

Clinical Case

Treating Patellar Instability After Total Knee Arthroplasty with Medial Retinaculum Reconstruction: A Clinical Case and Narrative Review

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Abstract

Background: Patellar instability after a total knee arthroplasty is a disabling complication that often needs surgical revision, prolonging hospital in-stay and rehabilitation. Different surgical techniques exist in literature and no one seem superior to the other in terms of outcome.

Clinical Case: 67 years-old patient who underwent kinematic-aligned TKA experienced patellar dislocation during the rehabilitation program. After three months of conservative treatment, patellar instability was still present and thus revision surgery was suggested. Patellar resurfacing, lateral patellar retinacular release and MPFL reconstruction with a cadaveric gracilis tendon was performed.

Discussion: Once malalignment of the prosthesis is excluded, soft-tissues imbalance should be considered as the main risk factor for patellar instability. A chance should be given to conservative treatment, but usually a revision surgery is required. The decision to use a cadaveric graft was made to shorten the rehabilitation, also considering the functional requirements of our patient.

Conclusion: After the revision surgery, no new episodes of patellar dislocation occurred to our patient. The choice of the graft and the surgical technique seem safe and minimally invasive, guaranteeing a faster and shorten recovery, which is especially important in older patients.

Keywords: Patellar Instability; MPFL Reconstruction; TKA Complications

Introduction

Patellar complications after a Total Knee Arthroplasty (TKA) are a common cause of implant poor outcome, accounting for 10% of all TKA complications such as patellar fractures, dislocations, persistent anterior knee pain and patellar bone deficiency [1,2]. Among this patellofemoral

instability is a disabling complication that requires revision surgery with an incidence ranging from 0.5% to 0.8% after a TKA [3]. Despite the small literature available on this topic, some key points are accepted by the scientific community:

1. If a substantial limb malalignment is found, prosthesis exchange must be considerate as the preferred treatment
2. If the instability is due to soft-tissue imbalances revision surgery can greatly improve the symptomatology, even though no technique seems to be superior to another and each case must be studied to choose the best management. The medial parapatellar approach, which is the most used worldwide, strongly compromises the medial structures of the knee and the extensor mechanism [4]. In fact, even if trochlear and patellar topography play a key role in patellar stability, from full extension to approximately 30° of knee flexion soft-tissue restraints are the main characters and the Medial Patella-Femoral Ligament (MPFL) is considered the most important soft-tissue structure in preventing lateral displacement of the patella; muscular laxity, especially of the vastus lateralis obliquus and the vastus medialis obliquus, can also play a role in patellar dislocation [4-7].

Clinical Case

Our patient is a 67 years-old female who underwent a left total knee arthroplasty in May 2022 due to a severe gonarthrosis. A medial parapatellar approach was used and kinematic alignment with a Medacta GMK Sphere prosthesis was chosen (Fig. 1); patella resurfacing was not performed [8]. Post-operative course was regular and a fast-track protocol was applied; 5 days post-operatively the patient was discharged from the Orthopedic department and admitted to the Rehabilitation department. During the rehabilitation program, the patient experienced lateral patellar dislocation; the patient referred that the first event occurred while she was going out of bed with the knee at the first degrees of flexion. After radiographic exams were done (Fig. 2), the patella was manually reduced and we noted that subluxation was reproducible during active flexion; a kneepad with patellar support was prescribed to the patient.

After three months the patient was reevaluated by our team; patellar instability was still present despite conservative treatment. Surgical approach was then proposed to the patient and instrumental examinations were done to exclude TKA malalignment; in August 2022, once verified the correct position of the prosthesis, a revision surgery was performed. Lateral patellar retinacular release was done, together with patellar resurfacing lastly, reconstruction of the medial patellofemoral ligament was executed. Cadaveric gracilis tendon graft was used; it was fixed to the medial patellar border through suture anchors and then, with the help of a C-arm machine, the adductor tubercle was identified. A tunnel of about 7 mm was created and the neoligament tensioned at about 30° of knee flexion and then fixed using a biotenodesis screw (Fig. 3). A splint in extension was then applied. Post-operative course was regular and 5 days post-operatively the patient was discharged with the following indications:

1. Walk using crutches and avoiding weight-bearing on the left leg for three weeks
2. Use a hinged knee brace blocked in extension for the first 2 weeks after surgery, then with a range of motion 0-30° for the 3rd week and then increase flexion of 10° every week. The patient was followed by a physiotherapist during the rehabilitation period. Six months after the revision surgery, no new episodes of patellar dislocation occurred to the patient. She is overall satisfied with her prosthesis, with a full range of motion of the left knee without discomfort or pain

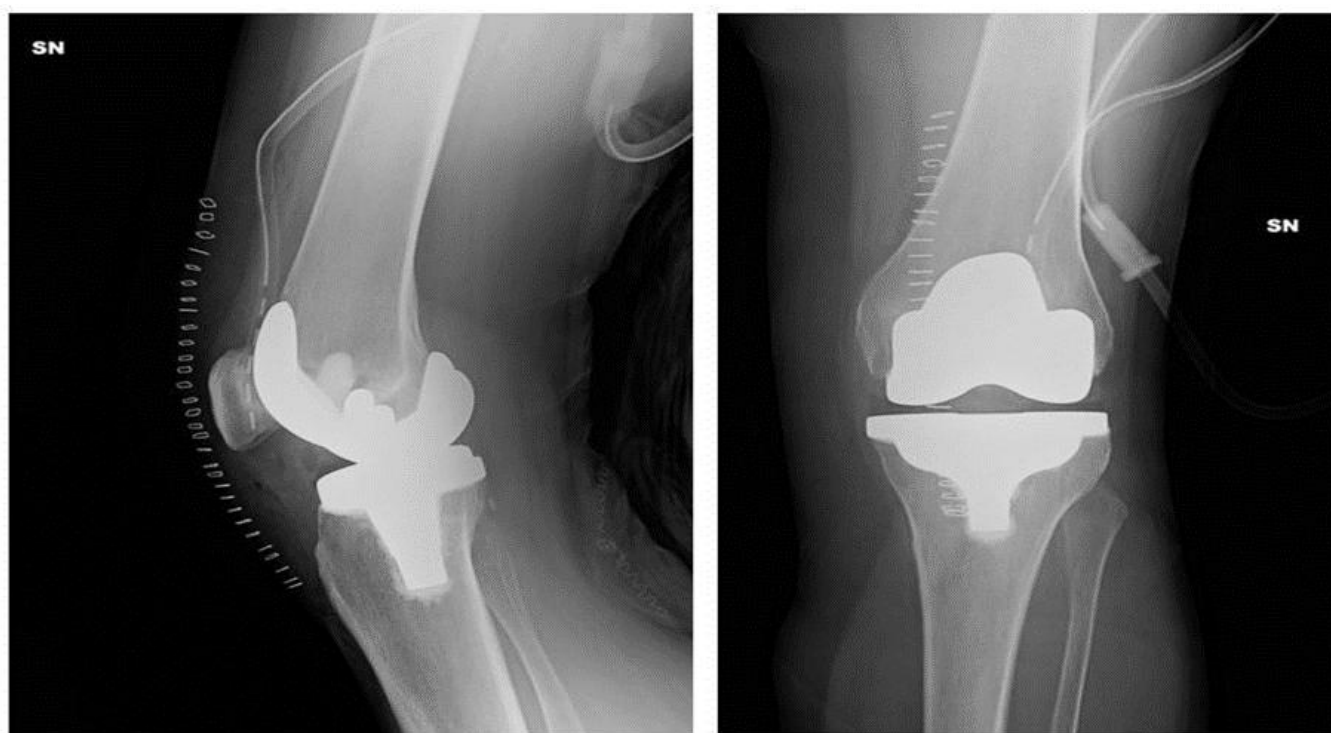


Figure 1: Post-operative radiographs in L-L and A-P projections.

