Article published online: 2024-12-26

Knee Arthoplasty in Chronic Patellar Dislocation: A Case Report

Artroplastia total de rodilla en luxación inveterada de patela: Reporte de un caso

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Rev Chil Ortop Traumatol 2024;65(3):e149–e155.

Abstract

Introduction Chronic patellar dislocation (CPD) associated with osteoarthritis is a rare and challenging problem, especially in patients with Down syndrome (DS). Chronic alteration of patellofemoral (PF) function due to severe malalignment leads to progressive joint destruction, potentially resulting in tricompartmental osteoarthritis. Various techniques have been described for its resolution, ranging from soft tissue procedures to total knee arthroplasty (TKA).

Case presentation A 29-year-old male with DS presented with a one-year history of atraumatic right knee pain, associated with episodes of joint effusion. Initially, he was diagnosed with septic arthritis. Physical examination showed hyperlaxity (Beighton score 8), limping gait, CPD, irreducible genu valgum, and tricompartmental osteoarthritis with 13.3° genu valgum on the right side. Treatment included TKA and extensor mechanism realignment through lateral retinaculum lengthening and advancement of the vastus medialis obliquus (VMO) using the Insall technique. At 8 months postoperatively, the patient was pain-free, had no new episodes of patellar dislocation, and was independent in basic activities of daily living.

Discussion This is a complex case of gonarthrosis, and patellar instability associated with genu valgum in a patient with DS and hyperlaxity. Along with CPD, we faced a 13.3° valgus deformity and tricompartmental osteoarthritis. A primary posterior-stabilized (PS) TKA was planned with the option for increased constraint intraoperatively, along with soft tissue realignment. The literature demonstrates that this step is essential to restore PF biomechanics and achieve good functionality.

Keywords

- chronic patellar dislocation
- total knee replacement
- lateral retinacular release
- down syndrome

Resumen

Introducción La luxación patelar inveterada (LPI) asociada a artrosis es un problema infrecuente y de difícil manejo, especialmente en pacientes con síndrome de Down (SD). La alteración crónica del funcionamiento patelofemoral (PF) debido a un severo mal alineamiento conduce a una progresiva destrucción articular que puede culminar

received
October 9, 2024
accepted after revision
November 29, 2024

DOI https://doi.org/10.1055/s-0044-1801270.
ISSN 0716-4548.

Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

en artrosis tricompartimental. Se han descrito distintas técnicas para su resolución, desde procedimientos en partes blandas hasta el uso de prótesis total de rodilla (PTR).

Presentación del caso Hombre de 29 años con SD consultó por un año de gonalgia derecha atraumática, asociado a episodios de derrame articular. Inicialmente, se diagnosticó como artritis séptica. El examen físico mostró hiperlaxitud (Beighton 8), marcha claudicante, LPI, genu valgo irreductible y artrosis tricompartimental con genu valgo de 13,3° a derecha. Se trató con una PTR y realineamiento del aparato extensor mediante alargamiento del retináculo lateral y avance del vasto medial oblicuo (VMO) con técnica de Insall. A los 8 meses postoperatorios, el paciente está sin dolor, sin nuevos episodios de luxación patelar y es independiente para las actividades básicas de la vida diaria.

Discusión Se trata de un caso complejo de gonartrosis e inestabilidad patelar asociado a genu valgo, en un paciente con SD e hiperlaxitud. Junto con la LPI, enfrentamos un valgo de 13,3° y artrosis tricompartimental. Se planificó una PTR primaria estabilizada posterior (PS) con posibilidad de mayor constricción intraoperatoria, junto con realineamiento de partes blandas. La literatura demuestra que este paso es esencial para restaurar la biomecánica PF y lograr buena funcionalidad.

