

CASE REPORT

Staged Bilateral Total Hip and Knee Arthroplasties with Subsequent Hip Revisions in Juvenile Rheumatoid Arthritis: A Rare Case Report

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Background:

Juvenile idiopathic arthritis (JIA), previously termed juvenile rheumatoid arthritis (JRA), is a chronic inflammatory condition that can result in severe joint destruction if inadequately treated. While pharmacologic advancements have significantly reduced the need for surgery, a subset of patients with refractory disease may progress to end-stage arthritis requiring total joint arthroplasty (TJA). Surgical management in this population presents unique challenges due to young age, anatomical deformities, and long-term disease burden.

Case Presentation:

We report the rare case of a young adult with longstanding JIA who underwent staged bilateral total hip arthroplasty (THA), later requiring bilateral primary total knee arthroplasty (TKA) and simultaneous bilateral total hip revision surgeries. The patient had a history of severe joint deformity, limited mobility, and prolonged corticosteroid use. A unique surgical strategy was employed for this patient: a staged, simultaneous primary total knee arthroplasty combined with contralateral revision hip arthroplasty. Autologous bone obtained during the knee procedure was used to reconstruct the acetabular defect encountered during the hip revision. Through multidisciplinary planning and staged interventions, the patient achieved significant functional improvement and pain relief.

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Introduction

Juvenile idiopathic arthritis (JIA) is a chronic inflammatory condition that affects children under the age of 16 and can result in long-term joint damage, deformity, and disability if not adequately treated. Although advancements in medical management—particularly the use of disease-modifying antirheumatic drugs (DMARDs) and biologics—have significantly improved outcomes, a subset of patients with severe or refractory disease still progress to end-stage joint destruction requiring surgical intervention^{1,2}.

Total joint arthroplasty (TJA) in patients with JIA is challenging due to early-onset disease, long-term corticosteroid use, and osteopenia. While isolated hip or knee arthroplasties have been described in the literature for this population, the need for sequential bilateral total hip arthroplasty (THA) followed by bilateral total knee arthroplasty (TKA) and ultimately revision of both hips is rare and poses unique surgical and rehabilitation challenges^{3,4}.

The novelty of this case lies in the rare sequence of staged bilateral total hip arthroplasties (THA) and staged total knee

arthroplasty with contralateral revision THA in a young patient with juvenile idiopathic arthritis (JIA). While previous studies have reported outcomes of isolated THA or TKA in JIA patients, reports describing sequential four-joint arthroplasty followed by bilateral hip revisions are exceedingly rare. Swarup et al. reported favourable survivorship after THA in JIA, whereas Ledbetter et al. described favourable long-term outcomes following TKA; however, neither study described such extensive multi-joint reconstruction in a single patient. Another unique aspect of this case is the staged combined approach of performing primary TKA with contralateral revision THA during the same operative setting. Biological reconstruction techniques have been shown to restore bone stock and provide satisfactory long-term outcomes in young revision patients, as demonstrated by Schreurs et al. In our case, an autologous morselised bone graft harvested from knee arthroplasty bone cuts was utilised for acetabular reconstruction during revision THA. This case therefore highlights a rare and practical reconstructive strategy for managing severe multi-joint destructive disease in JIA.

Case Report

A 34-year-old male was diagnosed with juvenile rheumatoid arthritis at the age of 4 years. He was initially being managed with disease-modifying anti-rheumatic drugs (DMARDs) and corticosteroid therapy. At 17 years of age, he underwent staged bilateral total hip arthroplasty secondary to advanced erosive arthritis involving both hip joints. (Figure. 1 and Figure. 2).



Figure 1. Preoperative radiograph.

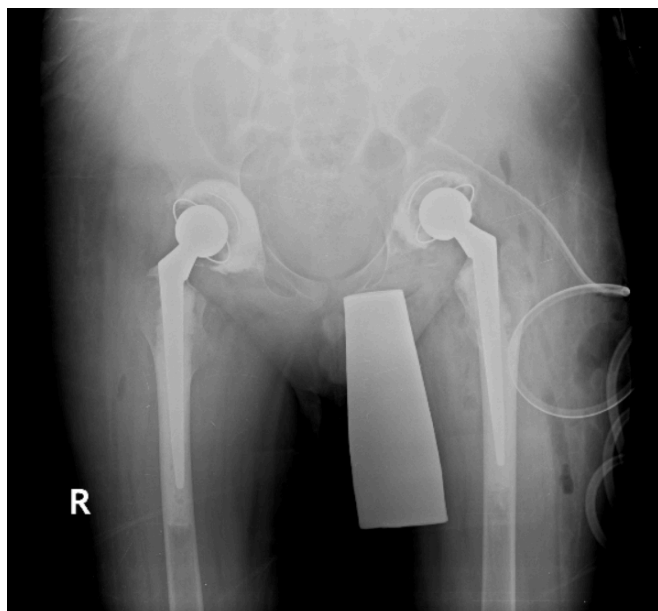


Figure 2. Preoperative radiograph.

