERENCES

1. Canale ST. Arthroplasty of knee. In: Campbell's operative orthopaedics. Philadelphia: Mosby; 2003.
2. Leonhardt MC, D'Elia CO, Santos ALG, Lima ALLM, Pécora JR, Camanho GL. Revisão da artroplastia total de joelho em dois tempos: o valor da cultura obtida por biópsia artroscópica. Acta Ortop Bras. 2006;14(4):226-8.
3. Bourne RB, Rorabeck CH, Vaz M, Kramer J, Hardie R, Robertson D. Resurfacing versus not resurfacing the patella during total knee replacement. Clin Orthop Relat Res. 1995;(321):156-61.
4. Kubota MS, Navarro RD, Carneiro Filho M, Luzo MVM. Estudo da articulação patelofemoral na ATJ cimentada que preserva o ligamento cruzado posterior. Rev Bras Ortop. 2004;39(1/2):21-9.
5. Barbosa RE. Artroplastia total de joelho sem o uso do componente patelar: importância do grau de artrose femoropatelar pré-operatório no resultado em médio prazo. 2006. Available at: <http://hdl.handle.net/1884/7804. (Access date 9/1/2010).
6. Mayman D, Bourne RB, Rorabeck CH, Vaz M, Kramer J. Resurfacing versus not resurfacing the patella in total knee arthroplasty. 8- to 10-year results. J Arthroplasty. 2003;18(5):541-5.
7. Ayers DC, Dennis DA, Johnson NA, Pellegrini VD Jr. Common complications of total knee arthroplasty. J Bone Joint Surg Am. 1997;79:278-305.
8. Wasilewski AS, Frankl U. Fracture of polyethylene of patellar component in total knee arthroplasty diagnosed by arthroscopy. J Arthroplasty (Suppl). 1989;4(1):19-22.
9. Rae PJ, Noble J, Hodgkinson JP. Patellar resurfacing in total condylar knee arthroplasty. Technique and results. J Arthroplasty. 1990;5(3):259-65.
10. Abraham W, Buchanan RJ, Daubert H, Greer III BR, Keefer J. Should the patella be resurfaced in total knee arthroplasty? Efficacy of patellar re-surfacing. Clin Orthop Relat Res.1988;(236):128-34.
11. Turqueto L, Villardi A, Leite ER, Palma IM, Tejada JVH. Artroplastia total do joelho com e sem substituição da patela. Rev Bras Ortop. 1994;29(5):318-20.
12. Arnold MP, Friederich NF, Widmer H, Muller W. Patellaersatz bei knietotalendoprothesen – notwendig?. Orthopade. 1998;27:637-41.
13. Carvalho Júnior LH, Andrad MAP, Lemos W G, Américo LRD. Estudo comparativo sobre artroplastia total do joelho com e sem o componente patelar. Rev Bras Ortop. 2000;35(4):114-7.
14. Barrack RL. All patellae should be resurfaced during primary total knee arthroplasty. In opposition. J. Arthroplasty. 2003;18(3):35-8.
15. Marczyk LRS, Gomes JLE. Instabilidade femoropatelar: conceitos atuais. Available at: <http://www.rbo.org.br/pdf/2000_ago_or08.pdf>. (Access date 9/1/2010).
16. Blackburne J, Peel TE. A new method of measuring patellar height. J Bone Joint Surg Br. 1977;59(2):241-2.
17. Alves Junior WM, Migan EZ, Zabeu JLA. Dor no joelho após artroplastia total de joelho: uma abordagem sistematizada. Rev Bras Ortop. 2010;45(10):302-20.
18. Keblish PA. Comparison of patella retention and patella replacement in LCS mobile bearing total knee arthroplasty: a prospective comparison of 52 knees in 26 patients. In: 58th Annual Meeting American Academy of Orthopedics Surgeons, 1990.
19. Ranawat CS. The patellofemoral joint in total condylar knee arthroplasty. Pros and cons based on five- to ten-year follow-up observations. Clin Orthop Relat Res. 1986;(205):93-99.
20. Keblish PA, Varma AK, Greenwald AS. Patellar resurfacing or retention in total knee arthroplasty. A prospective study of patients with bilateral replacements. J. Bone Joint Surg Br. 1994;76(6):930-7.
21. Barrack RL, Wolfe MW, Waldman DA, Milicic, M, Bertot AJ, Myler L. Resurfacing of the patella in total knee arthroplasty. A prospective, randomized, double-blind study. J Bone Joint Surg Am. 1997;79(8):1121-31.
22. Kulkarni SK, Freeman MAR, Poal-Manresa JC, Asencio JI, Rodriguez JJ. The patellofemoral joint in total knee arthroplasty. Is the design of the trochlea the critical factor? J Arthroplasty. 2000;15(4):424-9.
23. Ogon M, Hartig F, Bach C, Nogler M, Steingruber I, Biedermann R. Patella resurfacing: no benefit for the long-term outcome of total knee arthroplasty. A 10- to 16.3-year follow-up. Arch Orthop Trauma Surg. 2002;122(4):229-34.

24. Waters TS, Bentley G. Patellar resurfacing in total knee arthroplasty: a prospective, randomized study. J Bone Joint Surg Am. 2003;85(2):212-17.
25. Soudry M, Mestriner LA, Binazzi R, Insal JN. Total knee arthroplasty without patellar resurfacing. Clin Orthop Relat Res. 1986;(205):166-70.
26. Boyd AD Jr, Ewald FC, Thomas WH, Poss R, Sledge CB. Long-term complications after total knee arthroplasty with or without resurfacing of the patella. J Bone Joint Surg Am. 1993;75(5):674-81.
27. Bourne RB, Burnett RSJ. The consequences of not resurfacing the patella. Clin Orthop Relat. 2004;(428):166-9.
28. Carvalho Júnior LH, Castro CAC, Gonçalves MBJ, Rodrigues LCM, Cunha FVP, Lopes FL. Amplitude de movimento após ATJ. Acta Ortop Bras. 2005;13(5):149-52.
29. Villardi A, Veiga, LT, Mandarino M, Schott M. Artroplastia total do joelho não cimentada, sem substituição da patela: avaliação clínico-funcional. Rev Bras Ortop.2005;40(9):507-24.
30. Dejour H, Levigne CH, Dejour D. Patela infera: a post operative complication treated by a new technic. Rev Shir Orthop Reparatrice Appar Mot.1995;81(4):286-95.