Palabras Claves
- luxación patelar inveterada
- prótesis total de rodilla
- liberación retináculo lateral
- síndrome de down

Introduction

Chronic patellar dislocation (CPD) associated with knee osteoarthritis is a rare problem that is difficult to manage.[1] The most frequently reported etiologies are due to congenital cases and acquired cases, also called "progressive dislocations" that are associated with anatomical alterations that favor patellar instability such as genu valgus, patella alta, and trochlear dysplasia.[2] Its manifestation is claudication, pain, and decreased joint range.[2,3]

Chronic alteration of patellofemoral (PF) function due to severe malalignment leads to progressive joint destruction that can end in tricompartmental osteoarthritis.[4,5] Therefore, in these cases with advanced osteoarthritis it may be necessary to resort to joint replacement as a definitive solution for the treatment of pain and functional improvement of the patient. Achieving adequate functioning of a total knee prosthesis (TKR) in these conditions is a challenge for which it is necessary to modify and associate different procedures with the traditional technique that ensures optimal PF path.[1,6,7] Within these techniques, patellar alignment procedures for both soft and bone tissues have been described.[8] The objective of this report is to present the clinical case of a patient with Down syndrome (DS), genu valgus, LPI, and tricompartmental osteoarthritis of the knee which was resolved with a TKR plus lengthening of the lateral retinaculum and anterolateral advancement of the vastus medialis oblique (VMO) with the Insall technique.[9]

Case presentation

A 29-year-old man with Down syndrome and hypothyroidism under treatment, was institutionalized in a foster care home. He is independent in performing activities of daily living (ADLs). He presents a one-year history of right knee pain (gonalgia) associated with episodes of ipsilateral joint effusion and progressive functional impairment, which increasingly hinders walking and ADLs. No history of trauma was identified.

These episodes of pain and effusion were previously suspected to be septic arthritis on two occasions, leading to open surgical washouts; however, no bacterial growth was identified in either case.

Physical examination reveals cognitive impairment, as the patient responds only to simple commands. Additionally, he has hyperlaxity, scoring 8 points on the Beighton scale, a limping gait, and bilateral asymmetric genu valgum, more pronounced on the right.

In the right knee, findings include a hypertrophic longitudinal anterior scar, mild joint effusion, and a laterally dislocated and irreducible patella (►**Fig. 1b**). He presents a joint range (ROM) with limitation in extension of 10° and flexion up to 80°, in addition to crepitation and significant pain with passive and active mobilization. The valgus deformity is irreducible with a competent medial collateral ligament. The patient did not have gait instability.

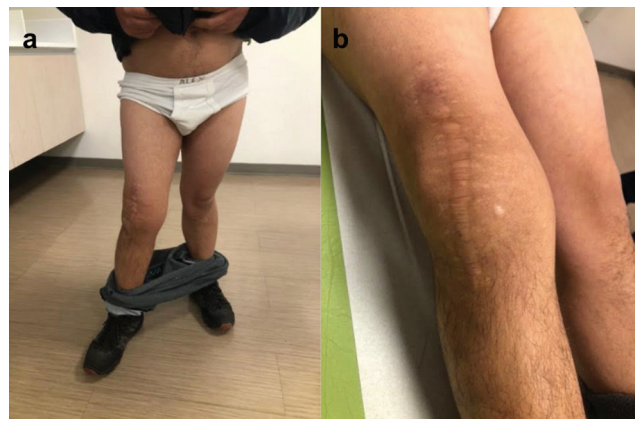

Fig. 1a and **1b**: Physical Examination (a) Genu valgum. (b) Right, patella dislocated laterally.

