Fracture of a Polyethylene Tibial Post in Posterior Stabilized Total Knee Replacement. Two Case Reports

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ABSTRACT
Tibial post fracture after posterior stabilized total knee replacement (TKR) is a uncommon and disabling complication. We report two cases of non-traumatic tibial post fracture, which presented with sudden pain and recurvatum instability in joint replacements with good previous function. For the first case, the presentation time was 12 years from the primary TKR, and for the second it was 14 months. Both presented the same model of a posterior stabilized prosthesis. In both cases, a revision TKR was performed with a rotating hinge prosthesis (Endo-Model NR®, Waldemar Link), without recurrence of the deformity.
Key words: Tibial post fracture; recurvatum; total knee replacement; posterior stabilized total knee replacement.
Level of Evidence: IV

Fractura del poste tibial en la artroplastia total de rodilla estabilizada a posterior. Presentación de dos casos

RESUMEN
La fractura del poste tibial luego de un reemplazo total de rodilla es una complicación poco frecuente e incapacitante. Presentamos a dos pacientes con fractura del poste tibial no traumática, que acudieron con dolor más inestabilidad en recurvatum, de forma repentina, después de reemplazos articulares con buen funcionamiento previo. El primer paciente se presentó a los 12 años del reemplazo total de rodilla primario y el segundo, a los 14 meses. Ambos tenían el mismo modelo de prótesis estabilizada a posterior. Los dos pacientes fueron sometidos a una revisión con prótesis abisagrada rotatoria (Endo-Model NR®, Waldemar Link, EE.UU.), sin recidiva de la deformidad.
Palabras clave: Rotura; poste tibial; recurvatum; reemplazo total de rodilla; prótesis estabilizada a posterior.
Nivel de Evidencia: IV

INTRODUCTION

Several etyologies contribute to the failure of a total knee arthroplasty and instability is the cause of revision in 10-22% of cases.[1-3] Instability can be classified as follows: flexion, extension and genu recurvatum.[4] Genu recurvatum after a total knee arthroplasty is rare.[1,2,4,5]

We report the cases of two patients with tibial post fracture and recurvatum instability.

CLINICAL CASE 1

A 77-year-old male, with history of obesity, diabetes, chronic kidney disease, hypertension, heart failure, bilateral charcot foot and pacemaker for heart block underwent a left total knee arthroplasty in November 2006 for osteoarthritis in genu varum. A posterior stabilized prosthesis (Scorpio®, Stryker, NJ, USA) was used and he did well for almost 12 years (Figures 1 and 2).

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Figure 1. Frontal radiograph, 11 years after TKA. Correct alignment and placement of the prosthetic components, no signs of wear or loosening.

Figure 2. Profile radiograph, 11 years after surgery. Correct placement of the components, no recurvatum.

In October 2018, he presented with knee pain and recurvatum instability which made walking impossible. Physical examination revealed varus-valgus stability of the knee, with a passive range of motion of 0-100º and active range of motion of 10-100º, and evident quadriceps weakness.

Frontal radiographs showed an implant in the right position and alignment, without signs of wear. In profile images, a recurvatum of approximately 20° was confirmed (Figures 3 and 4).

Figure 3. Frontal radiograph of the TKA. Correct alignment, no signs of loosening.

Figure 4. Profile radiograph . Correct placement of the components, with recurvatum.

During surgery, a fracture of the central post of the polyethylene insert (liner) was detected (Figure 5). The primary prosthesis was removed and a rotating-hinge prosthesis (Endo-Model NR®, Waldemar Link GmbH & Co. KG, Hamburg, Germany) was inserted, with a satisfactory evolution to date (15 months post-operative) (Figures 6 and 7).

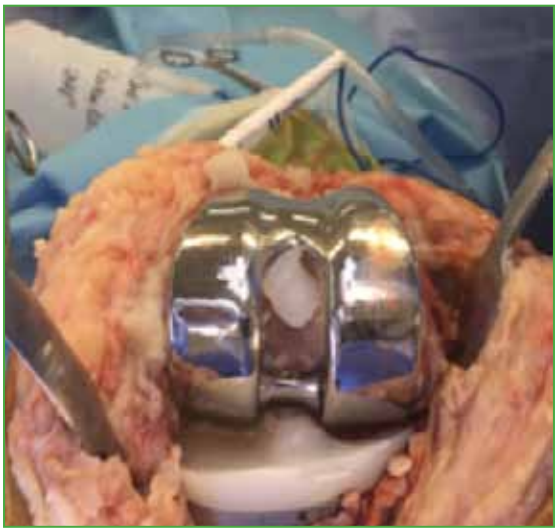

Figure 5. Intraoperative image. Fracture of the tibial post is observed.

Figure 6. Frontal radiograph . Follow-up of the revision with a rotating hinge prosthesis.

Figure 7. Profile radiograph of the revision. Adequate alignment.

