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Original article

Total knee arthroplasty with mobile tibial weight-bearing: clinical evaluation after a minimum of five years of postoperative follow-up☆

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ABSTRACT

Objective: To evaluate the medium and long term results from total knee arthroplasty with rotating tibial weight-bearing.
Methods: Between January 2000 and July 2007, 162 patients underwent total knee arthroplasty with mobile tibial weight-bearing. Among these, 96 were evaluated in a previous study with a mean follow-up of 4 years. In the present study, the same group was invited back for reassessment and the results were analyzed. Sixty-nine patients responded to this call (79 knees), and they were evaluated in accordance with the Knee Society Rating System (KSRS), after a mean follow-up of 8 years and 8 months (ranging from 5.5 and 13 years).
Results: A mean KSRS score of 74.41 points was obtained, with good or excellent results.
Conclusion: The medium and long-term results from total knee arthroplasty with mobile tibial weight-bearing were good, and a mean score of 74.41 points in the Knee Society Clinical Rating System was attained.

Artroplastia total do joelho com o apoio tibial móvel. Avaliação clínica após seguimento mínimo de cinco anos de pós-operatório

Palavras-chave:
Artroplastia de substituição
Joelho
Prótese do joelho
Osteoartrite do joelho

RESUMO

Objetivo: Avaliar os resultados, em médio e longo prazo, das artroplastias totais de joelho com apoio tibial rotatório.
Métodos: De janeiro de 2000 a julho de 2007, 162 pacientes foram submetidos à artroplastia total do joelho com apoio tibial móvel. Desses, 96 foram avaliados em um estudo prévio com tempo de seguimento médio de quatro anos. No atual trabalho, esse mesmo grupo foi

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convocado para reavaliação e os resultados foram analisados. Responderam à atual convocação 69 pacientes (79 joelhos), que foram avaliados conforme o Knee Society Rating System (KSRS), após seguimento médio de oito anos e oito meses (variação entre 5,5 e 13 anos).

Resultados: Foi obtida pontuação média de 74,41 pontos no KSRS, com 78,7% de resultados bons ou excelentes.

Conclusão: A artroplastia total do joelho com apoio tibial móvel obteve bons resultados em médio e longo prazo e atingiu a média de 74,41 pontos no Knee Society Clinical Rating System.

Introduction

The concept of knee arthroplasty with mobile tibial weight-bearing was introduced by Goodfellow and O'Connor in 1978.[1] This innovation was based on the need to adapt the components of the prosthesis to different angles during flexion and extension.[2] Its aim was to increase the physiological movement in the joint and thus diminish abrasion and wear on the polyethylene component, formation of particles, occurrences of osteolysis[3] and, especially, patients' complaints of pain. This greater durability has not been proven in medium and long-term clinical studies.[4–7] However, some authors have achieved better results from prostheses with mobile weight-bearing, in relation to stability and the action of going up stairs.[8,9]

Biomechanical studies have shown that prostheses with mobile tibial weight-bearing reduce the incongruence created by non-physiological rotation in implanting the femoral component. Several studies have shown good long-term results from using these implants. However, some authors have indicated that there is a need for studies with long-term follow-up and have proven that this technique has clinical and survival advantages, in comparison with implants with fixed tibial weight-bearing.[10–12]

The objective of this paper was to present the medium and long-term clinical results from using prostheses with mobile tibial weight-bearing in patients attended by the Knee Surgery Group of the Department of Orthopedics and Traumatology of Santa Casa de São Paulo.

Sample

Between January 2000 and July 2007, 162 patients underwent total knee arthroplasty in which polyethylene tibial components with rotary movement were used (Fig. 1). These patients were initially invited to return for medium-term assessment of the clinical results (mean follow-up of 4 years). On that occasion, 96 patients responded to the invitation, and a total of 117 knees were evaluated.[13] The present study consisted of reassessment of these same patients after a minimum postoperative period of 5 years.

Out of the 96 patients who were assessed in the previous study, 69 responded to the invitation of the present study. Ten of these had undergone bilateral arthroplasty, and therefore 79 knees were evaluated. There were 10 men and 59 women, with ages ranging from 53 to 87 years (mean of 75.7) and postoperative follow-up ranging from 5.5 to 13 years (mean of 8 years and 8 months). The deformities that formed the indications for surgery are described in Table 1. Out of the 27 patients who were lost from the follow-up, it was found that ten patients had died for reasons unrelated to the surgery, while the other losses (17) were due to our failure to locate the patient or to patients' non-attendance even after receiving the invitation.