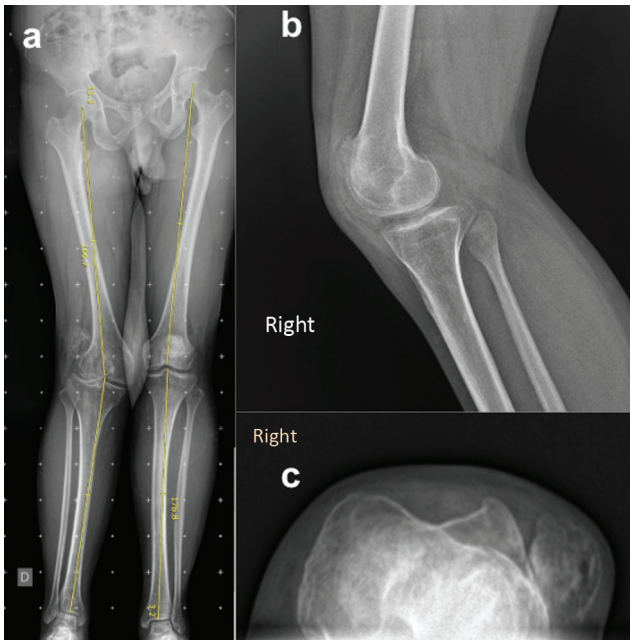

Fig. 2a, 2b, and **2c**: Preoperative X-rays (a) Long-leg teleradiograph. Preoperative X-rays of the Right Knee (b) Lateral view. (c) Axial View.

Figures

Teleradiography

A greater bilateral genu valgus is observed on the right with a loading axis of the right lower extremity 39.4 mm lateral to the medial tibial spine, a mechanical limb angle of 13.3°, a distal lateral femoral angle of 77° and proximal medial tibial 81° to right. Therefore, the angulation is attributed to a predominantly femoral deformity. (►**Fig. 2**)

Non-weight-bearing knee x-rays

Lateral dislocation of the patella with destruction of the PF compartment plus osteoarthritis of the lateral femorotibial compartment Kellgren Lawrence (KL) III and medial femorotibial compartment KL I.

Computed tomography (CT)

Lateral dislocation of the patella, small and osteoporotic, with severe patellar and trochlear osteoarthritis, trochlear dysplasia, and lateral and medial femorotibial osteoarthritis associated with chondrocalcinosis. The distance between the intercondylar notch (ICN) concerning the anterior tibial tuberosity (ATT) is 22 mm. (►**Fig. 3**)

Nuclear magnetic resonance (NMR)

Chronic lateral dislocation of the patella**, associated with disruption of the medial retinacular complex. The PF articular cartilage shows advanced diffuse degenerative lesions, along with isolated areas of grade 3-4 degenerative chondropathy in the lateral femorotibial compartment, and a complete vertical tear at the meniscocapsular junction of the lateral meniscus.

(►**Fig. 4a**, **4b** and **4c**): Magnetic Resonance (a) STIR coronal section (b) STIR sagittal section (c) STIR axial section

Surgical technique

Surgical approach

The patient is in a supine position. An extensive medial parapatellar approach was performed due to a previous anterior scar. Samples of scant bloody joint fluid (10cc) are taken. An immediate alpha defensin test and prolonged cultures were performed, both negative. No samples were taken for intraoperative cell counting. An extensive release of both leaks (medial and lateral) is performed to identify VMO and lateral retinaculum. It is observed how the extensor apparatus is moved laterally.

Lengthening of the extensor retinaculum (Hayden's Z technique)

A careful dissection of the lateral retinaculum is performed, identifying its superficial and deep layers (Hayden's Z technique) achieving an elongation of 2 cm.[10]

(►**Fig. 5**): Hayden Z lateral retinaculum lengthening surgical technique diagram. (a) Proper illustration of lengthening through retinaculotomy of the superficial and deep layer (b) Lateral retinaculum lengthening through the junction of the superficial and deep layer.

