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Total knee arthroplasty for the treatment of osteoarthritis secondary to bilateral congenital patellar dislocation: A case report and review of the literature

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Abstract. Congenital patellar dislocation is a relatively rare clinical deformity. In some patients, a delayed diagnosis or lack of early surgical intervention results in permanent patellar dislocation and subsequent knee osteoarthritis. Total knee arthroplasty (TKA) is currently the most effective treatment for end-stage osteoarthritis, but performing surgery in these patients presents notable technical challenges. The current report presents the case of a 60-year-old woman who had been suffering from knee extensor weakness and dysfunction for >50 years, resulting in an active knee extension deficit. The patient experienced a sensation of instability in the knee when going up and down stairs and could only walk short distances without the aid of a cane. These severe symptoms markedly affected daily life. The patient was diagnosed with total knee osteoarthritis (Kellgren-Lawrence grade IV), secondary to congenital patellar dislocation, according to established clinical and radiological criteria, accompanied by valgus deformity and flexion contracture of the knee joint. The patient underwent a staged bilateral TKA. The procedure utilized the standard Insall approach, with bone cuts performed to achieve mechanical alignment and implantation of conventional primary prostheses. Additionally, the pie-crusting technique was employed to release the lateral structures, while the overlap-suturing technique was used to reinforce the medial structures, thereby ensuring proper patellar tracking. At the final follow-up, the patient exhibited satisfactory clinical outcomes, including a pain-free gait, full knee extension and good joint range of motion. Imaging confirmed stable prosthesis alignment with no signs of loosening or patellar subluxation, while dynamic assessment demonstrated excellent patellofemoral joint stability. In conclusion, TKA is the most effective treatment for osteoarthritis caused by congenital patellar dislocation. Through the implementation of the pie-crusting technique and overlap suturing for lateral structural release and medial structural reinforcement, respectively, notable patellar reduction was achieved employing standard prostheses.

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Abbreviations: CPD, congenital patellar dislocation; TKA, total knee arthroplasty; MPFL, medial patellofemoral ligament; ROM, range of motion; PS, posterior stabilized; TTO, tibial tubercle osteotomy; VMO, vastus medialis obliquus

Key words: congenital patella dislocation, knee osteoarthritis, TKA, pie-crusting, overlap suturing

Introduction

Congenital patellar dislocation (CPD) is a rare condition with an unclear etiology, affecting approximately 1 in 100,000 individuals (1). Numerous patients only seek medical attention in the late stages of the disease when they develop severe knee osteoarthritis (2). Lateral fixed patellar dislocation during knee flexion and extension is the most typical clinical manifestation (3). As the condition progresses, certain patients may develop knee deformities, such as valgus knee, tibial external rotation and femoral internal rotation. Recent case reports have suggested that total knee arthroplasty (TKA) is the most successful treatment for such patients (4,5). However, there is currently no consensus regarding the optimal surgical approach for the extensor mechanism, among tibial tubercle medialization, patellar replacement and medial patellofemoral ligament (MPFL) reconstruction, or on the choice of knee prosthesis (6). Reconstructing patellar tracking and stability, restoring the alignment of the extensor mechanism and ensuring soft tissue balance are crucial; compared with standard primary TKA, surgery for patients with patellar dislocation and valgus knee deformity presents certain technical challenges. The pie-crusting release technique is a reliable method for lateral retinacular release. By gradually releasing and immediately reassessing, it can accurately restore soft-tissue tension balance, safely reduce the patella and ensure stable tracking. The tight overlapping suturing of the medial patellar retinaculum is a relatively simple and effective technique for medial patellar stabilization. The present case report explored in detail the treatment of bilateral CPD leading to severe knee osteoarthritis using the adopted surgical method of TKA combined with the pie-crusting release and overlap suture techniques. No additional reconstructive procedures were performed. This case highlights the potential of these two techniques in managing atypical and complex joint disorders, particularly in settings with limited medical resources and technical capabilities. Furthermore, it underscores the importance of comprehensive evaluation when addressing such rare and challenging cases.

Case report

Patient information. A 60-year-old female farmer with a 30-year history of bilateral knee pain, presented to Zhangye People's Hospital Affiliated to Hexi University (Zhangye, China) in March 2024 complaining of an exacerbated pain and restricted mobility in the right knee over the past year. Pertinent to the patient's medical history was the delayed onset of walking; no other syndromic features, hereditary conditions or intellectual impairments were noted. Since childhood, the patient had experienced persistent bilateral knee weakness and instability. As a young adult, the patient could not participate in heavy physical labor and struggled with basic movements, such as standing up from a squatting position. At the age of 30 years, the patient visited a local county hospital where an X-ray was taken (no relevant imaging data was available) and a diagnosis of CPD was formed, which required surgical treatment. However, the surgery was deferred due to financial constraints. The patient was unable to climb stairs or use a toilet, which severely impacted daily life. At the present admission, the patient entered the clinic with a noticeable limp while using a walking aid. Physical examination revealed that the patient could stand independently with a 15˚ valgus deformity. Range of motion (ROM) of the knee joint was restricted: There was a 30˚ extension contracture deformity in both knees, and flexion was limited to 80˚ due to pain. Both knee joints exhibited mild swelling. The patella was positioned laterally to the lateral femoral condyle and could not be reduced medially, even with flexion and extension attempts. Both lateral stabilities testing and anterior-posterior drawer testing demonstrated normal ligamentous integrity. The ROM in the right knee was 25-80˚, while that in the left knee was 35-80˚. Preoperative X-ray and computed tomography imaging revealed bilateral patellar dislocation, abnormal development of the femoral trochlea and irregular patellar morphology, along with extensive osteophyte proliferation around the knee joint (Figs. 1A and B, and 2A and B). Preoperative functional assessment revealed severe impairment, with Knee Society Scores (KSS) of 42 (clinical) and 50 (functional), Oxford Knee Scores (OKS) of 36 (7,8), and a Visual Analog Scale (VAS) score of 8, consistent with advanced osteoarthritis.

