

Posterior dislocation of a hinged knee prosthesis

Case report

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ABSTRACT

Knee hinged prostheses are associated with complication rates that can get as high as 44% at 15-year follow-up. Prosthetic dislocation secondary to rupture of the hinged mechanism is the most frequent long-term complication after mechanic loosening. We present a case of posterior prosthetic dislocation in a third-generation rotary hinged implant (Rotax, FII SA®, Saint Just Malmont, France), originally inserted in a sixty-nine-year old patient with rheumatoid osteoarthritis and long-term high-dose methylprednisone and methotrexate therapy. The treatment was given to the two knees in two times to correct a bilateral knee deformity highly evident. We believe that the dislocation must have been caused by the rupture of the polyethylene axle casing, since this is the most fragile link in the hinged mechanism. There are few bibliographic reports on this particular kind of complication. However, our conclusions agree with others' that the assembly between the tibial and the femoral components is the most fragile part of the system. We recommend in such complex scenarios carrying out prosthetic revision only in the case of evident disorders such as knee dislocation or persistent instability.

Key words: Knee hinged prosthesis; bilateral knee deformity; posterior prosthetic dislocation; implant rupture; hinged prosthesis failure; uncoupling; revision in knee hinged prosthesis

Level of evidence: IV

LUXACIÓN DE UNA PRÓTESIS ABISAGRADA DE RODILLA. REPORTE DE UN CASO

RESUMEN

Las prótesis abisagradas de rodilla tienen índices de complicaciones que pueden llegar al 44% en 15 años. La luxación protésica secundaria a una ruptura del mecanismo abisagrado resulta ser la complicación alejada más frecuente luego del aflojamiento mecánico.

Presentamos un caso de luxación protésica posterior, en un implante abisagrado rotatorio de tercera generación (Rotax, FII SA®, Saint Just Malmont, Francia), implantado originalmente en una paciente de 69 años, con artritis reumatoide y en terapia prolongada con metilprednisona y metotrexato a altas dosis. El tratamiento se realizó en ambas rodillas, en dos tiempos para corregir una deformidad en ráfaga altamente invalidante.

Nuestra hipótesis postula que la luxación se debió a la ruptura del buje de polietileno del implante, este es el eslabón más débil del mecanismo abisagrado. Existen escasos reportes bibliográficos sobre esta particular complicación. Sin embargo, encontramos homogeneidad en las conclusiones, que consideran el ensamble entre el componente tibial y femoral, como el punto más frágil del sistema.

Conflict of interests: The authors have reported none.

Recomendamos, en estos complejos escenarios, efectuar la revisión protésica solo ante la presencia de episodios clínicos evidenciables, como luxaciones o inestabilidad persistente.

Palabras clave: Prótesis abisagrada de rodilla; deformidad en ráfaga; luxación protésica posterior; ruptura del implante; falla de prótesis abisagrada; desacople; revisión de prótesis abisagrada de rodilla.

Nivel de Evidencia: IV

Case

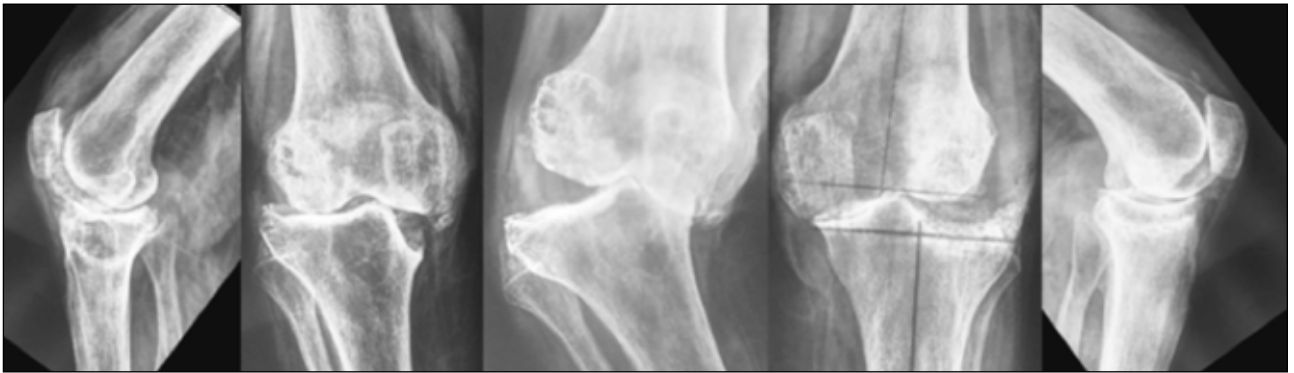
Sixty-nine-year old female with 13-year rheumatoid osteoarthritis-history treated with high-dose methylprednisone and methotrexate during 12 years that consults for 5-year history bilateral-knee pain which limits walking at home and requires two-crutch assistance. At physical examination, we detect bilateral knee deformity with varus misalignment in right knee and valgus misalignment in left knee, both with multi-directional ligament instability (Figure 1). In X-rays we verify right varus-knee osteoarthritis with extensive bone defect in medial tibial plateau, and left valgus-knee osteoarthritis also associated with extensive bone defect (Figure 2).