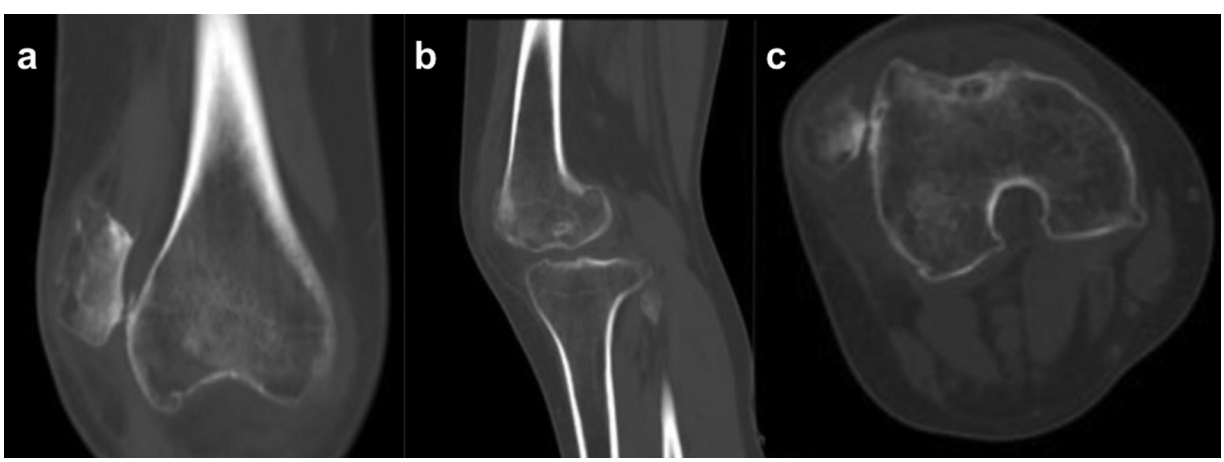

Fig. 3a, 3b, and **3c**: Computed Tomography (a) Coronal view. (b) Sagittal view. (c) Axial view.

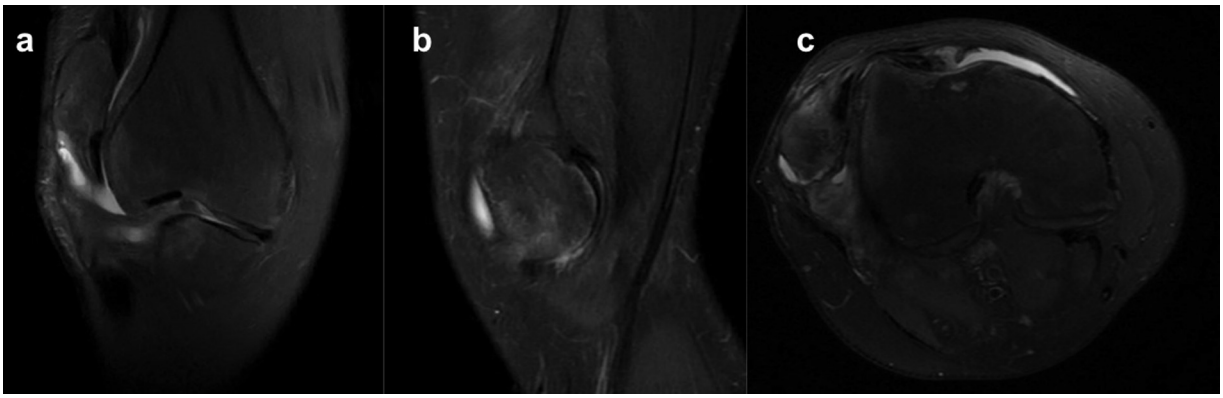

Fig. 4a, 4b, and **4c**: Magnetic Resonance Imaging (a) Coronal view. (b) Sagittal view. (c) Axial view.