Case analysis and surgical reconstruction strategy. TKA was selected as a treatment option to address three main problem areas: Knee osteoarthritis, patellar dislocation and knee flexion-extension dysfunction. The purpose of TKA combined with the pie-crusting and overlapping techniques is to treat osteoarthritis and reconstruct patellar tracking and stability (9). The preoperative lateral stress test under general anesthesia revealed good stability of the medial and lateral collateral ligaments. If intraoperative findings had shown irreparable patellar tracking and alignment, reconstruction of the MPFL would have been necessary to achieve balance. A pneumatic tourniquet was applied at the upper thigh, and the knee was maintained in extreme flexion to avoid interference from the extensor mechanism. A modified Insall approach (parapatellar approach) was used (10). First, a midline skin incision was made, then a superficial fascial incision, and finally, the joint incision 8 cm above the patella. A longitudinal incision was made along the medial third of the quadriceps tendon, extending medially and distally through the patellar ligament to the tibial tubercle. Intraoperative findings revealed fixed patellar dislocation with dysplastic morphology, and extensive osteophyte formation had created a concave articular surface, along with a ball-socket-like pseudojoint with the lateral femoral condyle. Weight-bearing occurred on the anterior-lateral femoral condyle and tibial intercondylar eminence, and osteophytes covered the femoral intercondylar notch. The distal femur exhibited equinus deformity, with articular cartilage wear, joint space narrowing, subchondral bone sclerosis and severe posterior femoral condyle destruction (Fig. 3A and B). The lateral retinaculum and iliotibial band were markedly contracted. The standard neutral mechanical alignment principle was adopted for the osteotomy, and the trial test showed good stability in both flexion and extension. Next, a reciprocating saw was used to perform patellar surface reconstruction, reshaping the articular surface and central ridge for proper alignment with the femoral trochlear groove. The significant lateral patellar maltracking and subluxation risk were addressed. A deep capsular release was first performed. Subsequently, a pie-crusting release of the lateral retinaculum and the iliotibial band was conducted using an #11 blade. With the knee held at 90˚ flexion and a laminar spreader gently distracting the lateral compartment, multiple horizontal stab incisions (8-10 punctures spaced 0.5-1 cm apart) were made parallel to the joint line over the palpably tight lateral structures. This stepwise release was performed until the lateral structures demonstrated adequate lengthening. Patellar tracking was assessed following each series of punctures using the 'no-thumb' test. The release was considered sufficient when the patella remained centered within the trochlear groove throughout a full range of passive knee flexion and extension without manual pressure, and a rectangular flexion gap was achieved. To reinforce medial stability, a medial retinacular overlap suturing technique was employed. The redundant medial retinacular tissue was advanced laterally and superiorly. Using #2 Ethibond sutures, an interrupted vertical mattress suture pattern was utilized to imbricate the medial retinaculum. The sutures were placed to achieve an overlap of 1.0-1.5 cm, starting proximally at the vastus medialis obliquus (VMO) expansion and extending distally to the medial border of the patellar tendon. The suturing was performed with the knee positioned at 30-45˚ flexion, and the patella was reduced in the trochlear groove, ensuring appropriate tissue tension that was neither too tight to cause medial over-constraint nor too loose to allow residual lateral shift. This created a double-layered reinforcement: The deep layer involved imbricating the medial capsule and residual MPFL tissue to the

