Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/jcot

Case Report

Acquired permanent dislocation of the patella in a patient with rheumatoid genu valgum

Masataka Nishikawa MD, PhD^{a,*}, Hajime Owaki MD, PhD^{a,b},
Shoichi Kaneshiro MD, PhD^a, Takeshi Fuji MD, PhD^a, Kenrin Shi MD, PhD^c

^a Department of Orthopaedic Surgery, Japan Community Healthcare Organization Osaka Hospital, 4-2-78 Fukushima, Fukushima-ku, Osaka City, Osaka 553-0003, Japan

^b Department of Rheumatology, Japan Community Healthcare Organization Osaka Hospital, 4-2-78 Fukushima, Fukushima-ku, Osaka City, Osaka 553-0003, Japan

^c Department of Orthopaedics, Osaka University Graduate School of Medicine, 2-2 Yamadaoka, Suita City, Osaka 565-0871, Japan

ARTICLE INFO

Article history:

Received 14 November 2014

Accepted 7 January 2015

Available online 2 February 2015

Keywords:

Genu valgum

Permanent dislocation of the patella

Rheumatoid arthritis

Total knee arthroplasty

ABSTRACT

A case of acquired permanent dislocation of the patella associated with severe genu valgum in a patient with rheumatoid arthritis (RA) is herein reported. The pain and genu valgum progressed because of poor RA control. The patient had no history of major trauma of the knee before or after the onset of RA. The most reasonable hypothesis to explain this patient's pathology is that occult patellar dislocation developed after a minor trauma and progressed to permanent dislocation; poor RA control then worsened both the patellar dislocation and genu valgum. Total knee arthroplasty (TKA) with patella reduction was successfully performed with release of the lateral retinaculum and extension of the extensor mechanism by partial snipping of the rectus femoris tendon. Two years after the operation, the patient exhibited improvement in her Knee Society Knee and Function Scores from preoperative scores of 18 and 20 to postoperative scores of 94 and 80, respectively. Acquired permanent dislocation of the patella associated with severe genu valgum in patients with RA is rare. Excellent results were obtained with TKA, and the proximal realignment method was a useful procedure for patella reduction.

Copyright © 2015, Delhi Orthopaedic Association. All rights reserved.

1. Introduction

Permanent dislocation of the patella is a rare condition that is usually congenital in origin.¹ However, irreducible patellar dislocation may also be acquired. Acquired dislocations are

usually secondary to knee trauma with subsequent malunion or growth arrest. Permanent dislocation leads to progressive genu valgum and external tibial torsion.² Weak or absent active knee extension is characteristic in affected patients. Progression of the genu valgum contributes to gonarthrosis, which becomes painful and debilitating. When total knee

* Corresponding author. Tel.: +81 6 6441 5451; fax: +81 6 6445 8900.

E-mail address: ni4kawa-ma@umin.ac.jp (M. Nishikawa).

<http://dx.doi.org/10.1016/j.jcot.2015.01.094>

0976-5662/Copyright © 2015, Delhi Orthopaedic Association. All rights reserved.

arthroplasty (TKA) is performed, special attention must be given to restoring the extensor mechanism alignment, balancing soft tissues, and remedying bone deficiencies.

Rheumatoid arthritis (RA) is a chronic inflammatory disease associated with systemic immunologic abnormalities. RA mainly affects the synovial joints within the upper and lower extremities, and it may result in severe damage or destruction of the affected joints.³ Although genu valgum of the lower extremities is often seen in patients with RA, acquired permanent dislocation of the patella is very rare. We herein present a case of acquired permanent dislocation of the patella associated with severe genu valgum in a patient with RA that was successfully treated with TKA.

2. Case report

A 63-year-old woman developed an acquired permanent dislocation of the patella associated with severe genu valgum in her left knee. She had developed RA at the age of 25 years. She had no complaints regarding her left knee before the onset of RA. Previous treatments included gold sodium thiomalate, D-penicillamine, bucillamine, mizoribine, salazosulfapyridine, prednisolone, methotrexate and tacrolimus; her most recent treatment had comprised prednisolone at 2 mg/day, methotrexate at 4 mg/week, and tacrolimus at 1 mg/day for the last 2 years. Her preoperative RA status was classified as stage IV, class III.⁴ Laboratory test results showed a C-reactive protein (CRP) level of 0.67 mg/dL, matrix metalloproteinase-3 (MMP-3) level of 78.8 ng/mL, and rheumatoid factor positivity (42 IU/mL). Her preoperative Disease Activity Score in 28 joints based on CRP^{5,6} and Modified Health Assessment Questionnaire score⁷ were 2.81 and 1.625, respectively.