CLINICAL CASE 2

A 64-year-old female, with a 30-year history of rheumatoid arthritis. In April 2014 she underwent a right total knee arthroplasty in another center. A Scorpio® prosthesis (Stryker®, NJ, NY, USA) was used.

The patient's knee had a good clinical function, she walked unaided and without limitations since the third month post-surgery. Follow-up radiographs showed a correct alignment, without prosthesis wear.

According to the obtained information, she had a passive range of motion of 0-100º and an active range of motion of 10-100º.

In March 2016 (approximately 2 years post-surgery) she presented to our center with recurvatum instability of the prosthesis which made walking impossible. The patient did not report trauma (Figures 8 and 9).

Figure 8. Frontal radiograph of the TKA. Correct alignment and placement of the prosthetic components, no signs of wear or loosening.

Figure 9. Profile radiograph . Correct placement of the components, with recurvatum.

In April 2016, revision surgery was carried out and an Endo-Model® rotating-hinge prosthesis was inserted**.** The patient has had a satisfactory evolution to date (34 months post-surgery) (Figures 10 and 11).

Figure 10. Frontal radiograph. Follow-up of the revision with a rotating hinge prosthesis.

Figure 11. Profile radiograph of the revision. Adequate alignment.

DISCUSSION

Both cases have shared characteristics; on the one hand, the polyethylene post fracture, with the same model of posterior-stabilized prosthesis, on the other hand, the recurvatum.

Within non-prosthetic genu recurvatum, we must make a distinction between patients with and without neuromuscular compromise. When there is compromise, muscular imbalances and ligamentous laxity (frequently, quadricepts weakness) coexist. For this reason, the patient hyperextends the knee in order to walk, progressively generating recurvatum.[2,5,6]

If there is not a neurological disorder, recurvatum can be associated to severe valgus as well as to the typical ligamentous laxity of rheumatoid arthritis.[5]

The first patient had quadriceps weakness and the second patient had a significant ligamentous laxity associated with rheumatoid arthritis. Both patients presented hyperextension gait.

In these cases, the polyethylene post fracture was generated by the anterior impact of the post with the femoral component, producing excessive wear on the base of its anterior aspect.[7,8]

In 2009, Lim et al. reported a similar case: a 72-year-old female with a history of cerebrovascular accident and muscle weakness underwent a knee arthroplasty with a Scorpio® prosthesis; 14 months after the procedure, the patient presented with recurvatum and a post fracture was revealed. The authors replaced the polyethylene insert for a thicker one. Three months after the replacement, during an arthroscopic surgery where a fragment of the patella was excised, they noted the anterior aspect of the post had already started to wear.[9]

In 2010, Lachiewicz published a literature review and found 27 cases of this complication in 18 papers, between 2000 and 2010. The patients presented with instability and pain. He does not mention recurvatum, which was the way our cases manifested.[10] While our patients had the same prosthetic model, in this group of 27 tibial post fractures there were eight different designs from five different manufacturers, which indicates this complication (tibial post fracture) can occur with different prosthetic models.[11]

Regarding the tibial component and its manufacturing, our patients had a highly cross-linked tibial component, but in the scant literature on the matter we could verify that this complication can occur in high-molecular-weight components as well.

In 2018, Diamond et al. reported five cases of tibial post fracture in posterior stabilized highly cross-linked polyethylene prostheses and advised not to use this type of polyethylene.[12]

In 2017, the Australian report informed differences in the survival rate of polyethylenes (high-molecular-weight vs. highly cross-linked) in cruciate-retaining prostheses which favored the latter, but they did not find significant differences in posterior stabilized models (4.6, IC95% 4.0-5.2 vs. 5.1, IC95% 4.7-5.6, respectively).[13]

Likewise, in a retrospective cohort study, Paxton et al. reported that revision rates at five years post-surgery for posterior stabilized knee prosthesis NexGen® (Zimmer® Inc., Warsaw, IN, USA), comparing highly cross-linked polyethylene and ultra-high-molecular-weight polyethylene, were 3.5% and 2.5% respectively, without significant differences, whereas there were no revisions due to fractures or failures of the tibial component.[14]

In the reported cases, the diagnosis was based on radiographic images and exhaustive physical evaluation. The use of nuclear magnetic resonance or arthroscopy as diagnostic tools in patients with extension instability without recurvatum has been reported.[9]

Revision surgery with replacement of the tibial component for a thicker component has been described as a treatment for this complication. Although it is a valid option, it is not supported by long-term follow-up.[9,10] When recurvatum is the clinical manifestation and the cause of failure, increasing polyethylene thickness can cause a relapse of the deformity, as reported by Erceg and Raki.[15]

CONCLUSIONS

Tibial post fracture is a rare complication that can occur in prostheses from different manufacturers, as it has been published. Upon the presentation of recurvatum instability and muscle weakness or ligamentous laxity, as described in the two reported cases, revision with a rotating-hinge prosthesis resulted in favorable outcomes.

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