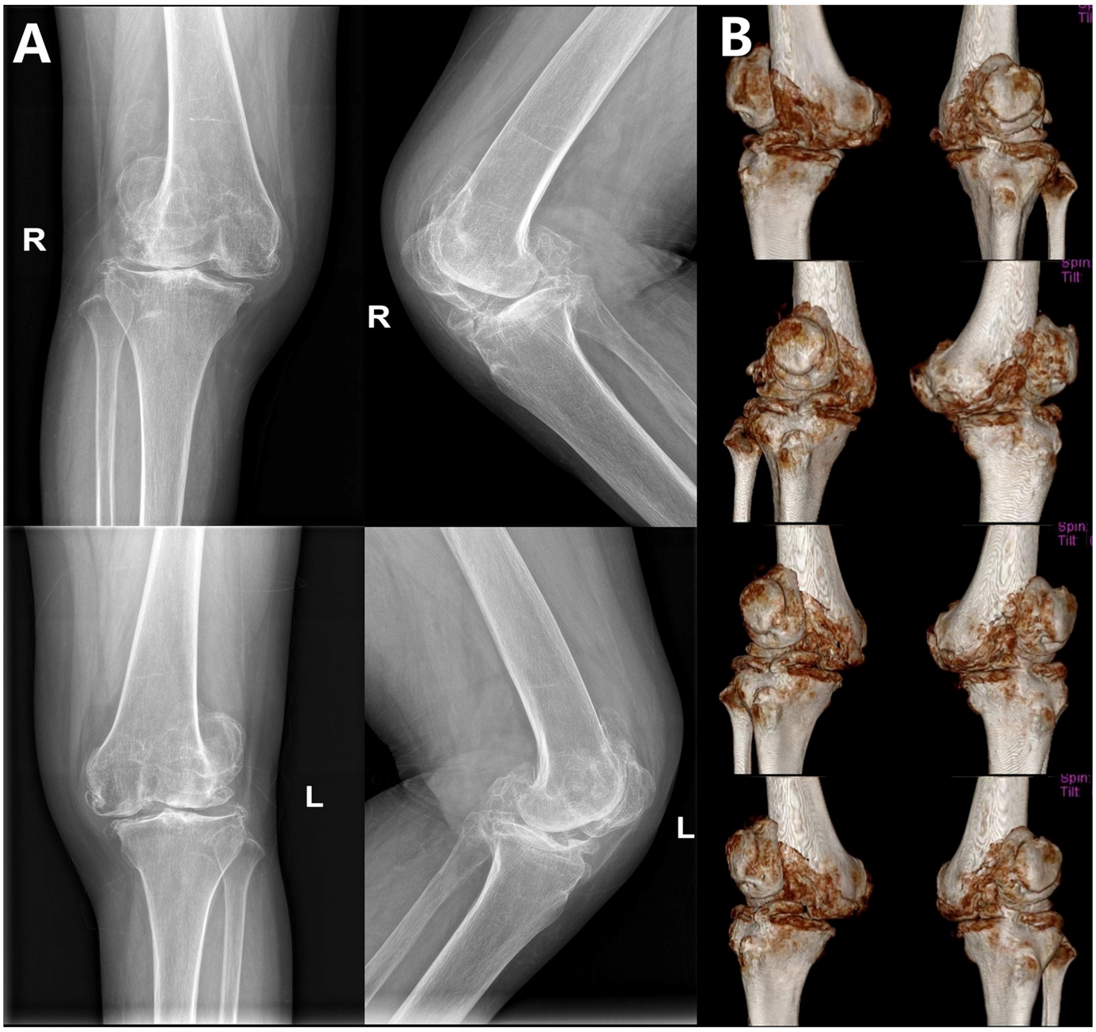

Figure 1. Preoperative knee CT and X-ray. (A) Preoperative anteroposterior and lateral knee X-rays showing severe osteoarthritis with lateral patellar dislocation. (B) CT three-dimensional reconstruction showing subluxation of the tibiofemoral and patellofemoral joints, along with marked osteophyte proliferation. CT, computed tomography.

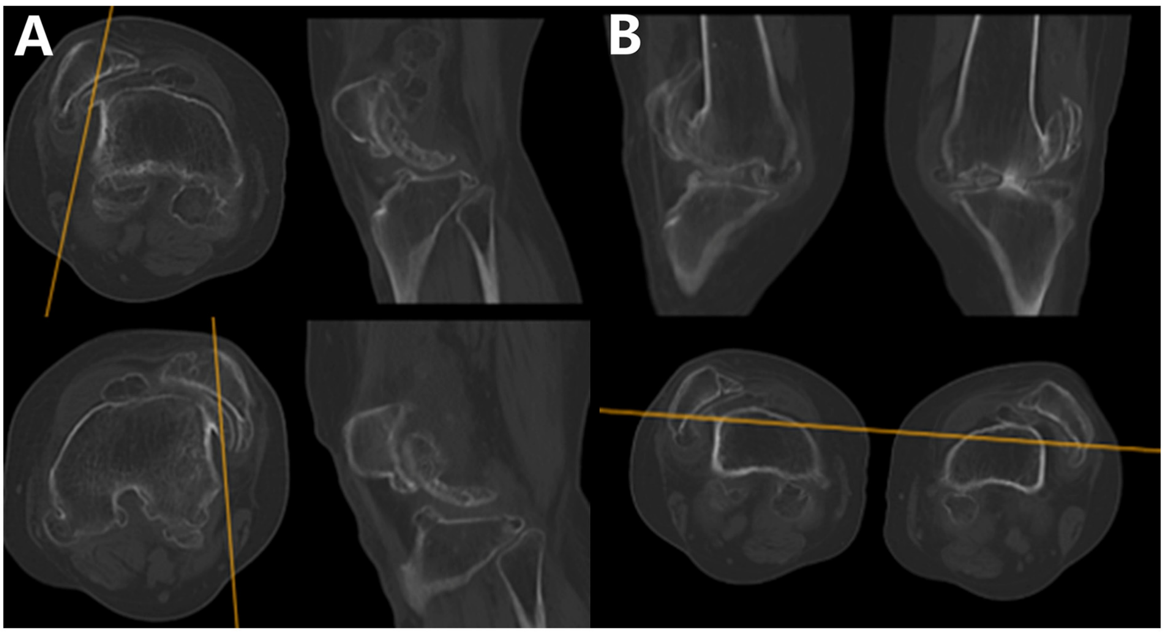

Figure 2. Preoperative knee CT scan. (A) CT scanning combining transverse and sagittal planes. (B) CT scanning combining transverse and coronal planes. Yellow lines are positioning lines along which reconstruction was performed. CT, computed tomography.