When the mild pain in her left knee began at the age of 56 years, the femorotibial angle (FTA) of her left lower extremity was 172°. The patella did not appear to be dislocated on the anteroposterior X-ray (Fig. 1) (Unfortunately, the skyline view of the left knee was not available). According to the patient, the genu valgum began to progress at the age of 59 years. Because no data on the tender and swollen joint counts were obtained from the medical record before the surgery, the disease activity at that time was estimated according to the CRP and MMP-3 levels. From the age of 56–59 years, the patient's RA activity was poorly controlled; the mean CRP and MMP-3 levels were 1.32 mg/dL (range, 0.10–8.10) and 200.20 ng/mL (range, 78.90–471.00), respectively. From the age of 60–63 years, her RA activity became better controlled; the mean CRP and MMP-3 levels were 0.36 mg/dL (range, 0.07–2.33) and 87.50 ng/mL (range, 69.50–139.00), respectively. The pain in her left knee was aggravated while weight-bearing at the age of 63 years, at which time the patella had already become permanently dislocated. However, the onset of the dislocation was not remembered by the patient, nor could it be estimated according to the clinical course. Physical examination revealed an extension lag of 30° due to the abnormally lateralized extensor mechanism associated with the dislocated patella. The passive range of motion (ROM) was 5°–130°, and the patella was laterally dislocated throughout the ROM. The patient could walk a maximum distance of 30 m. Her preoperative Knee Society Scores,⁸ namely her Knee Score

Fig. 1 – X-ray at the onset of the left knee pain. Narrowing of the bilateral joint spaces was recognized with slight genu valgum (femorotibial angle, 172.0°). The patella did not appear to be dislocated.

and Function Score, were 18 and 20, respectively. X-ray examination revealed severe genu valgum of the left lower limb with an FTA of 153.0° and hip-knee-ankle (HKA) angle of 19.7° valgus in the weight-bearing position (Fig. 2A). This severe genu valgum was uncorrectable by manual stress. Loss of the joint space at the lateral femorotibial and patellofemoral compartment was recognized (Fig. 2B,C), and the patella was laterally dislocated (Fig. 2D). Computed tomography (CT) showed that the patella was laterally dislocated on a secondarily formed articular surface with a large osteophyte outside the femoral trochlear groove (Fig. 3). The other large joints of the lower limbs (bilateral hips, right knee, and bilateral ankles) were mostly normal, and no systemic joint laxity was observed.

TKA was planned because of the severity of the pain and deformity. We routinely establish a preoperative plan for TKA operations using a conventional two-dimensional template with X-ray films. In this case, however, we established a preoperative plan using CT-based three-dimensional (3D) template system (ZedKnee; LEXI, Tokyo, Japan) to obtain adequate femoral and tibial rotational alignment for better patella tracking. First, release of the lateral retinaculum was performed to reduce the patellar dislocation and treat the genu valgum. The lateral femorotibial and patellofemoral compartments exhibited abundant scarring of the synovium and severe bone erosion. After the synovectomy, the secondarily formed articular surface with a large osteophyte outside the femoral trochlear groove was directly observed and removed. At this stage, although the laterally dislocated patella was repositioned in the original femoral trochlea groove in full extension, it was easily dislocated again in the lateral direction during flexion. Extension of the lateral extensor by partial snipping of the rectus femoris tendon on the lateral side was performed to lessen the tendency of the patella to laterally

Fig. 2 – Preoperative radiographs of the left knee. (A) Standard anteroposterior weight-bearing view (femorotibial angle; 153.0° and hip-knee-ankle angle; 19.7° valgus). (B) Anteroposterior view. (C) Lateral view. (D) Skyline view. The patella was laterally dislocated with severe deformity of the femoral trochlear groove.

dislocate with lateral tightness. The laterally dislocated patella was then repositioned in the original femoral trochlear groove through the full ROM. Next, the femur and tibia were cut via the medial midvastus approach according to the recommendations of the manufacturer. The femoral component was placed parallel to the surgical epicondylar axis, and the center of the tibial component was aligned in relation to the tibial tuberosity with regard to rotation and translation with reference to the 3D template. The patella was resurfaced with a cemented, medially positioned, all-polyethylene button. Because medial instability and lateral tightness were observed when checked with trial components, lateral release was performed with detachment and cutting of the iliotibial band (ITB) from Gerdy's tubercle and at the level of the superior aspect of the patella, respectively. Finally, the knee was replaced with a constrained condylar knee prosthesis (LCCK; Zimmer, Warsaw, IN, USA) to provide security against the remaining medial instability. Upon completion of the implantation, the patella was confirmed to track centrally within the trochlear groove of the femoral component through the full ROM. It was impossible to close the remaining large defect

of the lateral retinaculum; therefore, we patched it with the free ITB graft (Fig. 4).