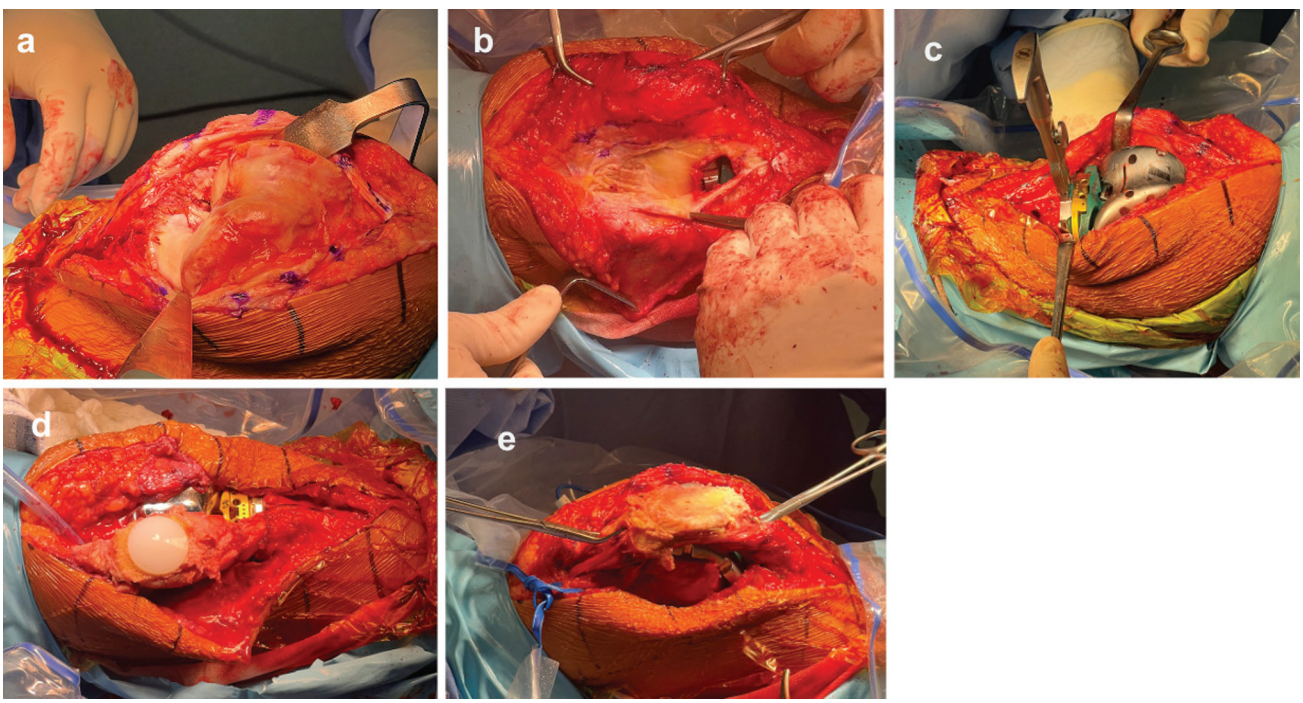

Fig. 5a–5e: Intraoperative Images (a) Initial approach and gutter release. (b) Extensor mechanism displaced laterally. (c) TKR. (d) Patellar prosthesis component. (e) Extensor mechanism alignment with patella reduction.

Total knee arthroplasty

A measured resection was performed to achieve neutral alignment. In this case, the femoral component was positioned with 5° of external rotation and lateralized. The tibial tray was also maximally externally rotated to medialize the ATT and reduce the "Q angle," thereby facilitating patellofemoral tracking.

Proper alignment was achieved, and during the flexion and extension space balancing, greater medial than lateral laxity was observed, with a gap of 3 to 5 mm at 20° of flexion. Consequently, a posterior-stabilized constrained insert (CPS) was selected. The tibial fixation was completed using a 30 mm stem to prevent loosening due to increased implant constraint and poor tibial bone quality.

(►**Fig. 6a–6e**): Intraoperative images: (a) Initial approach and gutter release. (b) Extensor mechanism displaced laterally. (c) TKP. (d) Patellar component of the prosthesis. (e) Alignment of the extensor mechanism with patella reduction.

VMO Transposition (Insall Technique)

Using the Insall technique, a transfer is performed from the medial edge of the patella, anchoring the VMO to the lateral edge of the patella with 3 to 4 temporary points testing different tensions until adequate "tracking" is achieved between 0° - 120° of flexion and then definitive high-strength sutures are placed.