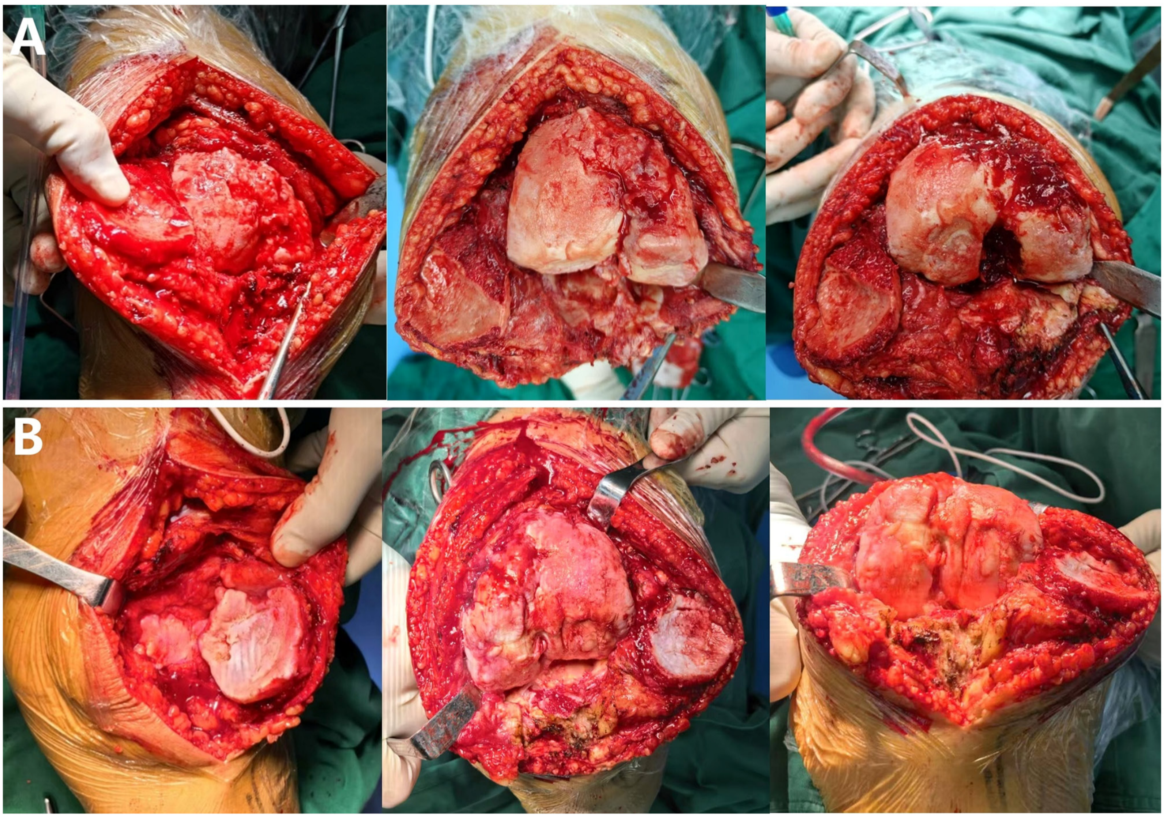

Figure 3. Intraoperative images of the knee. (A) Intraoperative views of the right knee procedure. (B) Intraoperative views of the left knee procedure.

patellar border, while the superficial layer involved advancing the VMO fascia anterolaterally and suturing it to the anterior surface of the patella to provide dynamic medial stabilization. Fig. 4 illustrates the extent of the release of the lateral patellar retinaculum (marked as zone 'I'). The medial patellar retinaculum and its continuity with the vastus medialis muscle were reinforced by an overlapping suture technique using Ethibond sutures, ensuring stability and providing adequate soft tissue coverage.

Postoperative management. Following the surgery, the patient wore a hinged knee brace in an extended position. On the day of the surgery, the patient performed ankle pump exercises, and on post-operative day 2, isometric and isotonic exercises of the quadriceps were initiated. At 1-week post-surgery, the patient actively performed knee flexion and extension exercises within a pain-free ROM. At 2 weeks post-surgery, the patient walked with partial weight-bearing on the ground, assisted by a walker. All surgical incisions achieved primary healing without wound dehiscence or infection, and the sutures were removed 2 weeks after surgery. At 4-weeks post-surgery, the knee brace was removed, and the patient was able to walk with full weight-bearing and continued to perform the straight leg raising exercise.

