ORIGINAL PAPER

Secondary patellar resurfacing in painful total knee arthroplasty

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Purpose. To analyze the results of the secondary patellar resurfacing (SPR) procedures carried out in our department for the treatment of patients with painful total knee arthroplasty (TKA).

Materials and methods. We retrospectively reviewed 20 patients who had undergone SPR due to persistent anterior knee pain following TKA. The mean time interval to secondary resurfacing was 24.8 months (8.5-67) and the mean follow-up was 13.5 months (2-44). Patients were evaluated radiologically and clinically through an analysis of variations in ROM and pain relief.

Results. Pain relief was reported for 60% of patients, 30% permanently and 30% temporaly with a pain-free time interval of 8.2 months (1.5-18). The radiological parameters for patellofemoral congruency improved in all patients and there was a shortening of the mean length of the patellar tendon. The mean patellar thickness increased after the secondary procedure. There were complications in 10% of patients.

Conclusions. The reproducibility of the technique with new implants, the low rate of complications and the percentage of satisfactory results make this technique suitable for selected cases. The diverse origin of painful TKA and the complexities of diagnosis should make the surgeon weigh the situation carefully before embarking on an SPR.

Key words: *patellar resurfacing, total knee arthroplasty, patellar tendon.*

Artroplastia patelar secundaria en el tratamiento de la prótesis total de rodilla dolorosa

Objetivo. Analizar los resultados de las artroplastias patelares secundarias (APS) realizadas en nuestro centro sobre pacientes con artroplastia total de rodilla (ATR) dolorosa.

Material y método. Se estudiaron retrospectivamente 20 pacientes sobre los que se había realizado una APS por presentar una ATR con dolor de origen patelar. El intervalo medio de tiempo desde la ATR fue de 24,8 meses (8,5-67) y el seguimiento posoperatorio medio de los casos fue de 13,5 meses (2-44). Se realizó un análisis radiológico y una evaluación clínica mediante las variaciones del rango articular y el alivio del dolor.

Resultados. El 60% de los pacientes tuvo un alivio del dolor, el 30% de forma permanente y el 30% de forma temporal con un tiempo medio libre de dolor de 8,2 meses (1,5-18). Los parámetros radiológicos de alineación rotuliana mejoraron en todos los casos y se observó un acortamiento del tendón rotuliano. El grosor patelar medio posoperatorio fue mayor que el preoperatorio. Se observaron complicaciones en el 10% de los pacientes.

Conclusiones. La reproducibilidad de la técnica con los nuevos implantes, la baja tasa de complicaciones y las aceptables cifras de resultados satisfactorios la convierten en una técnica valorable para determinados casos. El carácter multifactorial de la ATR dolorosa con rótula nativa y la complejidad diagnóstica que esto implica debe plantear cautela a la hora de indicar una APS de forma rutinaria.

Palabras clave: *artroplastia patelar, artroplastia total de rodilla, tendón patelar.*

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INTRODUCTION

There is no consensus in the literature about using patellar resurfacing during total knee replacement (TKR). Although the first long-standing TKR series of the 1960's did not consider patellar resurfacing, it was soon observed that 20-40% of patients experienced pain further to TKR[1]. The

first models that were developed gave rise to a whole constellation of complications related to patellar resurfacing such as patellofemoral instability, fractures, prosthetic loosening and extensor mechanism failure[1]. The improvements achieved by new implants significantly decreased the incidence of complications[2] and caused this technique to be considered as standard practice. It is always challenging for the surgeon to address a painful TKR, with seemingly normal femoral and tibial components, where the patella was not resurfaced in the initial surgery. There are few studies in the literature that analyze the outcome of secondary patellar arthroplasty and none of them reflects altogether favorable results[3-6]. The goal of the present paper is to analyze the results of secondary patellar arthroplasty procedures performed in our center in patients with a TKR that experience patellar pain.

MATERIALS AND METHODS

Between February 1999 and May 2005 1,610 TKR procedures were performed in our center. In 1,450 (90%) of these, the surgeon did not perform a patellar arthroplasty in the same surgical stage and in 20 a secondary patellar arthroplasty was carried out.

The main symptom on the basis of which secondary arthroplasty was indicated was patellar pain in patients with TKR applied on a natural patella.

We retrospectively evaluated the clinical records of all 20 patients subjected to a secondary patellar arthroplasty; 16 were women and 4 were men, with a mean age of 70.1 years (range: 59-81) at the moment of TKR and of 72.2 years (range: 60-84) at the time of the secondary patellar arthroplasty. Mean time elapsed between the 2 procedures was 24.8 months (range: 8.5-67). Mean follow-up further to patellar component placement was 13.5 months (range: 2-44).