Table 1 – Clinical data and etiology of the osteoarthrosis of the patients who underwent arthroplasty.

Primary deformity	Varus: 64.5% Valgus: 29.2% Without deformity: 5.1% Recurvatum: 1.2%
Side affected	Right: 51.9% Left: 48.1%
Etiology	Knees
Primary osteoarthrosis	71 (89.9%)
Rheumatoid arthritis	2 (2.5%)
Osteonecrosis	3 (3.8%)
Fracture	3 (3.8%)

Methods

This was an observational study on a cohort of patients from a previous investigation.[13] It was conducted in a public university hospital (Santa Casa de São Paulo). The study was approved by the institution's ethics committee.

Before the surgery, the patients were evaluated using semiological data, frontal-view panoramic radiographs with weight-bearing and also lateral and axial radiographs on the patellofemoral joint, and a diagnosis of osteoarthrosis was made. The patients underwent preoperative evaluations so that the procedure could be implemented with the lowest risk possible. The following were considered to be exclusion factors: diaphyseal deformities that made correction via arthroplasty impossible, major bone losses due to osteolysis, ligament laxity that required implants with stabilizing mechanisms (not present in the model that would be used) and osteoarticular infections. In cases of bilateral treatment, there was always an interval of 2–4 months between the operations on one knee and the other.

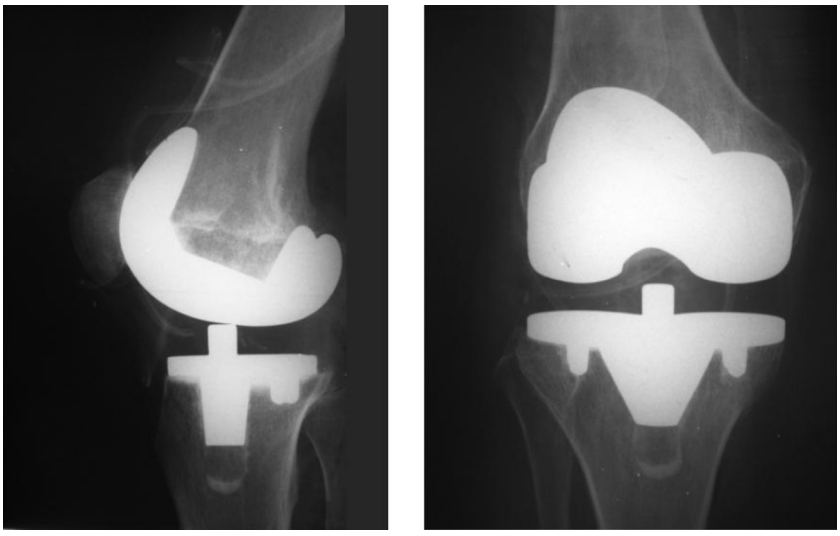

Fig. 1 – Radiographs in anteroposterior (AP) and lateral views on a knee that underwent total arthroplasty with mobile tibial weight-bearing.

Table 2 – Form for gathering objective data based on the Knee Society Rating System (KSRS).[14]

Pain	Points	Deductions (at least)	Points
Absent	50	Contracture in flexion	
Slight or occasional	45	5–10°	2
Only on stairs	40	10–15°	5
Walking and on stairs	30	16–20°	10
Severe	0	>20°	15
Movements		Incapacity to perform extension	
(Each 5° = 1 point)	25	<10°	5
Stability		10–20°	10
Anterior–posterior		>20°	15
<5 mm	10	Alignment	
5–10 mm	5	0–4°	0
>10 mm	0	5–10°	3 pt/1°
Medial–lateral		11–15°	3 pt/1°
<5°	15	Others	20
6–9°	10		
10–14°	5	Points deducted	
15° or more	0	Total final	

For this study, the patients were invited to come for a new clinical and functional assessment. The functional assessment was made in accordance with the objective criteria established by the Knee Society Clinical Rating System (KSRS),[14] as shown in Table 2.