Follow-up results. The patient underwent left knee surgery 12 months after right knee surgery using the same approach. The final follow-up was conducted 27 months after right knee surgery and 15 months after left knee surgery. The patient demonstrated a pain-free gait (Video S1), with active leg extension capability. The knee joint extension was comparable and symmetrical between both sides. The 27-month postoperative X-rays showed satisfactory results, with good

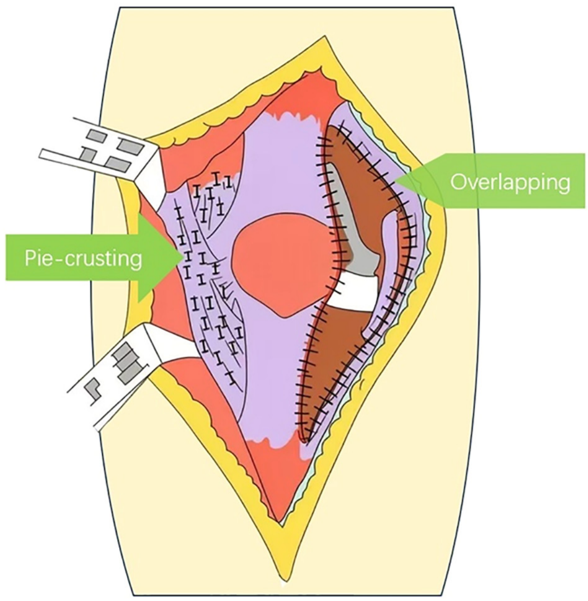

Figure 4. Diagram of lateral retinacular release and medial plication suture of the knee joint. Schematic illustration of the surgical incision, lateral retinacular release by pie-crusting and medial capsular overlapping. A midline incision with a medial parapatellar approach was used for exposure. The area marked by the 'I': The lateral retinaculum was released using a sharp blade. The area marked by the medial black incision line: The medial capsule was plicated and sutured.

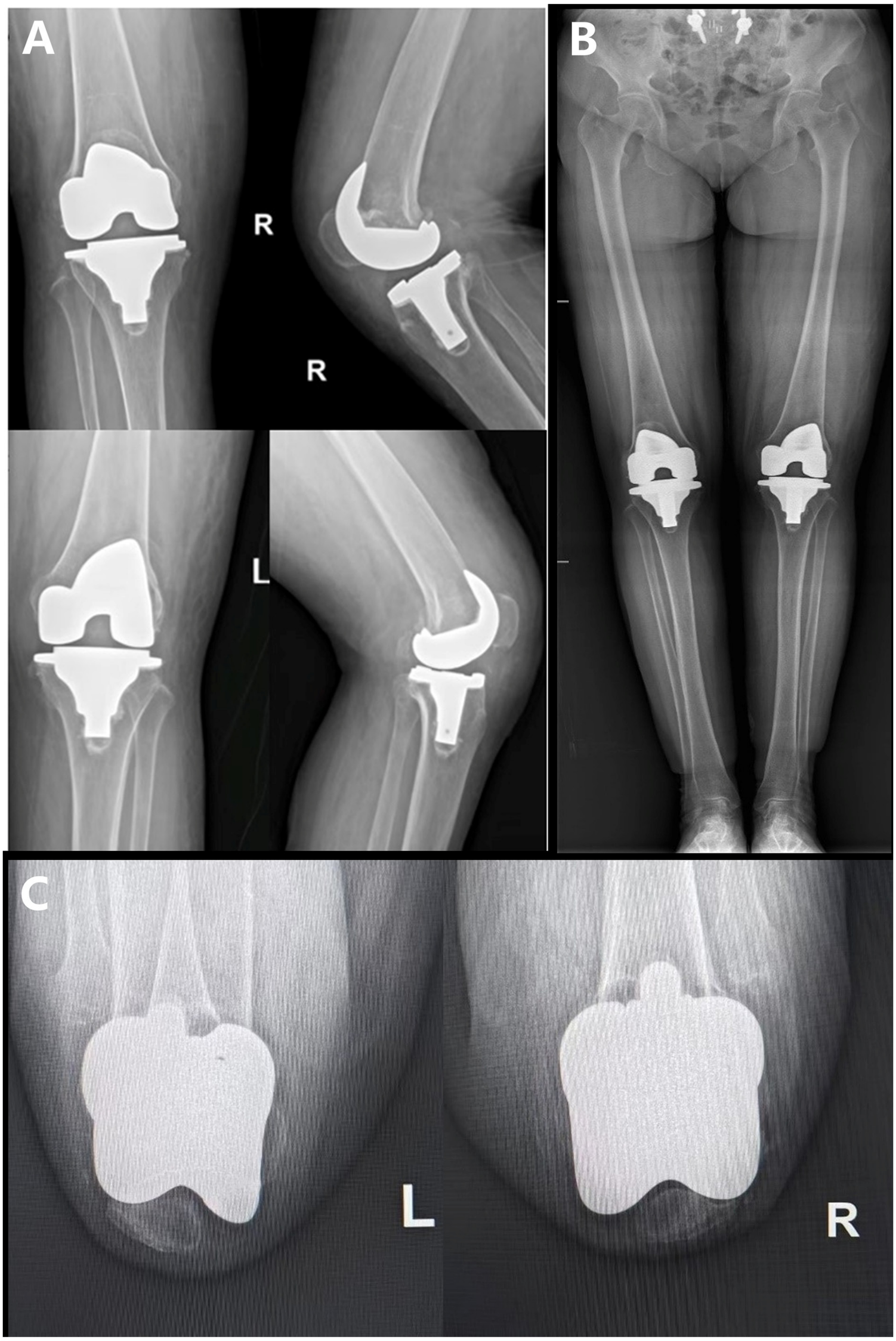

Figure 5. Postoperative X-ray following total knee arthroplasty. (A) Anteroposterior and lateral views of knees. (B) Full-length lower limb radiographs. (C) Patellar axial views.

prosthesis stability and no signs of osteolysis or patellar subluxation (Fig. 5A and B). Sunrise view X-ray of the patella revealed good patellofemoral alignment with stable patellar tracking (Fig. 5C). The ROM was 0-115˚ for the right knee and 0-115˚ for the left knee (Fig. 6A and B). Patellar tracking and stability were excellent (Video S2). The KSS results of the right knee were 94 points (clinical) and 92 points (functional), and the OKS was 13 points (7,8). Meanwhile, the KSS clinical

Figure 6. Knee ROM at final follow-up. (A) Postoperative ROM of the left knee: 0-115˚. (B) Postoperative ROM of the right knee: 0-115˚. ROM, range of motion.

