American Journal of Clinical Case Reports

ISSN: 2766-5844

Case Report

Different Joint-Preserving Osteotomies for Each Hip in Bilateral Dysplastic Osteoarthritis: A Case Report

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Abstract

Introduction: Acetabular dysplasia is a major cause of secondary hip osteoarthritis. In young patients' joint preservation is preferred over arthroplasty. When both hips are dysplastic but at different stages, a single operation may not suit both, and using a different joint-preserving procedure for each hip has not been described.

Case presentation: A 42-year-old welder had bilateral dysplastic osteoarthritis at different stages: an under covered early-stage right hip (Tönnis grade 1) and an advanced subluxated left hip (Tönnis grade 2). Functional radiographs showed congruency in abduction on the right and lateral joint space widening in adduction on the left. Staged surgery comprised right rotational acetabular osteotomy and, eight months later, left subtrochanteric valgus femoral osteotomy with shelf acetabuloplasty. At latest follow-up, coverage had improved bilaterally, the left hip showed good remodelling without arthritic progression, and the patient had returned to welding. The Japanese Orthopaedic Association hip score improved from 41 to 95 on the right and 49 to 93 on the left.

Conclusion: When both hips are dysplastic but at different stages, matching the joint-preserving procedure to each hip rather than applying a single operation achieved good mid-term coverage and remodelling, allowing both hips to be preserved in a young patient.

Keywords: Acetabular dysplasia; Secondary hip osteoarthritis; Rotational acetabular osteotomy; Valgus femoral osteotomy; Joint preservation

Introduction

Acetabular dysplasia is a leading cause of secondary osteoarthritis of the hip. In young patients, total hip arthroplasty carries a substantial lifetime risk of wear and revision, so joint preservation is generally preferred. The joint-preserving procedure is chosen according to disease stage and morphology: a reorienting osteotomy such as Rotational Acetabular Osteotomy (RAO) suits a dysplastic hip with little or no arthritic change [1] whereas advanced subluxation-type osteoarthritis may be treated with a valgus femoral osteotomy [2] often combined with shelf acetabuloplasty to augment coverage [3]. When both hips of a young patient are dysplastic but have reached clearly different stages, a single uniform operation may be inappropriate, because the procedure best suited to one hip may not suit the other. The surgeon then faces a choice to accept arthroplasty for the more advanced hip, or to attempt preservation on both sides with procedures that necessarily differ. To our knowledge, the use of a different joint-preserving procedure for each hip in such a patient, preserving both hips rather than proceeding to arthroplasty, has not been reported. We describe such a case with a favourable mid-term outcome.

Citation: Okuda H, Yasunaga Y, Izumi S, Harada T, Yamakido T, Masuda T, et al. Different Joint-Preserving Osteotomies for Each Hip in Bilateral Dysplastic Osteoarthritis: A Case Report. Am J Clin Case Rep. 2026;7(4):1128.

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Publisher Name: Medtext Publications LLC

Manuscript compiled: Oct 27th, 2026

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Case Presentation

A 42-year-old man, a welder, presented with several years of bilateral hip pain and recent worsening on the right. He had no history of developmental dysplasia of the hip. His main wish was to relieve the pain and return to work. On examination the Patrick (flexion–abduction–external rotation) sign was positive bilaterally physiotherapy assessment documented weight-bearing pain in both hips and left hip abductor weakness with trunk lean during left stance. The Japanese Orthopaedic Association (JOA) hip score (maximum 40 for pain, 20 for range of motion, 20 for gait, and 20 for activities of daily living; total 100) was 41(0,15,10,16) points on the right and 49(10,13,10,16) points on the left (Table 1).

Radiographs showed bilateral acetabular dysplasia at different stages (Table 1and Figure 1). The right hip had early arthritic change (Tönnis grade 1) with severe under coverage (Centre-Edge (CE) angle 7°, Sharp angle 48°, Acetabular Head Index (AHI) 60%); on the abduction functional view the femoral head medialised and the joint congruency was excellent according to the classification of Yasunaga, et al. [4] The left hip showed advanced subluxation-type osteoarthritis (Tönnis grade 2, CE angle 0°, Sharp angle 49°, AHI 46%) on the adduction functional view the lateral joint space widened, indicating that congruency was restored only in adduction.