First we carried out right total knee replacement (TKR) in August 2011 and, 9 months later, left TKR. In both cases we used third-generation rotary hinged knee pro-

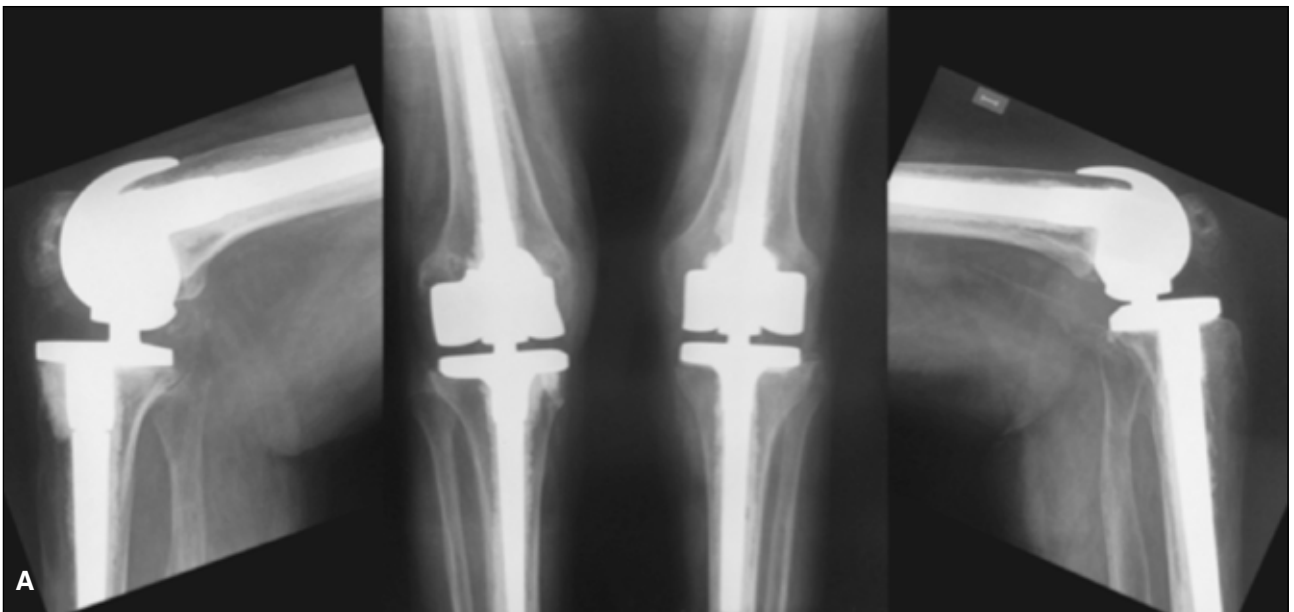
thesis (Rotax, FII SA®, Saint Just Malmont, France). Two and a half years after right TKR, the patient consults for acute pain and functional impairment in right knee secondary to mechanism of extreme knee flexion while going from sitting position on a low seat to a two-feet-standing position. At physical examination, we verify a painful knee, with active 5-100° active flexion-extension and instability in both coronal and sagittal planes. In X-rays we verify signs relatable to knee prosthetic dislocation with neither loosening signs, nor polyethylene wear evidence, nor components fatigue (Figure 4). We tried closed reduction under anesthesia, with no satisfactory results; therefore, we carried out TKR revision verifying rupture of the polyethylene axle casing in the femoral component of the hinge (Figure 5). Due to the patient's low demand, we went on with open reduction with no prosthetic change.



▲ **Figure 1.** Bilateral knee deformity with varus misalignment in right knee and valgus misalignment in left knee, both with multidirectional ligament instability.



▲ **Figure 2.** X-rays showing right varus-knee osteoarthritis with extensive bone defect in the medial tibial plateau and left valgus-knee osteoarthritis, also associated with extensive bone defect in lateral tibial plateau.



▲ **Figure 3.** A. Postoperative X-rays. B. Medical outcomes. C. Pictures of the implants we used: third-generation rotary hinged knee prosthesis (Rotax, FII SA®, Saint Just Malmont, France).

During the surgery we verified joint stability between 0° and 90° of flexion-extension and knee dislocation as of 100°-knee flexion. We prescribed long leg splint for three weeks, and then articulated splint with 0°-70° mobility. Three months afterwards, the patient suffers a new dislocation episode that we managed to reduce by closed methods. Consistently with these outcomes, we suggested a revision surgery for polyethylene-axle casing replacement. The patient refused the surgery because, in spite of bad these results, with knee immobilizer she was able to keep stable and painless walking.