Figure 7. Both knee incisions demonstrated good healing. The patellar position was noted to be favorable, and the tibial rotational alignment was correct.

score of the left knee joint was 93 points, the functional score was 90 points and the OKS score was 14 points. The rotational alignment of both knee joints was successfully corrected and restored post-operatively (Fig. 7). A detailed comparison of the clinical outcomes before and after the surgery is presented in Table I. At the final follow-up, no early complications, such as wound infection, periprosthetic infection, thrombosis, prosthesis loosening, patellar instability or recurrent dislocation, were observed. The patient will be followed up regularly for at least 2 years post-operatively, with clinical evaluations and

Table I. Comparison of knee joint function scores before and after total knee arthroplasty.

		KSS				
Timeframe	Knee	Clinical score	Functional score	OKS	VAS	ROM, ˚
Preoperative	Right	42	50	36	8	10-85
	Left	52	55	32	7	5-90
Postoperative	Right	94	92	13	0	0-115
	Left	93	90	14	0	0-115

KSS, Knee Society Score; OKS, Oxford Knee Score; VAS, Visual Analog Scale; ROM, range of motion.

radiographic assessments scheduled every 3 months during the first year, every 6 months during the second year, and annually thereafter. Follow-up assessments will include the KSS, OKS, VAS for pain, and active ROM measurements. Additionally, long-term monitoring for potential complications such as implant loosening, periprosthetic infection or recurrent patellar dislocation will be conducted through physical examinations and periodic radiographs.

Discussion

Irreducible patellar dislocation is a rare disease. According to recent studies, its causes are mainly divided into congenital and acquired types. Most patients with acquired patellar dislocation have an obvious history of knee joint trauma. In adults, chronic dislocations often go undiagnosed as symptoms of secondary osteoarthritis appear late and patients adapt to their limited function (2,11). To further understand patellar dislocation, relevant literature was retrieved, including 10 case reports and 1 retrospective case series study. The specific descriptions are shown in Table II (2-6,11-16). Among them, 5 case reports explicitly mentioned the description of acute patellar dislocation following a sprain or fall in the medical history (3,5,11-13). In addition to acquired cases, some patients with CPD have a higher probability of knee joint injury during exercise or labor than the normal population. Among patients with a history of CPD who present with permanent patellar dislocation, some cases may be attributable to trauma-related factors. In addition, CPD-related or pathological anatomical factors may contribute, including poor hypoplastic patellar and femoral condylar development, a flattened femoral trochlea and inherent patellar instability. From the pathological anatomy in the literature review (Table II), it can be concluded that in most cases, dysplasia of the femoral trochlea can be observed in the patients undergoing TKA (2,3,5,6,12,14). Therefore, some cases may have multiple etiologies. Furthermore, most patients lack previous imaging data, have a long history of dislocation and deformity, and also present with severe knee osteoarthritis (hyperplastic osteophytes, disorder of anatomical structures or ligament contracture). All these factors affect the clinical diagnosis. Regardless of the difficulty in determining the diagnosis and etiology, for patients with patellar dislocation combined with end-stage osteoarthritis, TKA has been widely adopted and achieved good clinical efficacy. However, the most important aspect of the surgical technique is how to reconstruct the patellofemoral trajectory and restore patellar stability during the surgery.

There are differences in patellar treatment strategies and opposing views on reconstructing the extensor mechanism of the knee. Marmor (17) and Pradhan *et al* (16) reported that patients with CPD often adapt to abnormal anatomy, and that satisfactory functional outcomes can still be achieved with TKA even without altering the patellar position. However, in the case reported by Pradhan *et al* (16), tibiofemoral joint dislocation occurred 14 months after the surgery, suggesting that a high-restraint prosthesis is required following extensive soft-tissue release. Ishigaki *et al* (6) and Kim *et al* (11) advocated for combined lateral support band release, medial overlapping sutures and patellar replacement to reconstruct the trajectory (6,11). In addition, the 68-month follow-up in the case series reported by Kim *et al* (11) showed that there was only 1 case of asymptomatic subluxation (from 8 patients), supporting the reliability of this protocol. Regarding key techniques for soft-tissue balance, all studies have emphasized the necessity of releasing the lateral support band, but further surgeries need to be individualized. Kim *et al* (11) indicated that quadricep lengthening is suitable for those with a severe contracture. No severe contracture was observed in the bilateral quadriceps of the patient in the present case. Yamanaka *et al* (15) reported the risk of postoperative tibial fractures following tibial tubercle osteotomy (TTO) after a patient sustained a left tibial fracture 5 weeks postoperatively, just below the osteotomy/transfer site after a fall. There is controversy over prosthesis selection and the specific types of constraints in the prevention and control of complications. For the present patient, a PS prosthesis was used during primary TKA. Overlap and pie-crusting techniques were employed to achieve balanced soft tissues, resulting in good patellar tracking and stability as supported by the technical principles previously outlined (18). Pradhan *et al* (16) switched to a hinged knee due to dislocation failure; however, we consider that a posterior-stabilized (PS) prosthesis combined with soft-tissue surgery was sufficient to maintain stability in the present case. When considering patellar replacement, the advantages include reduced anterior knee pain and an optimized trajectory. However, there is an ongoing risk of an increased rate of dislocation, as seen in the subsequent failed cases in study by Marmor (17). In the present study, a patellar replacement was not performed, as the patella 12-mm thick following the removal of the osteophytes. A reciprocating saw was used for patelloplasty, with the aim

