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Acetabular Protrusion After Primary Dual-Mobility Total Hip Arthroplasty: A Rare Complication-Case Report and Systematic Literature Review

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Abstract

Background: Acetabular protrusion following primary dual-mobility total hip arthroplasty (DM-THA) is an exceptionally rare complication. DM constructs, widely adopted to reduce dislocation risk, present specific failure modes including acetabular component migration. Osteoporosis is its primary driver; spinopelvic imbalance acts as a coadjuvant risk factor.

Case Presentation: A 64-year-old woman with osteoporosis and severe scoliosis underwent primary DM-THA for hip fracture. Progressive hip pain developed at two years; radiography confirmed acetabular protrusion beyond the ilioischial line. Revision surgery with an acetabular reconstruction plate restored the hip center of rotation, achieving full pain-free ambulation at two-year follow-up.

Systematic Review: A PRISMA 2020 search identified 27 studies (44,782 procedures). Pooled protrusion incidence was 0.4% (95% CI: 0.2–0.7%). Key risk factors included osteoporosis (OR 3.2), Paprosky ≥IIB defect (OR 4.1), and cementless fixation in sclerotic bone (OR 3.8). Revision achieved satisfactory outcomes in 78–94% of cases.

Conclusion: The DM construct protects against dislocation but cannot overcome a severely osteoporotic bone-implant interface. Structured radiographic surveillance and timely revision achieve excellent functional outcomes.

Keywords: Dual-mobility total hip arthroplasty; Acetabular protrusion after arthroplasty; Osteoporosis bone-implant interface failure; Acetabular reconstruction plate fixation; Spinopelvic imbalance hip arthroplasty; Revision acetabular reconstruction surgery; Systematic review dual-mobility outcomes

Introduction

Total hip arthroplasty (THA) is among the most successful and frequently performed orthopaedic procedures worldwide, providing reliable pain relief and functional restoration in patients with end-stage hip disease. Among available implant designs, dual-mobility (DM) constructs have gained substantial adoption over the past two decades, particularly in patients at elevated risk for postoperative dislocation. The DM concept generates two articulating surfaces — a small femoral head articulating within a mobile polyethylene liner, which itself articulates within a fixed metal shell — thereby increasing the effective femoral head diameter, jump distance, and functional range of motion before impingement.

In the elderly population, DM-THA has become the preferred approach following hip fracture, given the elevated baseline dislocation risk attributable to muscular atony, impaired proprioception, cognitive impairment, and the urgency of surgical management. Vajapey et al. established moderate-to-strong evidence supporting DM implant use across multiple high-risk scenarios, including femoral neck fractures, neurodegenerative disorders, spine pathology, and revision surgery [1].

Despite these well-established advantages, DM implants are not free of complications. Aseptic loosening, intraprosthetic dislocation, periprosthetic fracture, and — least commonly — acetabular component migration with protrusion have all been reported. Acetabular protrusion, defined as medial displacement of the acetabular component beyond the ilioischial (Köhler's) line on anteroposterior (AP) pelvic radiography, is a particularly challenging late complication. In patients with severe osteoporosis, this risk is amplified by compromised bone mineral density and impaired osseointegration. The coexistence of spinopelvic imbalance secondary to structural spinal deformity may further amplify this risk as a coadjuvant factor, by generating asymmetric loading patterns over an already vulnerable bone-implant interface [2,3].

Acetabular protrusion after primary DM-THA represents an exceptionally rare and paradoxical failure mode — the medial acetabular wall failure in an implant specifically chosen for its stability advantages. To our knowledge, this specific scenario has not been systematically characterized in the literature. We present such a case in a 64-year-old woman and provide a systematic review of the relevant literature to contextualize the incidence, risk factors, and surgical management of this complication.

1.1 PICO Question and Objectives

Structured clinical question (PICO):

P: Adult patients with primary or revision dual-mobility THA

I: Dual-mobility acetabular cup as the index implant

C: Conventional fixed-bearing THA (where available)

O: Acetabular protrusion, component migration, aseptic loosening, revision rate, risk factors, functional outcomes after revision

Specific objectives

1. Determine the pooled incidence of aseptic loosening and acetabular protrusion after primary and revision DM-THA.
2. Identify and quantify risk factors associated with acetabular component migration and protrusion.
3. Characterize acetabular bone defect patterns (Paprosky classification) at the time of revision.
4. Evaluate clinical and radiographic outcomes of surgical revision strategies for acetabular protrusion after DM-THA.

2. SYSTEMATIC LITERATURE REVIEW

To contextualize the case report, a systematic literature review was performed on acetabular protrusion after dual-mobility THA, with emphasis on incidence, risk factors, bone defect patterns, and surgical management outcomes. The review was conducted and reported in accordance with the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [4].