Primary procedures were carried out by different surgeons of the same department using the following prosthetic models: Profix (Smith & Nephew Inc., Memphis, Tennessee, USA) in 16 cases, Insall-Burstein II (Zimmer, Warsaw, Indiana, USA) in 2 cases and Genesis (Smith & Nephew Inc., Memphis, Tennessee, USA) in another 2 cases. The secondary prostheses were implanted in accordance with the guidelines and instruments provided by their manufacturers. In all cases, and for both procedures, an anterior longitudinal approach was used with a medial parapatellar arthrotomy. Ten patients required some additional surgical maneuver, in 6 a lateral patellar retinaculum release was carried out, 2 needed a resection of the distal pole of the patella, 1 a proximal realignment of the extensor mechanism and in one it was necessary to fixate a low-energy patellar stress fracture discovered intraoperatively.

Patients were clinically assessed on the basis of whether pain relief had been achieved and considering the time during which patients obtaining only temporary pain relief remained pain free. We also compared preoperative/postoperative changes in range of motion.

Radiological evaluation was made on the basis of lateral knee views and axial patellar views with the knee joint at 30° flexion performed both pre- and postoperatively (figs. 1 y 2). Lateral radiographs were within normal values, discounting a certain degree of inaccuracy associated with patient positioning. Axial x-rays afforded an optimal view of the patellofemoral joint.

A series of measurements were taken from the x-rays views mentioned that were used to calculate the following indices: the Insall-Salvati[7] ratio was used as a measure of the relative position of the patella; the lateral patellofemoral angle, the patellofemoral congruence angle and the degree of patellar subluxation were used to quantify the degree of patellofemoral congruence[8]; patellar thickness, before and after resurfacing, was measured on the basis on the lateral view by calculating the distance between the anterior patellar cortex and the anterior border of the femoral component.

RESULTS

Of the 20 patients studied, 12 (60%) reported patellar pain relief: 6 (30%) continuously until the last follow-up appointment and 6 (30%) temporarily with a mean pain-free interval of 8.2 months (range: 1.5-18).

Only 3 (15%) of the patients showed a decrease in their postoperative range of motion of a mean 11.6° (range: 10-15). Eight cases (40%) preserved their pre-op range of motion and 9 (45%) increased their range of motion by a mean 15.5° (range: 5-25). All ROM decreases occurred at the expense of flexion. Of the ROM increases, two-thirds occurred at the expense of flexion and one-third at the expense of flexion and extension.

Only 2 patients (10%) experienced complications: there was one pseudoarthrosis resulting from failed treatment of a longitudinal patellar fracture found during secondary surgery and one subacute TKR infection that required a two-stage revision surgery.

Radiographic findings are shown in table 1. A shortening of the patellar tendon from 48 mm (32-57) to 46.2 cm (38-58) was observed postoperatively in these patients. The Insall-Salvati ratio increased from 0.94 (0.73-1.19) preoperatively to 0.97 (0.64-1.37) postoperatively. Before surgery, 2 patients had patella alta but none had patella baja. After surgery, 2 cases presented with patella alta and one with patella baja.

The lateral patellofemoral angle measurements indicated lateral opening in 19 of the 20 cases, both pre- and postoperatively, with the mean angle value increasing from 18.4° (8-24) to 26.1° (0-44), which reflected an improvement in patellar orientation. In one single case did the said angle open medially, which was attributed to subluxation