Table II. Summary of published literature on TKA for knee osteoarthritis secondary to patellar dislocation.

First author, year	Country	Article type	Pathological characteristics	Surgical methods	Surgical approach	Prosthesis type	Follow-up time, months	Clinical efficacy	(Refs.)
Ishigaki *et al*, 2018	Japan	Case report	Bilateral lateral patellar dislocation, valgus deformity (7-15°), trochlear hypoplasia	Simultaneous bilateral TKA+lateral release + vastus medialis plication + fat pad/joint capsule coverage	Lateral parapatellar	Cruciate-retaining (NAKASHIMA FINE)	24	ROM: 0-120°; JOA score: 40→90. Stable patellar tracking, No recurrence.	(6)
Figueroa *et al*, 2018	Chile	Case report	Chronic lateral dislocation, valgus/ varus deformity, tricompartmental OA	TKA+tibial tubercle osteotomy (medialization) + vastus medialis advancement	Medial parapatellar	Posterior-stabilized (PFC Sigma®)	24	Pain-free ambulation; ROM: 0-100°; KSS improved. No instability.	(4)
Yamanaka *et al*, 2015	Japan	Case report	Bilateral congenital dislocation, valgus (10°), trochlear dysplasia, hypoplastic patella	Bilateral staged TKA (right: no realignment; left: lateral release + tibial tubercle transfer + quadriceps lengthening)	Medial parapatellar (both)	Posterior-stabilized (NexGen LPS-Flex)	24	Right: ROM 0-125° (extension lag 45°); Left: ROM 0-90°. KSS improved. Left tibial fracture post-op (conservative management).	(15)
Albuquerque *et al*, 2018	Brazil	Case report	Permanent lateral dislocation, valgus/ varus OA, trochlear dysplasia	TKA+lateral retinacular release	Medial parapatellar	Posterior-stabilized (PFC Sigma)	24	KSS: 42→91 (Case 1), 25→82 (Case 2). Stable patellar tracking, No recurrence.	(5)
Pradhan *et al*, 2001	Japan	Case report	Bilateral congenital dislocation, severe valgus (FTA 160°), OA	Staged TKA+ITB/PLC/ LCL release + gastrocnemius release + biceps Z-lengthenin (right failed → constrained revision)	Not specified	MG-II prosthesis (primary); Constrained (Biomet Maxim) (revision)	14	Right knee dislocation at 14 months → revision. Left knee pain-free at 6 years.	(16)
Junqueira *et al*, 2016	Brazil	Case report	Chronic post-traumatic dislocation, valgus,	TKA+lateral release	Subvastus	Medial-pivot (unspecified)	24	KSS: 49→93; ROM: 0-105°. Bone scan	(13)

Table II. Continued.

First author, year	Country	Article type	Pathological characteristics	Surgical methods	Surgical approach	Prosthesis type	Follow-up time, months	Clinical efficacy	(Refs.)
			hypoplastic trochlea					confirmed patellar viability. No recurrence.	
Chouhan *et al*, 2024	India	Case report	Habitual dislocation (55 years), valgus (FTA 166°), trochlear dysplasia, tibial slope reversal	TKA+lateral release + ITB Z-lengthening + medial plication + quadriceps snip	Medial parapatellar	Posterior-stabilized (Scorpio-TS)	23	ROM: 5-95°; Kujala score: 39→83. Stable patella, no recurrence.	(2)
Kamada *et al*, 2017	Japan	Case report	Permanent lateral dislocation, valgus (12°), trochlear dysplasia, OA	Navigation-assisted TKA+lateral release	Medial parapatellar	Cruciate-retaining mobile-bearing (ATTUNE™)	12	ROM: 5-110°; KSS: 73→93. Stable patellar tracking.	(12)
Kumagai *et al*, 2016	Japan and UK	Case report	Prolonged dislocation (55 years), valgus, trochlear dysplasia	TKA+lateral release + medial plication	Medial parapatellar	Constrained condylar (Scorpio-TS)	12	ROM: 0-105°; HSS patellar score: 15→70. No recurrence.	(14)
Kim *et al*, 2024	South Korea	Case series	Neglected lateral dislocation, valgus (mean 8.2°), trochlear dysplasia, patellar hypoplasia	TKA+lateral release ± medial plication ± quadriceps lengthening (snip/V-Y)±constrained implant	Medial parapatellar	Varied (Triathlon/ Persona/Attune)	68	KSS knee: 36.7→88.3; WOMAC: 52.8→14.3. ROM improved. 1 case asymptomatic subluxation; no revisions.	(11)
Garcia-Mansilla *et al*, 2020	Argentina	Case report	Chronic dislocation, OA, trochlear irregularity	TKA + MPFL reconstruction (tibialis anterior allograft) + lateral release	Medial parapatellar	Cruciate-retaining (Legion Oxinium)	6	ROM: 0-115°; stable patellar position (lateral tilt but no dislocation).	(3)