(►**Fig. 7a**, **7b** and **7c**): Insall technique.[9] (a) Superimposition of vastus medialis on the patella, demarcation of the limit of vastus medialis and patella. (b) Final result. (c) Own illustration of the Insall technique.

Postoperative protocol

The patient remains hospitalized for 3 days with a knee immobilizer in extension and loading as tolerated. Immediate post-surgical control images are requested that show well-positioned prosthetic components (►**Fig. 8**). Motor

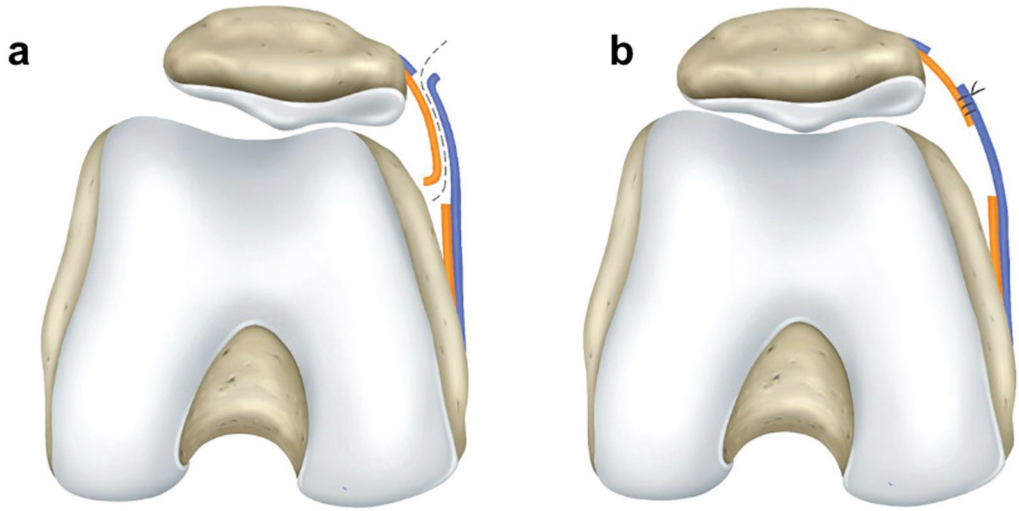

Fig. 6a and **6b**: Hayden's Z Lateral Retinacular Lengthening Technique (a) Illustrated diagram of lengthening via superficial and deep layer retinaculotomy. (b) Lateral retinacular lengthening by uniting superficial and deep layers.