As established in the assessment system (KSRS), the final scores ranged from 0 to 100. Results with scores greater than 84 were considered to be excellent; from 70 to 84, good; from 60 to 69, fair; and less than 60, poor. Patients who had to undergo revision of the arthroplasty were considered to be treatment failures and received the score of zero.

Statistical analysis

The data obtained were subjected to statistical evaluation. The chi-square test was applied for qualitative variables, or the Fisher exact test if necessary. To quantitative variables versus qualitative variables, the Mann–Whitney nonparametric test was used. The Statistical Package for the Social Sciences (SPSS) software version 13 was used, and the significance level was set at 5%. The analysis was conducted under guidance from statisticians from the publication support committee of the School of Medical Sciences, Santa Casa de São Paulo.

Table 3 – Surgical complications and respective scores according to the Knee Society Clinical Rating System (KSRS).

Surgical complications	Cases	Score (KSRS)
Femoral condylar fracture	1	0
Patellar fracture	3	83, 80, 68
Fibular neuropraxia	3	68, 93, 92
Reflex nerve dystrophy	1	45
Dehiscence of skin suture	1	75
Infection	5	0, 0, 0, 0, 0
Aseptic loosening	5	0, 0, 0, 0, 0

Results

Out of the 96 patients evaluated in the previous study,[13] 69 attended the invitation. Surgery had been performed bilaterally in ten of these patients. Thus, 79 knees were evaluated, with a mean follow-up period of 8 years and 8 months.

The arthroplasties that required revision received scores of zero. Among the patients who did not undergo revision, the minimum score found was 40 points and the maximum was 99. The mean score was 74.41 points.

With regard to surgical complications (Table 3), one case of fracturing of the femoral condyle was seen during cementation, and this was fixed using Steinmann wires, which required subsequent revision because of aseptic loosening. There were three cases of patellar fractures: one during the surgery and two after the operation. The fracture that occurred during the surgery was marginal and did not require fixation.

Among the others, one was comminutive (patellectomy was performed) and the other was a transverse fracture that was treated conservatively and evolved without consolidation and pain. Subsequently, this latter case was treated with partial patellectomy. Three patients presented neuropraxia of the fibular nerve. Two of them presented spontaneous recovery and the third underwent neurolysis 2 months later and evolved with total recovery. There was also one case of dehiscence of a skin suture. Surgical cleaning and suturing were performed, and the case evolved without infection and with a good clinical result. Five cases of infection occurred, all of them before reaching 5 years after the operation. One case occurred after a repair that was performed on the extensor mechanism because of a fall to the ground that evolved with infection and loosening of the prosthesis. In this case, the patient underwent removal of the prosthesis and then arthrodesis after the infection had been resolved. In the other four cases, revision of the arthroplasty was performed in two procedures, with use of a spacer. There were five cases of aseptic loosening of the prosthesis, and revision of the arthroplasty was performed in these cases.

The KSRS results were distributed as excellent (KSRS greater than 84), in 55.7% of the cases (44 knees); good (between 70 and 84), in 22.8% (18 knees); fair (between 60 and 69), in 7.6% (six knees); and poor (less than 60), in 13.9% (11 knees).

The relationship between the presence of complications and whether unilateral or bilateral arthroplasty had been performed, and no statistically significant association was found ($p = 0.058$; Fisher exact test).

The relationships between the patient's sex and occurrences of complications and between sex and results were also evaluated. Neither of these showed any statistical difference ($p = 1$, Fisher exact test; and $p = 0.610$, Mann–Whitney test, respectively).

The relationship between the etiology of the arthrosis and the presence of complications was evaluated. Greater incidence of complications was found in cases of secondary arthrosis, and this was statistically significant ($p = 0.044$; Fisher exact test). In evaluating the relationship between the results and whether the etiology was primary or secondary, better results were observed in the group of patients with primary osteoarthrosis, although without statistical significance ($p = 0.210$; Mann–Whitney test).