TKA, total knee arthroplasty; ROM, range of motion; JOA, Japanese Orthopedic Association Score; HSS, Hospital for Special Surgery; OA, osteoarthritis; KSS, Knee Society Score; PLC, posterolateral corner; LCL, lateral collateral ligament; FTA, femorotibial angle; ITB, iliotibial band; WOMAC, Western Ontario and McMaster Universities Arthritis Index; MPFL, medial patellofemoral ligament.

of restoring the anatomical structure of the patella as much as possible.

The pie-crusting release technique is a reliable method for lateral supporting band release. By gradually releasing and evaluating immediately, it can accurately restore soft-tissue tension balance, safely reduce the patella and ensure stable tracking. In addition, the tight overlapping suturing of the medial patellar retinaculum is a relatively simple and effective technique for medial patellar stabilization.

When performing TKA for CPD combined with severe patellofemoral arthritis, the choice of surgical strategy should be based on specific anatomical and pathological features, after carefully evaluating the trade-offs. No severe lateralization of the tibial tubercle was found in the preoperative evaluation of the present case; therefore, performing TTO would unnecessarily increase surgical complexity, operative time, and the risks of non-union and implant-related complications. While MPFL reconstruction is considered the 'gold standard' for restoring medial static stability of the patella, it requires a graft and a high level of technical expertise, with potential risks of excessive constraint leading to abnormal patellofemoral joint pressure or limited knee flexion. In the present case, following intraoperative release of the lateral contracted structures using the precise pie-crusting technique, the patellar trajectory was already balanced. When combined with a medial overlapping suture, this approach provided reliable static stability, thereby obviating the additional costs and complication risks associated with MPFL reconstruction. Regarding patellar replacement, although it can improve patellofemoral joint congruity and potentially reduce anterior knee pain, it also introduces long-term risks, such as prosthesis loosening, fracture and patellar clunk. In the present study, although the patient's patellar cartilage was severely worn, the bony structure was intact and of sufficient thickness; therefore, patelloplasty was selected over replacement. We acknowledge that postoperative imaging (for example, axial views) suggested a slight lateralization of the patella, a condition that might have been corrected to achieve better congruity through patellar replacement. However, given the excellent clinical scores and stability achieved, preserving the native patella avoided prosthesis-related risks, which we believe was a more reasonable choice. In conclusion, under the specific conditions of the present case, including limited resources, adequate patellar bone stock and stable collateral ligaments, the combined soft-tissue balancing technique using a standard prosthesis, lateral pie-crusting release and medial overlapping suture directly targeted the core pathology of 'tight lateral, loose medial'. This approach achieved stable reconstruction of the patellar trajectory with minimal complexity and cost, suggesting that it can be a safe, effective and goal-oriented strategy.

In addition, when confronted with limited medical resources or specific medical insurance payment policies, when there is a strict pre-operative evaluation and proper planning, combining standard prostheses with soft-tissue balance techniques can achieve satisfactory clinical efficacy. Given these challenges, surgeons must conduct thorough preoperative assessments.

The findings of the present study should be interpreted taking several limitations into account, including the relatively short follow-up duration (2 years for the right knee and 1 year for the left), potentially limiting the assessment of the long-term survivorship of the prostheses. The single-case design constrains the generalizability of these findings, and the success of this technique requires validation in larger cohorts. The absence of objective functional assessments, such as isokinetic muscle strength testing and instrumented gait analysis, precludes the acquisition of more granular quantitative biomechanical data.

In conclusion, TKA for end-stage osteoarthritis due to patellar dislocation is surgically challenging, requiring thorough preoperative assessment. In patients with stable collateral ligaments, primary TKA with pie-crusting lateral release can effectively restore patellar tracking and kinematics. The present case confirms that pie-crusting and medial overlap suturing can successfully correct patellar tracking and restore stability. Successful outcomes rely on systematic planning, meticulous technique and patient compliance. This combined approach represents a promising treatment strategy.

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Availability of data and materials

The data generated in the present study may be requested from the corresponding author.

Authors' contributions

Conceptualization was performed by XD. Data curation was the responsibility of HL, DY and XY. YW contributed to the collection of clinical data and imaging analysis. HL and DY wrote the original draft. HL, DY and XY reviewed and edited the manuscript. All authors have read and approved the manuscript. HL and XY confirm the authenticity of all the raw data.

Ethics approval and consent to participate

The present study was performed in accordance with the ethical standards of the Declaration of Helsinki 1964. The patient provided written informed consent for participation in the present case report.

Patient consent for publication

The patient provided written informed consent for the publication of the present case report and all accompanying images, including those that contain potentially identifiable features.

Competing interests

The authors declare that they have no competing interests.

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