Continuous passive motion and a standing gait exercise program were started on postoperative day (POD) 2 following the same rehabilitation protocol for standard TKA. On POD 21, the patient was able to walk without assistance, and the ROM of the operated knee was 5°–100°. She was discharged on POD 38, slightly later than the standard protocol (POD 21) because of delayed wound healing, which recovered fully with conservative therapy. At the 2-year postoperative follow-up evaluation, the operated knee was stable and pain-free. Good patella tracking was confirmed, and the ROM was 5°–110° without an extension lag. Walking was unlimited without assistance, and the Knee Score and Function Score were 94 and 80, respectively. The patient stated that her left knee was excellent and that she was fully satisfied with the operation. Her lower limb alignment was also excellent with an FTA of 172.0° and an HKA angle of 2.5° valgus on the anteroposterior weight-bearing X-ray. All component positions were excellent according to the Knee Society Radiographic Evaluation Form⁹ (α , 98°; β , 90°; γ , 2°; δ , 86°). No

Fig. 3 – Preoperative computed tomography of the left knee. The patella was laterally dislocated on a secondarily formed articular surface with a large osteophyte outside the femoral trochlear groove.

Fig. 4 – Closure of the articular surgical incision. After the medial midvastus incision had been closed (white arrows), a large defect remained in the released lateral retinaculum. The defect was patched with the iliotibial band (black arrows).

evidence of loosening or patellar dislocation was present (Fig. 5).

3. Discussion

Although genu valgum of the lower extremities is often seen in patients with RA, acquired permanent dislocation of the patella after onset of RA is quite rare. Although acquired dislocations are usually secondary to trauma, this patient had no history of major trauma to the left knee either before or after the onset of RA. When the pain in her left knee began at the age of 56 years, the left lower extremity exhibited slight genu valgum (FTA, 172.0°). Additionally, the patella did not appear to be dislocated. Unfortunately, because consecutive preoperative X-rays of the left knee were not available, the exact onset of the acquired permanent dislocation of the patella was unknown. The dislocation was first recognized when the pain in her left knee became aggravated at the age of 63 years. TKA was successfully performed to manage the pain and deformity in her left knee.

Patellofemoral instability presents in many ways, and its etiology is often multifactorial. The etiologic factors can be classified as external (trauma) or internal.¹⁰ The internal factors can be further subdivided into skeletal abnormalities (genu valgum, femoral or tibial torsional abnormalities, patellar dysplasia, and trochlear dysplasia) and soft tissue abnormalities (deficient medial structures, increased quadriceps angle, tight lateral structures, generalized ligament laxity, and patella alta).¹¹ In our case, the patient had no history of major knee trauma. Moreover, although we often see mild to moderate genu valgum in patients with RA, we rarely see patellar dislocation. It is difficult to conceive that only genu valgum with inflammatory soft tissue damage was responsible for the acquired permanent dislocation of the patella in this case. Instead, a combination of internal and external factors is considered to have contributed to the etiology of the patellar dislocation. First, a minor trauma (external factor) with a pre-existing background of slight genu valgum (FTA, 172.0°) (internal factor #1) caused occult patellar dislocation. RA control was poor for 3 years after the patient began to feel mild pain in her left knee at the age of 56 years. The dislocation was then enhanced by joint laxity with inflammatory damage to the surrounding soft tissue (internal factor #2). Finally, the poor RA control induced progression to a permanent patellar dislocation and worsening of the genu valgum. The patellar dislocation and genu valgum likely influenced each other, each worsening in the process.

There are only a few reports on the use of TKA to treat knee arthrosis with permanent patellar dislocation. Marmor¹² reported a case of bilateral TKA for the treatment of congenital dislocation of the patella. Correction of the dislocated patella and extensor mechanism was not attempted in either knee. He recommended avoidance of reconstruction of the extensor mechanism in adult patients with congenital dislocation of the patella if knee function is preserved. However, only a short-term follow-up was described, and the effects of the neglected patellar stability on the components are unknown.

Whiteside¹³ reported the performance of TKA with a distal realignment method including tibial tubercle transfer for the

Fig. 5 – Postoperative radiographs after total knee arthroplasty using a constrained condylar knee prosthesis 2 years after surgery. (A) Standard anteroposterior weight-bearing view. (B) Anteroposterior view. (C) Lateral view. (D) Skyline view. No evidence of loosening or patellar dislocation was present.

treatment of 15 knees with a high complication rate (6 of 15 knees). Moreover, one of the six knees required implant removal, debridement, and revision arthroplasty because of late-onset infection. Tibial tubercle transfer is also associated with the potential risk of nonunion, which may result in reoperation and delayed rehabilitation.