Following surgery, he remained clinically stable until the age of 24 years – when he presented to our institution with bilateral knee pain associated with bilateral hip pain. Clinical examination revealed a 5° valgus deformity in both knees, with

flexion contractures of 20° on the right side and 10° on the left side. The range of motion of the knees was 20–100° on the right and 10–100° on the left. Bilateral hip movements were restricted and painful. Further evaluation demonstrated erosive arthritis involving both knees along with aseptic loosening of bilateral hip prostheses (Figure. 3 and Figure. 4).

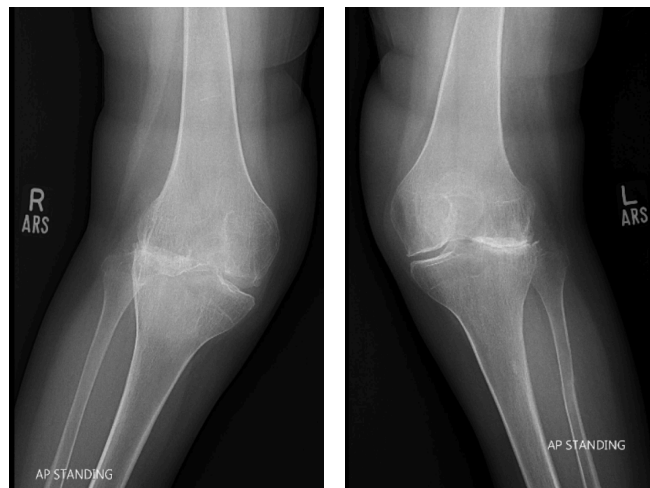


Figure 3. Radiographs at presentation, age 24.



Figure 4.

His treatment was planned in two stages.

Stage 1 – Revision Right Hip Replacement and Primary Left Total Knee Replacement

Stage 2 – Revision Left Hip Replacement and Primary Right Total Knee Replacement

Stage 1 – Revision Right Hip Replacement and Primary Left Total Knee Replacement

The patient initially underwent primary left total knee arthroplasty through a standard midline incision and medial parapatellar approach. Extensive hyperplastic synovium was excised, followed by bone preparation, soft tissue balancing, and implantation of the prosthesis.

Subsequently, the patient was repositioned for revision right hip arthroplasty using a posterior approach. The loosened acetabular component was removed, and acetabular reconstruction was performed using morselised autologous bone graft harvested from the knee arthroplasty bone cuts. A new acetabular component was implanted with supplementary screw fixation. The femoral stem was revised and re-cemented following femoral canal preparation, and the same femoral implant was retained.

Postoperatively, the patient was mobilised with full weight-bearing using a walker from postoperative day 1. Immediate postoperative radiographs demonstrated satisfactory implant alignment and soft tissue balancing, with complete correction of the deformity.

(Figure. 5 and Figure. 6).



Figure 5



Figure 6

Stage 2 – Revision Left Hip Replacement and Primary Right Knee Replacement

A similar staged procedure was subsequently performed on the contralateral side, consisting of primary right total knee arthroplasty followed by revision left total hip arthroplasty. An autologous bone graft harvested during the knee arthroplasty was again utilised for acetabular reconstruction during the hip revision procedure.

Postoperative radiographs demonstrated satisfactory implant positioning, stable fixation, and complete correction of the deformity with appropriate alignment and balancing. The patient was mobilised with full weight-bearing using walker assistance from the first postoperative day.

(Figure. 7 and Figure. 8).



Figure 7



Figure 8

The patient had been followed up regularly in the clinic for approximately 5 years and remained clinically well, with no active complaints related to the hip or knee joints. However, owing to the progressive nature of his disease, he frequently presented with aches and pains involving other joints of the body.

Implant Details

Hip Implants

	Right total hip replacement (2016)	Left total hip replacement (2017)
Femoral component (cemented)	Retained previously used femoral stem Zimmer implant (size 9) Taper neck, 110mm length	Retained previously used femoral stem Zimmer implant (size 9) Taper neck, 110mm length
Femoral head	Ceramic (36mm)	Ceramic (36mm)
Liner	Polyethylene (36mm inner diameter)	Polyethylene (40mm inner diameter)
Acetabular component (un-cemented)	United (U motion-2) 60 mm	United (U motion-2) 58 mm