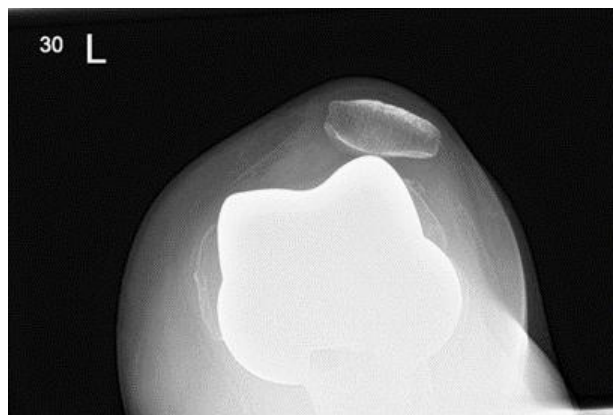


Figure 2: Radiograph showing lateral patellar dislocation.



Figure 3: Post-operative radiographs after revision surgery; the patella is now correctly approaching the trochlear groove.

Discussion

The first thing to rule out when a patient presents with patellar instability after a TKA is axial malalignment, followed by exclusion of malalignment of the femoral and tibial components. Axial alignment is easily calculated using a weight-bearing X-ray of the lower limbs; rotation of the prosthesis's components instead can be difficult, especially when kinematic alignment is used. Using the method described by Berger RA, et al., alignment of the components of our patients was calculated (Fig. 4,5). The rotation of the femoral component of our patient was 1.1° (normal range $0.3^\circ \pm 1.2^\circ$) and thus an excessive internal rotation of 0.8° was present. The rotation of the tibial component was 18.5° (normal range $18^\circ \pm 2.6^\circ$) and thus an excessive internal rotation of 0.5° was found. At this point, overall alignment of the prosthesis was calculated and for our patient, it was equal to -1.3° (of internal rotation). Despite the small internal rotation identified and considering some bias due to operator-dependent measurement, these findings were not enough to explain the patellar dislocation, which most often occurs when the overall alignment of the TKA is above -7° [9]. However, the normal range is calculated on TKA positioned using a mechanical alignment and thus the data of our patient could have no significance.

In a study discussing patellofemoral instability in kinematic aligned total knee prosthesis emerged that with this type of alignment, the internal-external rotation of the tibial and femoral components has no or little role in patellar instability; however, one major factor is flexion-extension of the femoral component: a flexion of $11^\circ \pm 6.2^\circ$ is instead associated with instability. In our patient flexion was equal to 4.4° (Fig. 6), supporting the correct alignment of the TKA [10].

Once excluded the malalignment of the prosthesis, an imbalance of the knee's soft tissues was the main suspect for the patellar dislocations. When dealing with post-operative soft tissues imbalances and specifically in the case of patellar instability, a chance should be given to conservative treatments, such as rest, quadriceps strengthening exercises and bracing, before surgery, even if rarely resolute [3]. After almost 3 months from the first episode of dislocation, our patients still had an important instability and thus revision surgery was indicated.

In literature, different surgical procedures exist to treat patellar dislocation after a total knee arthroplasty and no one seem to be superior to the others. It is important to underline that most of the studies available on this subject are case report with a small cohort of patients. However, release of the lateral compartment and reconstruction of the medial patellofemoral ligament play a major role. In our patient, patellar resurfacing was also performed to increase congruity of the patella and the femoral trochlea. When performing total knee arthroplasties, three scenarios can be chosen by the surgeon when dealing with the patella:

1. Always resurface the patella
2. Never resurface the patella
3. Selectively resurface the patella

Every treatment has his pros and cons and no treatment is superior to the other during the first surgery, we decided not to resurface the patella since osteoarthritis did not involve this compartment and the knee was stable after positioning of the tibial and femoral components [11].