Discussion

Prostheses with mobile tibial weight-bearing emerged through the study by Goodfellow and O'Connor in 1979. They defended the concept that the mobile tibial component, acting solidly with the femoral condyle, would represent a congruent prosthesis without restrictions at any moment during flexion and extension.[1] Subsequent studies showed that this implant had high durability and enabled movements similar to those of normal knees, with regard to kinematics, and its indications expanded to include younger patients.[1,15,16] Some studies have indicated that the survival of the implant is greater than 20 years in 97.7% of the cases.[17,15] Nonetheless, other authors have not seen advantages of one model over the other, since they found similar results regarding patient satisfaction and implant durability. Studies comparing bilateral arthroplasties, in which one knee received a prosthesis with fixed weight-bearing and the other received a prosthesis with rotary weight-bearing have been conducted, and no significant differences were found.[12,18,19]

Regarding our sample, out of the original 162 patients, 96 responded to the invitation at the time of the first data-gathering made by our group (mean follow-up of 5 years). Sixty-nine of these responded to the present invitation. This loss was greater than those in the literature consulted[12,20] and was due to a variety of factors, such as changes in address and telephone number, death or socioeconomic factors. It can be supposed that patients with good results from the procedure might have neglected to return because they considered this to be unimportant. We also noted that the loss from the follow-up was variable among the other studies consulted. Argenson et al. found a loss of 7% from their minimum follow-up of 10 years among their patients.[20] On the other hand, in a study with a similar length of follow-up, Meftah et al.[11] presented a loss of 23% among their patients.

In our group's first assessment, the mean final KSRS score was 78.22 points. In comparing this with the present results (mean final score of 74.41), we consider that this decrease was to be expected. It would have been caused by the expected wear on the implant and the aging of the patient sample. However, we did not find any data in the literature comparing the same group of patients over medium and long-term follow-ups.

In relation to complications, paralysis of the fibular nerve occurred in three cases that had all presented preoperative valgus deformity, and all of them presented total resolution. The data in the literature show that neuropraxia of the fibular nerve is more common in knees with valgus deviation, given that at the time of correction of the axis, through sectioning capsule, tendon and ligament structures, tension may be generated in the nerve and consequently, neuropraxia.[21,22]

Initially, the patellar component was fixed to the bone only using a wide circular orifice. All of the three cases of patellar fracture occurred with implants of this type. After changing the implant such that there would be three small orifices, there were no further postoperative cases of patellar fracture.

Prostheses with tibial weight-bearing have been implanted either with preservation or with replacement of the posterior cruciate ligament, with similar results. In our cases, the posterior cruciate ligament was replaced with the aim of avoiding asymmetrical tension and the possibility of rotary dislocation of the mobile platform (spin-out), which never occurred in our cases. There were five cases of aseptic loosening (6.3%). In none of our cases was there any postoperative misalignment of the axis that might have accelerated the loosening process. These five cases underwent revision operations and evolved satisfactorily.

In relation to the number of infections, the incidence in our sample was greater (6.1%) than what was seen in the worldwide literature (1.8–2.3%).[11,20] We can suppose that this was due to social factors, such as postoperative care, along with the fact that all of our patients underwent surgery in a public teaching institute, in which greater numbers of professionals undergoing training are present in the operating theater. Ong

et al.[23] identified that surgery performed in public services and lengthy duration of procedures (>210 min) were risk factors for prosthetic infections (in hip arthroplasty procedures).

In a case series with follow-up of greater than 10 years, Meftah et al.[11] found that 96% of their results were good and excellent, with a mean functional KSRS score of 89.1 points. Argenson et al.[20] showed similar results, with a mean functional KSRS score of 88. We conclude that our sample showed a lower mean score because we included cases that underwent revision, which lowered the mean score because we gave these cases the minimum score. In analyzing our results with exclusion of these cases with scores of zero, we obtained a mean score of 85 points and considerably diminished the difference encountered. Another result that should be noted is that 78.5% of the patients obtained KSRS scores >70, i.e. good or excellent.

The limitations of this study consist of the lack of control group for comparing the results and the difficulty in comparing patients for reevaluation after a long postoperative period. There is a need for new studies that compare function, symptoms and satisfaction among patients undergoing total knee arthroplasty with mobile and fixed weight-bearing, with follow-ups of more than 10 years.

Conclusion

The total knee prostheses with mobile tibial weight-bearing subjected to analysis using the Knee Society Clinical Rating System achieved good results with a mean of 74.41 points.

Conflicts of interest

The authors declare no conflicts of interest.

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