Discussion

The dislocation of hinged knee prostheses is a complication widely described in the specialized literature.¹⁻⁵ Its incidence is 2 to 10%¹ and most of these cases are associated with implant fatigue.^{1-3,6,7}

According to diverse authors, complication rates in these types of prosthesis (third generation-hinged prostheses) can get as high as 44% at 15-year follow-up. Among their main complications we can mention mechanic loosening, infection, patellar instability and prosthetic dislocation.^{2,8,9}

The second long-term complication amongst the most frequent ones, after mechanic loosening, is the rupture of the hinged mechanism, which is associated with instability or dislocation episodes.¹⁰ Among the causes of failure of the hinged mechanism, there are the rupture of the polyethylene axle casing,^{4,11} the rupture of the metallic tibial post,³ the fracture of the tibial insert,¹ the rupture of the anti-dislocation mechanism⁵ and the distraction tibiofemoral uncoupling. Sheer dislocation is much less frequent.^{2,11}

Wang et al. reported the rupture of the polyethylene axle casing of the femoral component of the hinge five months after the implantation of an Endo-Modell.⁴ Pacha-Vicent et al. described the rupture of the anti-dislocation mechanism of the Endo-Modell, what caused instability in two patients.⁵ Bistolfi et al., in a series of 98 TKR with hinged prostheses of similar characteristics, verified five cases of instability and nine cases of rupture of the polyethylene hinged mechanism with secondary varus-valgus instability or dislocation.^{10,12} The same authors report acknowledging the polyethylene component of these hinges representing the most fragile part of the system and being the cause of revision in 9 of the 53 evaluated cases.

We agree with the bibliography we analyzed that the explanation for these ruptures is that the resistance of the polyethylene axle casing is much lower than that of its metallic counterpart. Therefore, revision is advised only when it causes evident knee disorders such as dislocation or persistent instability.¹⁰



▲ **Figure 4.** X-rays showing posterior knee prosthetic dislocation.



▲ **Figure 5.** Intrasurgical picture showing the rupture of the polyethylene axle casing of the femoral component of the hinge.

In some knee prostheses such as the Rotax knee prosthesis, which was the one we used in our patient, the assembly device between both components allows surgeons to carry out distraction during knee flexion and extension, which is limited by the soft tissues tension with no capture mechanism whatsoever.¹ In our case, at first the complication was interpreted as a dislocation due to distraction tibiofemoral uncoupling in a patient with rheumatoid osteoarthritis treated with corticoids with poor soft tissues status. However, upon carrying out surgical exploration, we verified the rupture of the polyethylene axle casing,

what favored distraction dislocation because it reduced the effective working surface between the metallic post and the polyethylene axle casing. Since she was a hardly demanding patient, we opted for carrying out only reduction, verifying stability up to 90°-knee flexion. At a new instability episode, we suggested to carry out revision with replacement of the broken polyethylene component. Satisfied as she was, in spite of the aforementioned complications the patient refused the surgery. Nowadays, 18 months later, she walks at home with walker and knee immobilizer.

Bibliography

1. Friesenbichler J, Schwarzkopf R, Sadoghi P, Marwin SE, Glehr M, Maurer-ertl W, et al. Failure rate of a rotating hinge knee design due to yoke fracture of the hinged tibial insert : a retrospective data analysis and review of the literature. *Int Orthop* 2012;36:993-998.
2. Manzano G, Schwarzkopf R. Posterior dislocation of the hinge-post extension in a rotating hinge total knee prosthesis. *Case Rep Orthop* 2013;2013:4-7.
3. Schwarzkopf R, Chaudhry S, Kummer FJ, Marwin SE. Failure of the tibial insert in a rotating hinge total knee arthroplasty. *J Arthroplasty* 2011;26(6):977.
4. Wang CJ, Wang H. Case report: early catastrophic failure of rotating hinge total knee prosthesis. *J Arthroplasty* 2000;15(3):387-391.
5. Pacha-Vicente D, Malik A, Castellet-Feliu E, Nardi-Villardaga J. Dislocation of rotating-hinge knee prostheses with antidislocation mechanism. *J Arthroplasty* 2008;23(2):299-303.
6. Kawai A, Healey JH, Boland PJ, Athanasian EA, Jeon DG. A rotating-hinge knee replacement for malignant tumors of the femur and tibia. *J Arthroplasty* 1999;14(2):187-196.
7. Chuang MY, Chang TK, Huang CH, Huang TY. Failure of the rotating-hinge knee megaprosthesis. *J Arthroplasty* 2013;28(3):543.
8. Rand JA, Chao EY, Stauffer RN. Kinematic rotating-hinge total knee arthroplasty. *J Bone Joint Surg Am* 1987;69:489-497.
9. Deehan DJ, Murray J, Birdsall PD, Holland JP, Pinder IM. The role of the rotating hinge prosthesis in the salvage arthroplasty setting. *J Arthroplasty* 2008;23(5):683-638.
10. Bistolfi A, Lustig S, Rosso F, Dalmaso M, Crova M, Massazza G. Results with 98 Endo-Modell rotating hinge prostheses for primary knee arthroplasty. *Orthopedics* 2013;36(6):746-752.
11. Mayle R, Della Valle C, Biswas D, Haughom B. Failure of rotating-hinge total knee prosthesis by disengagement of the hinge-post extension. *Clin Orthop Relat Res* 2013;471(4):1389-1392.
12. Bistolfi A, Rosso F, Crovia M, Massazza G. Endo-Modell rotating-hinge total knee for revision total knee arthroplasty. *Orthopedics* 2013;36(10):1299-1306.