Surgical approach may also play a role in patellar instability. Medial parapatellar approach is common to most knee surgeons and offers a great exposure of the structures; however, it violates the medial compartment (and thus the extensor mechanism). Some surgical approaches known as "quadriceps-sparing", such as the midvastus and they can partially resolve this problem but are technically harder and accuracy of implant positioning is often reduced [4]. Regarding the graft choice, some considerations must be done. Firstly, we decided to use a cadaveric allograft to reduce patient's post-operative morbidity and to allow a faster recovery and rehabilitation; non-irradiated allograft is safe and results are comparable to that of autograft, which however are more cost-effective [12]. Secondly, we estimated that a gracilis tendon could have been enough to counteract lateral displacement in this patient. It is usually preferred to use a semitendinosus tendon for MPFL reconstruction due to its tensile strength; however, both gracilis and semitendinosus have a higher tensile strength compared to the medial patellofemoral ligament (838N and 1216N respectively, compared to 208N of the MPFL). Also, the gracilis tendon shows a stiffness (defined as force change/length change) similar to the MPF [13]. It is also important to note that usually the reconstructed MPFL is fixed with a greater tension with respect to the native one to avoid future patellar dislocations; this procedure however can increase the patellofemoral joint pressure. For this reason, MPFL reconstruction is often performed in association with lateral retinacular release, as in the case of our patient [14].

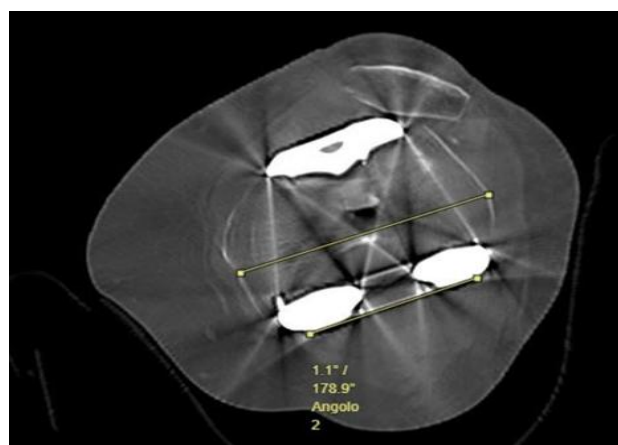


Figure 4: Rotation of the femoral component was calculated using two lines: (1) the line connecting lateral epicondylar prominence and medial sulcus of medial epicondylar sulcus (i.e. the surgical epicondylar axis) and (2) the line connecting medial and lateral prosthetic posterior condylar surfaces (i.e. the prosthetic posterior condylar line). The angle subtended by these two lines is called prosthetic posterior condylar angle.

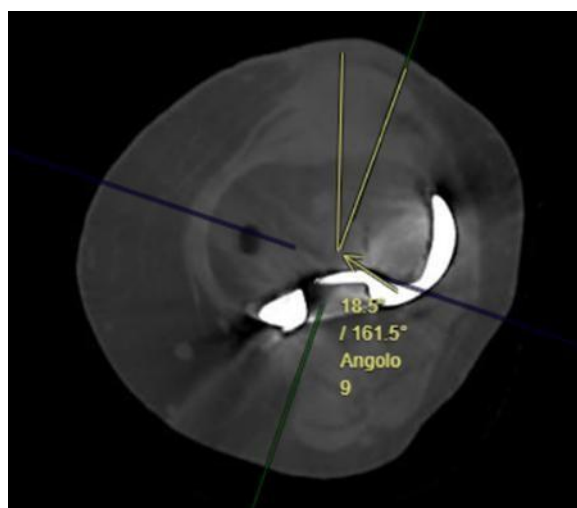


Figure 5: Rotation of the tibial component was calculated as follow: (1) the geometric center of the proximal tibial plateau was identified and transposed on the axial plane at the level of the tibial tubercle (not shown in the picture); (2) this latter point and the tip of the tibial tubercle are connected (i.e. orientation of the tubercle); (3) the tibial component anteroposterior axis is calculated. The angle subtended by the tibial component axis and the orientation of the tubercle gives the rotation of the tibial component.



Figure 6: Flexion of the femoral component.

Conclusion

After the revision surgery to correct patellar instability, no new events of patellar dislocation occurred to our patient. Despite different surgical techniques and approaches exists, our method seems to be safe and cost-effective to treat symptomatic patellar instability; also, this technique can shorten post-operative rehabilitation, which is quite important in older patients. Literature lacks studies with consistent cohorts and comparing different surgical techniques. Systematic reviews and meta-analyses could be useful to determine superiority of a surgical procedure over another and to draw-up guidelines on pre-operative exams, graft choice and surgical procedure and post-operative rehabilitation program.

Conflict of Interests

The authors have no conflict of interest to declare.

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