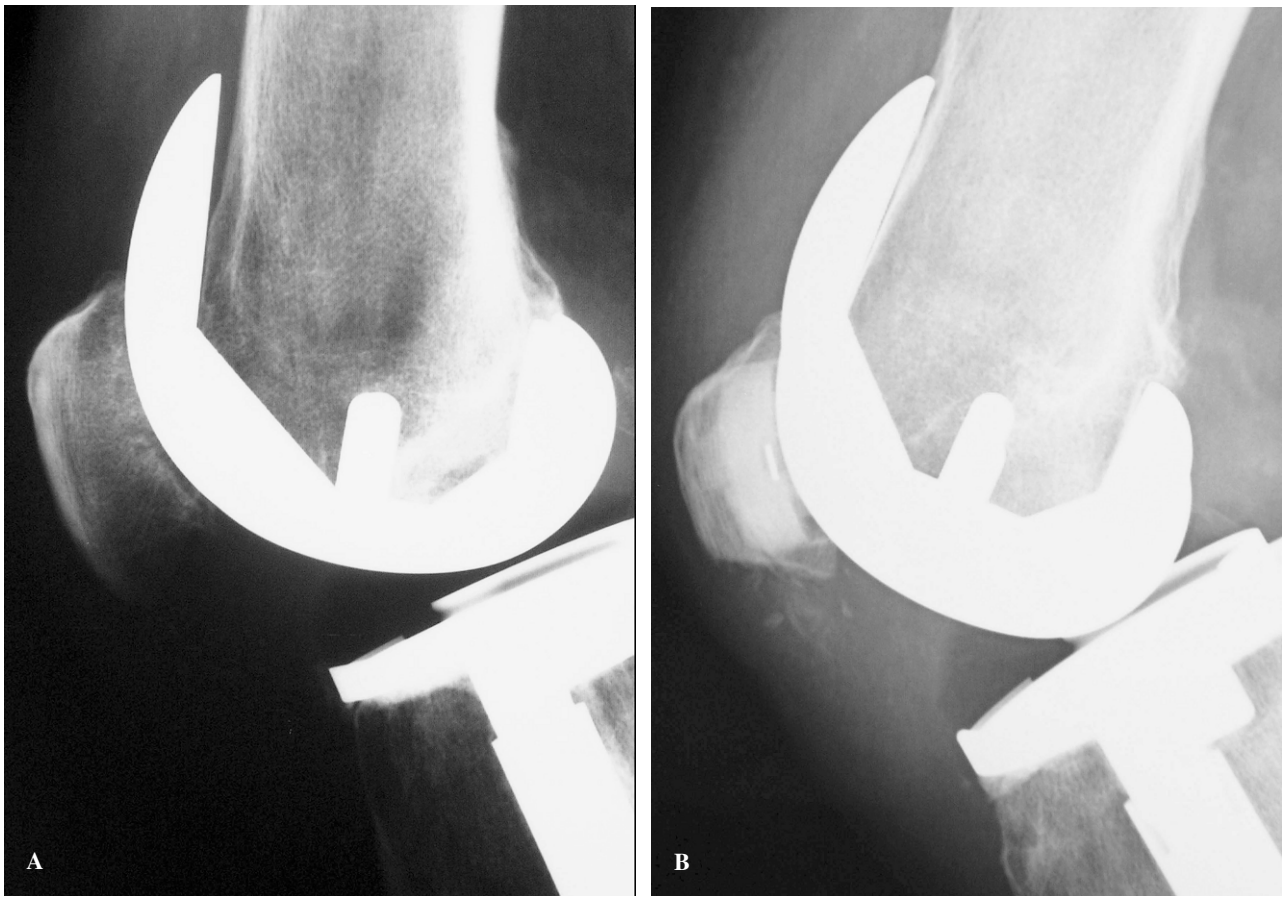

Figure 1. *Lateral view of a total knee arthroplasty before (A) and after (B) secondary patellar arthroplasty.*

and incompetence of the vastus medialis. Surgery only managed to correct this parameter from 15° to 8°.

The patellofemoral congruence angle was a mean 16.7° (0-77). Sixteen cases (80%) had lateral orientation, 2 (10%) medial orientation and the remaining 2 did not show patellar malalignment. Postoperatively, this angle was 7.3° (0-28), with 10 (50%) cases of lateral orientation, 6 (30%) of medial orientation and 4 (20%) cases with no malalignment.

Patellar subluxation decreased from 1.6 mm (0-7) to 0.4 mm (0-3) after surgery. Nine cases (45%) did not present with subluxation prior to secondary patellar arthroplasty