The two hips shared the same underlying dysplasia but had reached different stages, so the joint-preserving procedure was individualised to each side using the functional radiographs, following the established principle that a reorienting procedure suits a joint congruent in abduction whereas a valgus procedure suits one congruent only in adduction. The right hip congruent and medialised in abduction, with a low CE angle and only early arthritic change met the classic indication for RAO [1]. The advanced left hip deformed, subluxated, and congruent only in adduction was treated with a valgus femoral osteotomy to bring the congruent adducted position into the

Table 1: Clinical and radiographic findings for the right and left hips, preoperatively and at the latest follow-up.

	Right hip	Left hip
Preoperative		
Tönnis grade	1	2
CE angle	7°	0°
Sharp angle	48°	49°
AHI	60%	46%
Functional view	abduction: medialisation, congruent	adduction: lateral joint space widened
Patrick sign	positive	positive
JOA hip score	41(0, 15, 10, 16)	49(10,13,10,16)
Procedure	RAO	Subtrochanteric valgus femoral osteotomy 25° + shelf acetabuloplasty (8 months after RAO); HOP system plate 135°
Latest follow-up (4 years 4 months after RAO; 3 years 8 months after the left osteotomy)		
Tönnis grade	1	2
CE angle	31°	35°
Sharp angle	35°	43° (including shelf)
AHI	90%	82%
Joint status	excellent congruency	good remodelling
Patrick sign	negative	negative
Hip flexion	120°	120°
JOA hip score	95(35,20,20,20)	93(35,20,18,20)

AHI: Acetabular Head Index; CE: Centre-Edge; JOA: Japanese Orthopaedic Association; RAO: Rotational Acetabular Osteotomy. Joint status was assessed as congruency (right, per Yasunaga et al. [4]) and as joint remodelling (left). JOA hip scores were obtained at the preoperative physiotherapy assessment and at the latest follow-up.

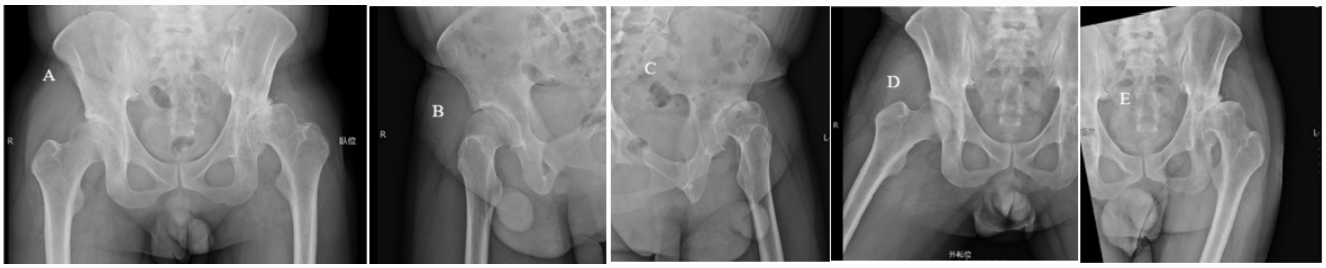


Figure 1: Preoperative radiographs. (a), Anteroposterior view; (b,c), right and left oblique views: right hip dysplasia with early arthritic change, left hip advanced subluxation-type osteoarthritis. (d), Right hip, abduction view: improved congruency. (e), Left hip, adduction view: widening of the lateral joint space.

weight-bearing arc [2]. A valgus osteotomy improves congruency in a deformed head but may leave acetabular cover insufficient because of subluxation, and adding a shelf restores that cover [8]; because the acetabulum remained markedly deficient (AHI 46%), shelf acetabuloplasty was performed, a combination reported to improve results when the AHI is below approximately 60% [3].