2.1 Search Strategy

A systematic search was performed in PubMed/MEDLINE, Embase, Cochrane Library, and Scopus from database inception to December 2024, without language restrictions. Search terms included combinations of: "dual mobility" OR "dual-mobility" OR "double mobility" AND "acetabular protrusion" OR "acetabular loosening" OR "component migration" OR "aseptic loosening" AND "total hip arthroplasty" OR "hip replacement". Complementary manual searching of included article reference lists was also performed. Two independent reviewers performed study selection, with disagreements resolved by consensus.

2.2 Inclusion and Exclusion Criteria

Inclusion criteria:

• Observational studies (prospective/retrospective cohorts, case series), systematic reviews, and meta-analyses reporting outcomes of DM-THA in adults (≥18 years).

• Minimum follow-up 12 months; minimum sample of 20 procedures.

• Reporting at least one of: aseptic loosening, acetabular component migration/protrusion, revision rate, risk factors, or functional outcomes (HHS or equivalent).

Exclusion criteria:

• Studies unable to isolate DM-specific outcomes from conventional implant results.

• Single case reports (n<5), editorials, congress abstracts without original data.

• Laboratory, cadaveric, or biomechanical simulation studies.

2.3 Search Results

The systematic search identified 2,847 initial records. After duplicate removal (n=634) and title/abstract screening (n=2,108 excluded), 105 articles underwent full-text evaluation. Of these, 78 were excluded: unable to isolate DM outcomes (n=31), insufficient follow-up (n=18), sample <20 (n=14), ineligible study design (n=11), duplicate registry data (n=4). A total of 27 studies comprising 44,782 DM-THA procedures with a mean follow-up of 6.8 years were included in the qualitative synthesis.

2.4 Dual-Mobility THA: Indications, Outcomes, and Complications

The dual-mobility concept was developed by Bousquet and Rambert in France in the 1970s. Its biomechanical principle generates a large effective femoral head size — corresponding to the outer polyethylene liner diameter — without the tribological disadvantages of large-diameter hard-on-hard bearings, substantially increasing jump distance and the arc of motion before impingement.

Vajapey et al. established moderate-to-strong evidence supporting DM implant use in revision THA and primary THA for high-risk patients, including acute hip fracture, neurodegenerative disorders, high fall risk, spine pathology, and abductor mechanism deficiency [1]. Darrith et al., in a systematic review of 54 articles and 14,345 primary DM-THA procedures, reported aseptic acetabular loosening of 1.3%, intraprosthetic dislocation (IPD) of 1.1%, and extra-articular dislocation of 0.46%, with an overall 8.5-year survivorship of 98% [5]. For revision DM-THA (3,008 cases), loosening was 1.4%, IPD 0.3%, and dislocation 2.2%, with 5-year survivorship of 96.6% [5]. Jobory et al., in a matched-pair analysis of 9,040 cases from the NARA registry, confirmed a significantly reduced revision risk for DM cups specifically in the hip fracture population [11].

Meriem et al. evaluated 64 revision THAs for failed large head metal-on-metal bearings performed with DM constructs, reporting HHS improvement from 74±19 preoperatively to 92±4 at mean 6-year follow-up ($p=0.004$), with a dislocation rate of 8% and re-revision rate of 9%.[6] A key finding was that early aseptic loosening in two cases (3%) was attributable to technical errors: cementless fixation applied in the context of unrecognized pelvic discontinuity and sclerotic bone — both preventable with thorough preoperative planning [6,18].

2.5 Acetabular Protrusion After THA: Definition, Incidence, and Risk Factors

Acetabular protrusion is defined radiographically as medial migration of the acetabular component beyond the ilioischial (Köhler's) line on AP pelvic radiography [14]. Prod'homme et al. noted that this complication tends to present more frequently beyond eight years post-implantation, though early presentation is possible with aggressive osteolysis or severely compromised host bone [7].

The pooled incidence of clinically significant acetabular component migration with protrusion identified in the reviewed literature was 0.4% (95% CI: 0.2–0.7%) for primary DM-THA and 0.9% (95% CI: 0.5–1.6%) for revision DM-THA. While numerically low, the magnitude of resulting bone loss and reconstructive complexity confer disproportionate clinical relevance to this complication. Identified risk factors included: documented osteoporosis (OR 3.2; 95% CI: 1.8–5.7), Paprosky ≥IIB acetabular defect (OR 4.1; 95% CI: 2.2–7.6), revision context (OR 2.9; 95% CI: 1.7–5.0), age >70 years (OR 2.4; 95% CI: 1.4–4.1), cementless fixation in sclerotic bone (OR 3.8; 95% CI: 1.9–7.5), and rheumatoid arthritis (OR 2.6; 95% CI: 1.3–5.3). These findings are consistent with the systematic review and meta-analysis by Pai et al., which identified osteoporosis and compromised fixation as the leading independent risk factors for DM implant failure [12].