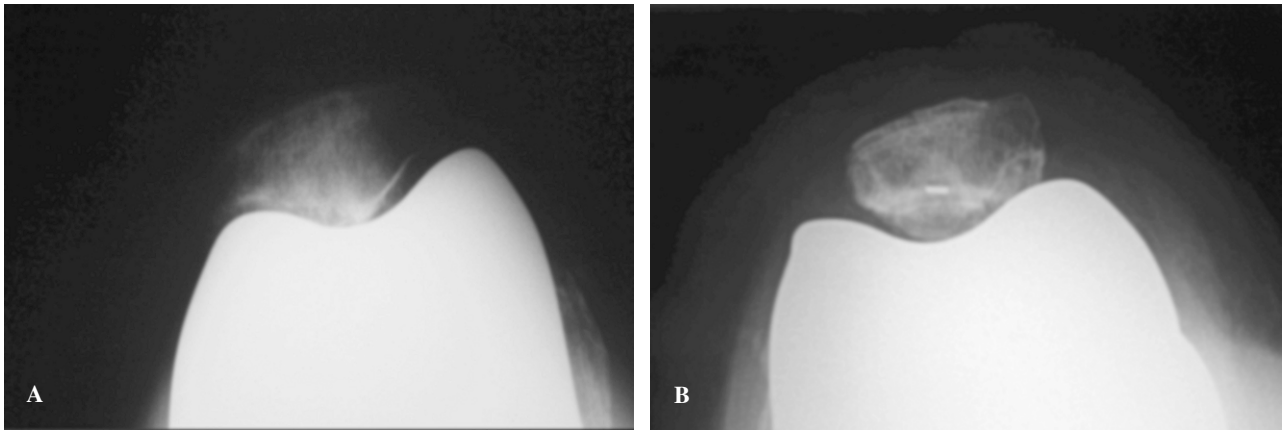

Figure 2. *Axial view of a patella in a total knee replacement, before (A) and after (B) secondary patellar arthroplasty.*

Table 1. Measurement of radiographic findings (mean values)

	Pre-op	Post-op
Length of patellar tendon	48 mm (32-57)	46.2 mm (38-58)
Insall-Salvati ratio	0,94 (0,73-1,19)	0.97 (0,64-1,37)
Lateral patellofemoral angle	18,4° (8-24)	26.1° (0-44)
Patellofemoral congruence angle	16,7° (0-77)	7.3° (0-28)
Patellar subluxation	1.6 mm (0-7)	0.4 mm (0-3)
Patellar thickness	15.6 mm (9-20)	16.8 mm (12-24)

and 16 (80%) did not present with subluxation after secondary patellar arthroplasty.

Patellar thickness increased further to secondary patellar arthroplasty from 15.6 mm (9-20) to 16.8 mm (12-24) on average.

DISCUSSION

Nowadays, the literature still does not provide categorical evidence on the advisability to perform patellar resurfacing during TKR. Multiple studies have attempted to determine the advantages or disadvantages thereof. When a surgeon performs a TKR, he is faced with 3 possible alternatives substantiated by the literature[9]: first, systematic patellar surface replacement[1,10]; secondly, retaining the native patellar surface[2]; and thirdly, selectively resurfacing the patella as a function of the patient's and/or the implant's characteristics[11].

In spite of this diversity of opinions, 2 of the meta-analyses published most recently argue that failure to resurface the patella during primary surgery increases the likelihood that the patient to experience anterior, the chances that revision surgery will be needed and the degree of patient dissatisfaction[12,13].

Comparisons between the results of primary patellar arthroplasty with those of secondary patellar arthroplasty further to a painful TKR have suggested that a primary procedure yields globally better results[3]. The causes of anterior knee pain further to TKR without resurfacing may at times be difficult to identify since on some occasions they may be multifactorial, compromising the overall success of the procedure. A possible source of pain may be contact between the damaged patellar cartilage and the femoral component during flexion-extension. Another possibility is for the pain to be caused by an increase in intraosseous pressure, especially during flexion, which can compromise subchondral circulation and cause pain[14].

These hypotheses would seem to argue that secondary patellar arthroplasty may resolve anterior pain. Nevertheless, studies that report on the results of secondary patellar arthroplasty, with series between 13 and 24 patients, provide satisfactory clinical figures in only 31% to 65% of cases[3-6], which is comparable to the results of the present study (table 2).

Our study show san improvement in all parameters related to patellar alignment analyzed postoperatively, suggesting an improvement in the stability and dynamics of the patella[5]. On the other hand, postoperative patellar thickness is increased, which shows that we are still incapable of treating this possibly etiological factor.

Although a group of patients does show clinical improvement, either permanently or temporarily, another significant group (40% of total) does not show better results after secondary patellar arthroplasty, which seems to point to the existence of other constraining factors. Among them, we could cite the alterations in the alignment and rotation of the components, which in some cases can be detected initially but in others lead to subclinical alterations that may complicate diagnosis[15].

When diagnosing a TKR patient with anterior pain it is recommended to carry out a dynamic mechanical analysis by performing plain films or a computerized axial tomography. In addition, other tests could be administered such as gammagraphy, which provides information about the biological status of the patella and the extensor mechanism[16] (fig. 3). This aids in further circumscribing the causes of anterior pain.