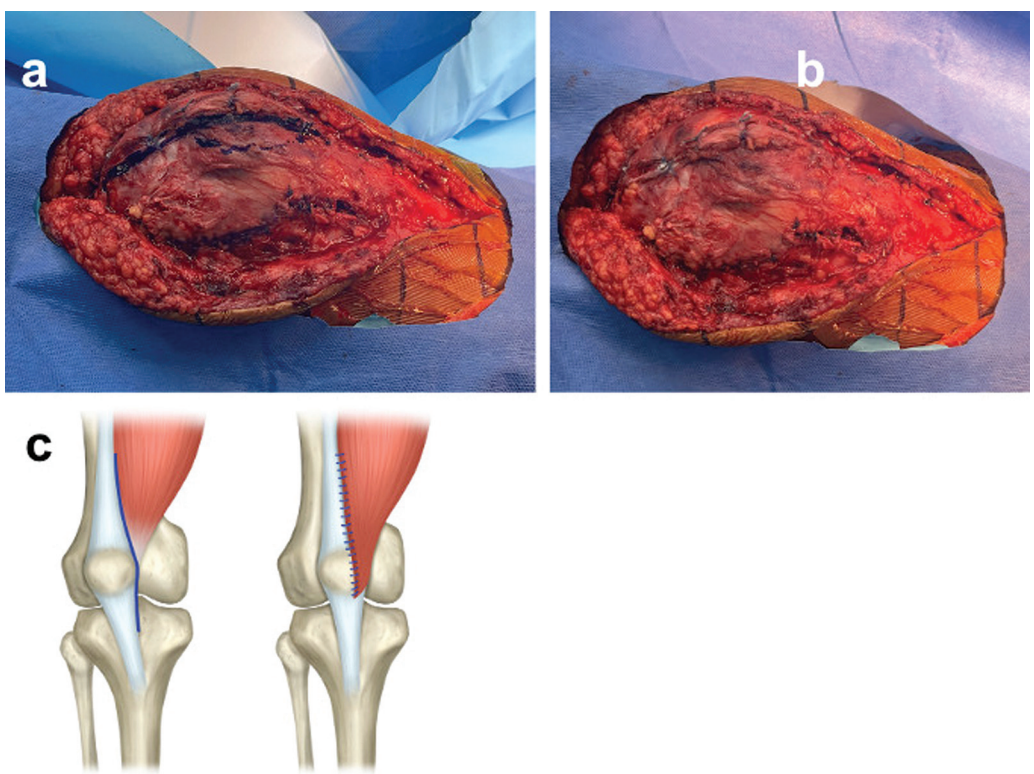

Fig. 7a, 7b, and **7c**: Insall Technique (a) Vastus medialis overlapping the patella and marking the boundaries of the vastus medialis and patella. (b) Final result. (c) Illustration of the Insall technique.

kinesiotherapy is indicated with load to tolerance and ROM 0-30° during the first 2 weeks, then an increase of 10° of flexion per week.[1]

Evolution at last follow-up

At 8 months postoperatively, the patient is pain-free and without new episodes of dislocation with adequate functionality. He regained his independence for basic ADLs. Features a ROM with full extension and up to 60° of flexion.

Discussion

This case reports the successful treatment of a chronic patellar dislocation (CPD) associated with tricompartmental

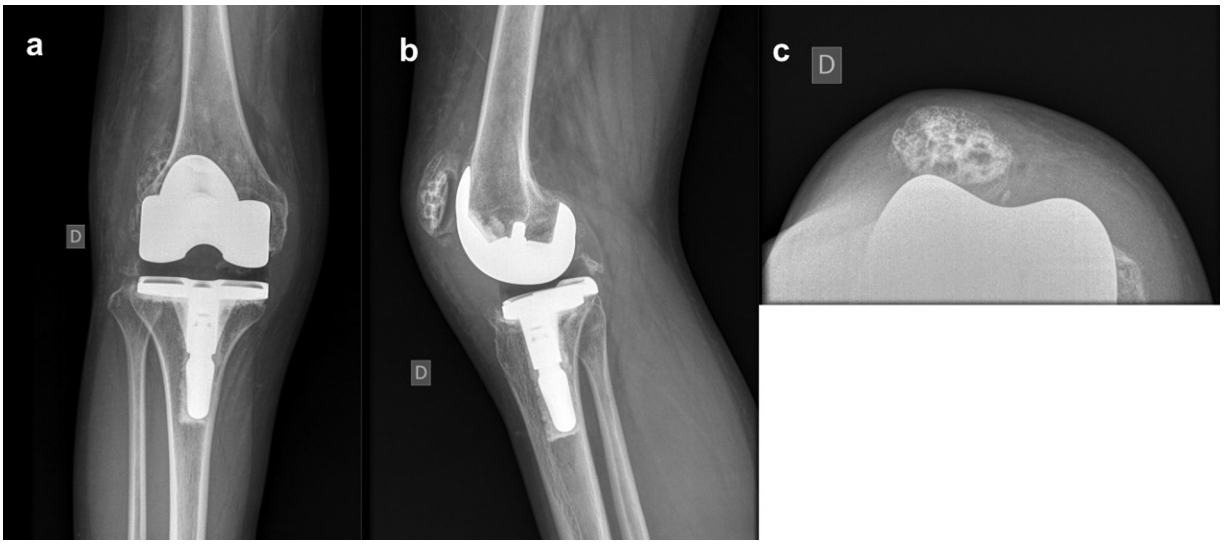

Fig. 8: Postoperative X-rays (a) Anteroposterior (AP) X-ray. (b) Lateral X-ray. (c) Axial X-ray of the patella.