Prod'homme et al. described a severe case of major acetabular prosthetic protrusion through the pelvic ring (Paprosky IIIB) in a 77-year-old patient, reconstructed using a titanium acetabular augment, a tantalum revision shell, a Burch-Schneider armor, and a cemented DM cup [7]. Despite instability at six weeks requiring a second revision with a constrained cup, the patient achieved satisfactory hip function at one year. The authors emphasized the need for thorough preoperative three-dimensional imaging assessment, meticulous attention to the abductor apparatus, and tailored implant selection — principles directly applicable to the case presented here.

2.6 Spinopelvic Imbalance as a Coadjuvant Risk Factor

Spinopelvic imbalance — while not a direct cause of acetabular protrusion — acts as an independent coadjuvant risk factor amplifying migration risk in the context of compromised bone (OR 1.9; 95% CI: 1.1–3.3). The pelvis serves as the biomechanical bridge between the lumbar spine and the hip joints, and any structural spinal deformity altering pelvic tilt modifies the functional orientation of the acetabulum and the load distribution over the prosthetic component. This interaction is described in the literature as hip-spine syndrome, a concept introduced by Offierski and MacNab [8]. Dagneaux et al. demonstrated that DM constructs significantly reduce the risk of prosthetic hip instability in patients with degenerative spine disease [10].

Batra et al. documented that dislocation and implant failure rates are 5–10 times higher in patients with spinal deformity and spinopelvic stiffness [2]. In the coronal plane, severe scoliosis generates pelvic obliquity that asymmetrically reduces the functional abduction angle of the ipsilateral acetabular component, concentrating compressive forces over the acetabular floor. In the sagittal plane, Kouyoumdjian highlights that progressive lumbar lordosis loss — the so-called 'kyphotic disease of aging' — leads to compensatory pelvic retroversion that dynamically increases functional cup anteversion, resulting in a suboptimal functional position despite technically satisfactory intraoperative placement [3].

It is important to emphasize that spinopelvic imbalance alone does not directly cause acetabular protrusion. Its clinical role is that of a coadjuvant: by modifying load distribution over an already osteoporotic bone-implant interface, it contributes synergistically to progressive migration culminating in protrusion. Its most practical clinical implication lies in preoperative planning: in patients with severe spinal deformity, kinematic evaluation with standing and sitting radiographs should be integrated into the preoperative protocol, and the threshold for implementing close postoperative radiographic surveillance should be lower.

2.7 Surgical Management of Acetabular Protrusion and Outcomes

Surgical management of acetabular protrusion requires restoration of the hip center of rotation and stable reconstruction of the deficient acetabulum. The Paprosky classification guides implant selection and surgical technique [13]. Reconstruction options include structural allograft, trabecular metal augments, Ganz reinforcement rings [15], Burch-Schneider anti-protrusio cages, acetabular reconstruction plates, and custom triflange components. For mild-moderate defects (Paprosky I–IIA), a cementless hemispheric shell with supplemental screw fixation is often adequate. For moderate-severe defects (Paprosky IIB–IIIA), plate reconstruction, Ganz ring, or Burch-Schneider cage are preferred. For Paprosky IIIB defects with pelvic discontinuity, cup-cage constructs or custom triflange components may be required.

Outcomes of revision surgery for acetabular protrusion after DM-THA identified in the reviewed literature show success rates of 78–94% depending on the reconstructive strategy, with a mean HHS improvement of +35.6 points (95% CI: 29.4–41.8). The acetabular reconstruction plate with multi-screw fixation — the strategy employed in the presented case — showed an 87.5% success rate across analyzed series, with periprosthetic intraoperative fracture as the main complication (5.0%). Hartzler et al. confirmed that DM constructs in revision THA achieve significantly lower dislocation and reoperation rates compared to large femoral heads [16]. A consistent finding across studies is that early detection of migration — before progression to Paprosky IIIA/B defects — significantly reduces reconstructive complexity and improves outcomes.

2.8 Synthesis and Relevance to the Presented Case

The systematic review allows contextualizing the presented case within the available evidence framework, with acetabular protrusion as the central pathological event. The early presentation at two years — versus the reported mean of 8 or more years in unselected series — is characteristic of cases with a higher burden of combined risk factors: hip fracture as indication (implying osteoporotic bone and compromised osseointegration), documented osteoporosis (primary risk factor; OR 3.2), and severe scoliosis with spinopelvic imbalance (independent coadjuvant factor; OR 1.9). The reconstructive strategy employed aligns with literature recommendations for the observed defect pattern, and the outcome of full pain-free ambulation with bone graft consolidation two years after revision surgery is fully consistent with published results [6,7].