A right RAO and a left valgus femoral osteotomy with shelf acetabuloplasty were planned, and the more symptomatic right hip was operated first. Although at an earlier arthritic stage, the right hip retained more of its joint and therefore had more to lose if reorientation were delayed and arthritis progressed; severe under coverage in a dysplastic hip is a recognised predictor of osteoarthritis progression [9]. The advanced left hip, already at Tönnis grade 2, was comparatively less likely to change over the short interval before the second stage. Because the two procedures could not be performed simultaneously, the hip with more to preserve was addressed first, and RAO performed before arthritic change advances yields more durable results [1]. The RAO corrected the CE angle to 31°. Rehabilitation after the RAO began with one-quarter partial weight-bearing at four weeks, one-third at five weeks with crutch-assisted gait, and one-half at 12 weeks; full weight-bearing was permitted at approximately five months. Eight months later the left hip underwent a subtrochanteric valgus femoral osteotomy (25° correction) fixed with a HOP system plate (135°; Teijin Nakashima Medical Co., Ltd., Japan), combined with shelf acetabuloplasty using autologous bone harvested at the osteotomy. After the left osteotomy, one-quarter partial weight-bearing began at five weeks, one-third at six weeks, and one-half at 14 weeks; full weight-bearing was permitted at approximately six months.

The patient returned to welding, at the same or a higher workload than before, approximately 17 months after the RAO and nine months after the left valgus femoral osteotomy. At the latest follow-up, 4 years 4 months after the RAO and 3 years 8 months after the left osteotomy, coverage had improved bilaterally (right AHI 90%, Sharp angle 35° left AHI 82%, CE angle 35°), the right hip maintained excellent joint congruency [4] and the left hip showed good joint remodelling (Figure 2). The Tönnis grade was unchanged on both sides (right grade 1, left grade 2), and both osteotomy sites had united without complication. The JOA hip score was 95(35,20,20,20) points on the right and 93(35,20,18,20) points on the left (Table 1). The patient remains well at 4 years 8 months after the RAO and 4 years after the left osteotomy.

On the left, the aim of the valgus femoral osteotomy was not to restore joint congruity but to alter the loading environment by bringing the hinge-adduction position into weight-bearing, thereby inducing the joint's own repair response [2] the shelf supplemented

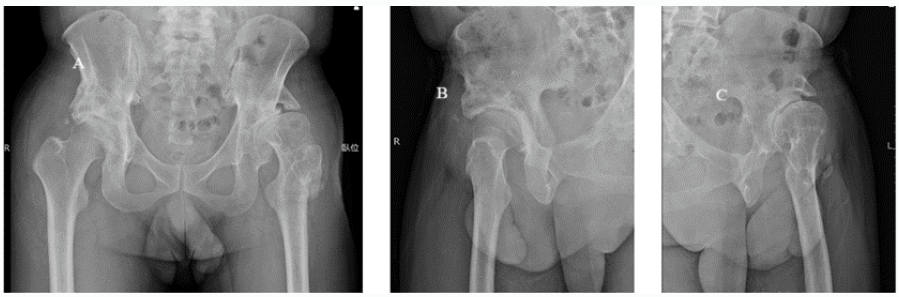


Figure 2: Radiographs at the latest follow-up. (a), Anteroposterior view: coverage improved bilaterally without arthritic progression. (b,c), right and left oblique views: united osteotomies; on the left, the shelf has incorporated with good remodelling.

this by adding extra-articular cover [3]. It is notable that a hip with advanced arthritis (Tönnis grade 2) neither deteriorated nor required conversion to total hip arthroplasty while the patient returned to demanding work. The durability of total hip arthroplasty has improved with modern highly cross-linked polyethylene, with few wear-related revisions beyond 15 years [5] however, survivorship further out is heterogeneous, falling to about 60% at 25-30 years in patients under 55, [6] and in patients under 40 the ten-year revision rate reaches 17% when the diagnosis is dysplasia [7]. By contrast, RAO can preserve a pre-arthritic dysplastic hip for over 30 years [1] which supported joint preservation in this young manual worker. This report is limited to a single case assessed radiographically at mid-term age over 40 years and pre-existing arthritic change are recognised risk factors for later progression [1], so longer follow-up is needed.

Conclusion

In this young patient the two hips shared the same dysplasia but had reached clearly different stages. Each hip was preserved with a different procedure matched to its stage: RAO for the early-stage hip, and valgus femoral osteotomy with shelf acetabuloplasty for the advanced hip. At mid-term follow-up both hips showed improved coverage without arthritic progression, and the patient had returned to demanding work.

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