In the series on secondary patellar arthroplasty, the incidence of complications tends to be low, at similar revels as those reported in our paper, i.e. 10%; there are even 3 papers that report no complication further to this secondary procedure[3-5]. In the series reviewed there are no reports of joint stiffness or arthrofibrosis further to secondary patellar

Table 2. Comparison between the different series in the literature

Author	Nr. of patients	Age*	Time**	Rate of improvement	Rate of complications
Muoneke et al	20	64.8	30.9	44,4%	30%
Mockford et al	13	67.8	28	31%	0%
Khatod et al	24	68	112	52%	0%
Karnezis et al	14	76	47	65%	0%
Ortiz Espada et al	20	72.2	24.8	60%	10%

*Mean years of age at the time of secondary patellar arthroplasty. **Months elapsed between primary knee arthroplasty and secondary patellar arthroplasty.

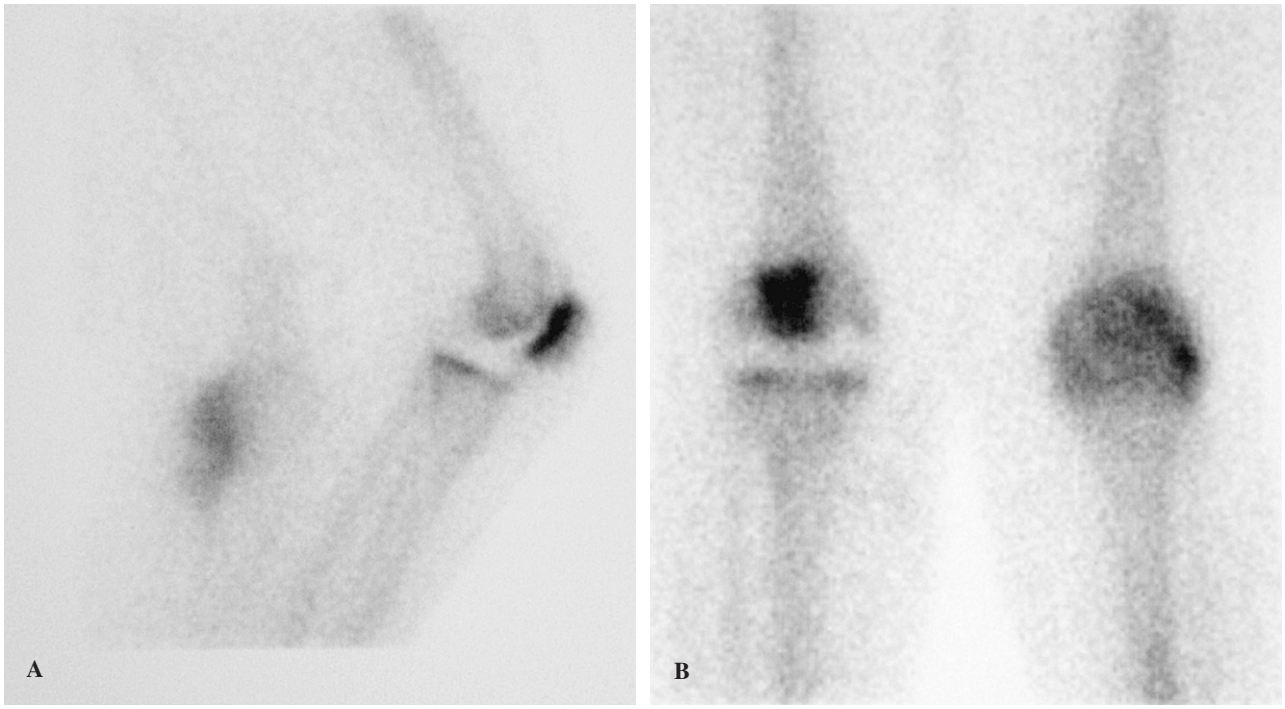

Figure 3. *Bone scintingraphy in a patient with patellar pain after TKA: (A) Lateral view. (B) AP view.*

arthroplasty. In our study, in spite of having found instances of postoperative shortening in the mean length of the patellar tendon, there was one single case of patella baja, which did not cause a decrease in range of motion or pain. Far from constituting a negative factor in the range of motion of a TKR, secondary patellar resurfacing causes in our series an increase in range of motion, in line with other reports in the literature[4].

When considering a secondary patellar arthroplasty for the treatment of painful TKR, the factors that have proved to exert a greater influence on the final outcome are patient selection and minimizing the length of time elapsed between primary TKR and the secondary procedure[3].

To conclude, the reproducibility of the technique afforded by new implant designs, the low rate of complications and the acceptable level of satisfactory results obtained make secondary patellar arthroplasty a useful technique for certain cases. The multifactorial nature of painful TKR without resurfacing and the diagnostic complexity involved in identifying its etiology seem to caution us against indicating a secondary patellar arthroplasty routinely.

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Conflict of interests

The authors have declared that they have no conflict of interests.