In several reports, a chronically dislocated patella was successfully repositioned and stabilized during TKA by modified lateral release and medial vastus medialis oblique imbrication.^{2,14,15} We have also chosen the proximal realignment method to reposition the dislocated patella and restore the extensor mechanism because active extension of the knee is extremely important in such activities as walking, standing up from sitting in a chair, and climbing stairs.^{16,17} However, the immobilization period after the performance of distal realignment may result in weakness of the extensor mechanism. Our proximal realignment method involves the combination of excessive lateral release and extension of the lateral extensor

by partial snipping of the rectus femoris tendon on the lateral side. The extension of the lateral extensor lessens the tendency of the patella to laterally dislocate with lateral tightness throughout patellar tracking. This method is not technically difficult, and the postoperative management can be identical to that of standard TKA. Moreover, proximal realignment has no risk of nonunion, which is sometimes encountered with use of the distal realignment method, and allows for early postoperative rehabilitation, including ROM exercises. Our patient achieved good knee function as early as the third postoperative week, and this function was retained at the 2-year postoperative follow-up. X-ray evaluation of the lower limb alignment and patellofemoral joint showed excellent results.

In conclusion, we have reported a rare case of acquired permanent dislocation of the patella associated with severe genu valgum in a patient with RA. TKA provided excellent results. The proximal realignment method was a useful procedure to reposition the patella and correct the genu valgum.

Conflicts of interest

All authors have none to declare.

REFERENCES

- Green JP, Waugh W. Congenital dislocation of the patella. *J Bone Jt Surg Br.* 1968;50:285–289.
- Bullek DD, Scuderi GR, Insall JN. Management of the chronic irreducible patella dislocation in total knee arthroplasty. *J Arthroplasty.* 1996;11:339–345.
- Mochizuki T, Saito S. Total knee arthroplasty for massive joint destruction in a patient with rheumatoid arthritis complicated with fibrous dysplasia. *Mod Rheumatol.* 2009;19:204–208.
- Steinblocker O, Traeger CH, Batterman RC. Therapeutic criteria in rheumatoid arthritis. *J Am Med Assoc.* 1949;140:659–662.
- Prevoo ML, van't Hof MA, Kuper HH, van Leeuwen MA, van de Putte LB, van Riel PL. Modified disease activity scores that include twenty-eight-joint counts. Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. *Arthritis Rheum.* 1995;38:44–48.
- Inoue E, Yamanaka H, Hara M, Tomatsu T, Kamatani N. Comparison of disease activity score (DAS) 28- erythrocyte sedimentation rate and DAS28-C-reactive protein threshold values. *Ann Rheum Dis.* 2007;66:407–409.
- Pincus T, Summey JA, Soraci Jr SA, Wallston KA, Hummon NP. Assessment of patient satisfaction in activities of daily living using a modified Stanford Health Assessment Questionnaire. *Arthritis Rheum.* 1983;26:1346–1353.
- Insall JN, Dorr LD, Scott RD, Scott WN. Rationale of the knee society clinical rating system. *Clin Orthop.* 1989;248:13–14.
- Ewald FC, on behalf of the Knee Society. The knee society total knee arthroplasty roentgenographic evaluation and scoring system. *Clin Orthop.* 1989;248:9–12.
- Runow A. The dislocating patella: etiology and prognosis in relation to generalized joint laxity and anatomy of the patella articulation. *Acta Orthop Scand Suppl.* 1983;201:1–53.
- Palmer SH, Servant CT, Maguire J, Machan S, Parish EN, Cross MJ. Surgical reconstruction of severe patellofemoral maltracking. *Clin Orthop.* 2004;419:144–148.
- Marmor LM. Total knee arthroplasty in a patient with congenital dislocation of the patella. *Clin Orthop.* 1988;226:129–133.
- Whiteside LA. Distal realignment of the patella tendon to correct abnormal patella tracking. *Clin Orthop.* 1997;344:284–289.
- Bergquist PE, Baumann PA, Finn HA. Total knee arthroplasty in adult with congenital dislocation of the patella. *J Arthroplasty.* 2001;16:384–388.
- Dao Q, Chen DB, Scott RD. Proximal patellar quadricepsplasty realignment during total knee arthroplasty for irreducible congenital dislocation of the patella. *J Bone Jt Surg Am.* 2010;92:2457–2461.
- Gur H, Cakin N. Muscle mass, isokinetic torque, and functional capacity in women with osteoarthritis of the knee. *Arch Phys Med Rehabil.* 2003;84:1534–1541.
- Hurley MV, Rees J, Newham DJ. Quadriceps function, proprioceptive acuity and functional performance in healthy young, middle-aged and elderly subjects. *Age Ageing.* 1998;27:55–62.