osteoarthritis in a patient with Down syndrome (DS) and hypermobility, which represents a significant clinical challenge due to the anatomical and functional complexity involved. The low incidence of this condition and the limited literature means that this case may contribute to the resolution of similar patients.[6]

Patellar dislocation in patients with DS is rare and, when present in conjunction with advanced osteoarthritis, poses significant challenges. Figueroa et al. (2018) reported a case treated with lengthening of the lateral retinaculum and reconstruction of the medial patellofemoral ligament (MPFL) in a patient with DS and CPD, without the need for TKA due to the absence of osteoarthritis.[8] In our patient, the extent of joint damage and the valgus deformity of 13.3° necessitated the selection of a posterior-stabilized (PS) TKR. This approach aimed to restore alignment and patellofemoral tracking, alleviate pain, and improve overall knee functionality and the patient's gait.[1]

We opted for a medial parapatellar approach over the old scar, rather than a lateral one, to maximize exposure and avoid compromising the lateral structures, allowing for controlled lengthening of the retinaculum.[11] A PS-type implant was selected, with the option of increasing the constriction intraoperatively to a CPS based on the stability observed during surgery, which was necessary given the medial laxity asymmetry.[12] Furthermore, the use of a short 30 mm tibial stem was important to improve load distribution and reduce the risk of loosening in an osteopenia bone, which is recommended in patients with DS and bone fragility.[13]

The Insall technique for antero-lateralization of the vastus medialis oblique (VMO) was used to optimize patellofemoral tracking. This approach is crucial because suboptimal alignment of the extensor mechanism is linked to poorer clinical outcomes, particularly in patients with complex patellofemoral instability.[14] The literature supports that realignment of the extensor apparatus is crucial to restoring patellofemoral biomechanics, thereby ensuring adequate functionality.[15]

The medialization osteotomy of the ATT was ruled out since the ICN-ATT distance was 22 mm, which did not justify this procedure. Furthermore, this technique makes the procedure difficult and has associated risks, such as non-union, fractures, and skin necrosis, especially when performed together with a TKA.[16,17] Another method described with good short-term results is the reconstruction of the MPFL with allograft,[15] but in our patient, it was not considered viable due to the small size and bone fragility of the patella.

In our case, the advancement of the VMO, the lengthening of the lateral retinaculum, and the external rotation of the components were sufficient to achieve stability and adequate patellofemoral travel.[18]

Among the strengths of this case is the comprehensive approach that combines TKA with soft tissue realignment techniques, rarely documented in the literature due to the complexity of this pathological combination. A limitation is the lack of long-term follow-up, necessary to evaluate implant durability and patellofemoral stability in patients with DS and hypermobility. After eight months, the patient has shown good functional recovery and the absence of new episodes of dislocation.[19]

Conclusion

This case highlights the importance of a personalized surgical approach in patients with CPD and advanced osteoarthritis, particularly those with DS and hyperlaxity. The combination of a PS TKR with the realignment of the extensor mechanism—achieved through techniques like VMO advancement and lateral retinacular lengthening—proves to be an effective strategy for restoring patellofemoral function and stability. This approach offers a viable solution for managing these complex and rare cases.

Acknowledgments

We deeply thank the *Fundación PAR* for the work carried out with the patients who belong to the foundation, and we thank the Chilean Society of Orthopedics and Traumatology

for having the opportunity to submit this case report for evaluation and to be part of the Chilean Orthopedics and Traumatology Journal.

Conflict of Interest
None.

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