Knee Implants

Age / Time Point	Clinical Event	Surgical Intervention / Outcome
4 years	Diagnosed with juvenile idiopathic arthritis (JIA)	Managed with DMARDs and corticosteroids
17 years	Developed severe erosive arthritis of both hips with functional limitation	Underwent staged bilateral total hip arthroplasties (THA)
Post-THA period	Initial improvement in pain and mobility	Continued follow-up with satisfactory function
24 years	Presented with bilateral knee pain and bilateral hip pain	Diagnosed with erosive arthritis of both knees and aseptic loosening of bilateral hip prostheses
Stage 1 surgery	Combined reconstructive procedure	Revision right THA with acetabular bone grafting using an autologous graft from primary left TKA
Immediate postoperative period (Stage 1)	Correction of deformity and improved alignment	Mobilised full weight-bearing with a walker on postoperative day 1.
Stage 2 surgery	Second combined reconstructive procedure	Revision left THA with acetabular bone grafting using an autologous graft from primary right TKA
Immediate postoperative period (Stage 2)	Restoration of alignment and joint stability	Mobilised full weight-bearing with a walker on postoperative day 1
5-year follow-up	Long-term clinical outcome	Good functional recovery with no major hip or knee complaints; occasional pain in other joints due to progressive systemic disease

Functional Outcome

At the final 5-year follow-up, the patient demonstrated marked functional improvement with satisfactory pain relief and independent ambulation. Bilateral knee range of motion improved from preoperative values of 20°–100° on the right and 10°–100° on the left to 0°–110° bilaterally postoperatively. Functional assessment showed an improvement in the Harris Hip Score (HHS) from 42 preoperatively to 88 at the latest follow-up, while the Knee Society Score (KSS) improved from 38 to 85. Radiographic evaluation demonstrated stable implant fixation with no evidence of loosening, component migration, or periprosthetic osteolysis.

Discussion

Juvenile idiopathic arthritis (JIA) is the most common chronic rheumatologic disease in children and a leading cause of acquired disability. Despite major advances in medical therapy—particularly disease-modifying antirheumatic drugs (DMARDs) and biologic agents—which have significantly improved disease control and reduced the need for surgical

	Left total knee replacement (2016)	Right total knee replacement (2017)
Femoral component (cemented)	Posterior stabilised cemented size 2.5	Posterior stabilised cemented size 1.5
Tibial insert	Fixed bearing, stabilised size 2.5	Fixed bearing, stabilised size 2
Modular tibial tray (cemented)	Cemented modular tibial tray size 2.5	Cemented modular tibial tray size 2
Patella	Oval dome patella, 32 mm	Oval dome patella, 32 mm

Sequence of Events

intervention, a small subset of patients with severe or refractory disease still progress to end-stage joint destruction^{1,2}. In such cases, total joint arthroplasty (TJA) remains the definitive treatment for pain relief, restoration of function, and improvement in quality of life.

Arthroplasty in JIA is technically demanding due to multiple disease-related challenges, including early-onset deformities, small and osteopenic bone stock, soft-tissue contractures, and prolonged corticosteroid exposure⁵. Additional anatomical factors such as narrow femoral canals and acetabular dysplasia further complicate implant selection and fixation, particularly in patients with early disease onset or skeletal immaturity at the time of index surgery⁶.

In this present case, acetabular deficiency was managed using impaction bone grafting with an autologous morselised graft harvested during TKA, followed by implantation of a screw-augmented cementless acetabular component. This biological reconstruction technique is particularly advantageous in young patients, as it facilitates restoration of bone stock and promotes biological incorporation, thereby optimising conditions for

potential future revision procedures. Several reconstruction strategies have been described in the literature, each demonstrating variable long-term survivorship and functional outcomes⁷.

Although both total hip arthroplasty (THA) and total knee arthroplasty (TKA) in patients with juvenile idiopathic arthritis (JIA) have demonstrated favourable long-term outcomes, they are associated with higher revision rates compared with adult arthroplasty populations. This is primarily attributed to longer patient life expectancy, higher functional demands, and an increased risk of implant wear and loosening⁶. In the present case, the requirement for bilateral hip revision in early adulthood aligns with previous reports demonstrating a significant decline in implant survival beyond 10–15 years in JIA patients, particularly when primary arthroplasty is performed during adolescence⁴.

Revision arthroplasty in this population is technically more demanding than primary procedures. Contributing factors include compromised bone stock, prior implants, periprosthetic osteolysis, and an elevated risk of infection and instability, all of which may adversely affect outcomes⁸. Despite these challenges, the patient achieved satisfactory functional recovery following a staged and meticulously planned surgical strategy, highlighting the importance of multidisciplinary care and individualised rehabilitation in complex JIA cases.

This case underscores the significance of early diagnosis, aggressive medical management, and timely surgical intervention in JIA patients with progressive joint destruction. It further demonstrates that acceptable long-term functional outcomes can still be achieved even in cases requiring multiple joint arthroplasties and revision surgeries, provided that treatment is carefully planned and longitudinally followed.

Conclusion

This case emphasizes the importance of individualised treatment strategies in managing end-stage joint disease in JIA patients. It illustrates the rare and complex surgical course of a young adult with juvenile idiopathic arthritis who underwent staged bilateral total hip and knee arthroplasties followed by bilateral hip revision procedures. Despite substantial anatomical and technical challenges, satisfactory functional outcomes can be achieved through meticulous surgical planning, a multidisciplinary approach, and long-term follow-up.

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