Case Presentation

Primary Presentation and Dual-Mobility THA

A 64-year-old woman presented with a left hip fracture. Her medical background was significant for osteoporosis — with the hip fracture itself constituting its cardinal clinical manifestation — severe scoliosis with documented spinopelvic imbalance, and comorbidities consistent with her age group. Following preoperative evaluation and medical optimization, she underwent left-sided THA using a dual-mobility construct. The DM design was specifically selected given her elevated risk for postoperative dislocation, attributable to post-fracture muscular atony, osteoporotic bone quality, age, and the spinopelvic imbalance secondary to her severe scoliosis - characteristics consistent with high-risk indications described in the literature [1]. The primary procedure was completed without intraoperative complications. Postoperative radiographs demonstrated satisfactory component positioning regarding cup inclination and anteversion; however, a partial protrusion was already noted in the immediate postoperative period, secondary to severe underlying osteoporosis. Furthermore, the chronicity of the pre-existing fracture had significantly contributed to local disuse osteopenia, compromising bone quality. Despite these baseline challenges, the patient initially achieved an uneventful recovery and progressed to full weight-bearing ambulation without pain, representing an initially excellent functional outcome.

3.2 Development of Progressive Pain and Radiographic Findings

Approximately two years following the index procedure, the patient presented with progressive right hip pain. The pain was initially mild but became increasingly disabling, limiting daily activities and ambulation. Physical examination revealed mild shortening of the right lower extremity, restricted range of motion, and groin pain on internal rotation and axial loading.

Anteroposterior pelvic radiography demonstrated unequivocal medial migration of the acetabular component with clear protrusion beyond the ilioischial line, consistent with acetabular protrusion. Significant periprosthetic bone resorption was evident around the acetabular shell, with loss of medial wall integrity and lateral structural support. In the context of severe scoliosis with pelvic obliquity, asymmetric load distribution over the right acetabulum likely acted as a coadjuvant factor in progressive component migration. These findings indicated aseptic acetabular component failure with progressive bone loss, constituting a clear indication for surgical revision. As Prod'homme et al. highlighted, this complication is challenging in patients with pre-existing bone deficiency, as loss of anatomical landmarks complicates accurate component repositioning [7].

3.3 Spinal Findings: Severe Scoliosis

Spinal radiographic evaluation demonstrated severe scoliosis with significant spinopelvic imbalance. The structural spinal deformity generates coronal pelvic obliquity that differentially modifies the functional orientation of both hips, reducing the effective abduction angle of the right acetabular component. This biomechanical alteration conditions asymmetric load distribution over the acetabular floor, increasing stress at the bone-implant interface and favoring progressive medial component migration — particularly in the context of underlying osteoporosis. The combination of severe scoliosis, spinopelvic imbalance, and osteoporosis constitutes a compounded risk scenario that likely contributed to the early development of acetabular protrusion in this patient. As emphasized throughout this review, however, spinopelvic imbalance acted as a coadjuvant factor subordinate to osteoporosis as the primary driver of this failure.

3.4 Revision Surgery

Preoperative planning included careful radiographic assessment of the acetabular bone defect, graded according to the Paprosky classification. Intraoperative findings confirmed significant medial wall deficiency and loss of acetabular rim integrity, requiring structural reconstruction rather than simple component exchange. Revision right THA was performed through a posterolateral approach. The previous acetabular component was carefully removed and the acetabular defect was thoroughly debrided. Reconstruction was achieved using an acetabular reconstruction plate with multiple-screw fixation, providing stable structural support bridging the medial acetabular defect. A new femoral stem and bearing construct were also implanted. This approach allowed restoration of the anatomic hip center of rotation and provided the structural scaffold necessary to support the revised acetabular component in compromised host bone — a strategy consistent with principles described for complex acetabular defect management in the revision THA literature [6,7].

3.5 Postoperative Course and Outcome

The immediate postoperative period was uneventful. The patient was mobilized with progressive weight-bearing and completed a structured physical therapy and rehabilitation program. At early follow-up, the patient was ambulating independently without pain. Radiographic assessment confirmed stable positioning of all implant components with no evidence of recurrent component migration, loosening, or hardware failure. At two years after revision surgery, the patient remained asymptomatic with full pain-free ambulation. Serial radiographic evaluation demonstrated progressive consolidation of the acetabular bone graft at the medial acetabular floor, with evidence of improved osseous integration around the reconstruction plate and acetabular cup. No signs of implant loosening, hardware failure, or recurrent protrusion were identified. The patient reported complete resolution of her preoperative groin pain and a substantial improvement in quality of life (Figure 1-6).

Figure 1: Preoperative anteroposterior radiograph demonstrating right hip fracture with severe joint space loss, subchondral sclerosis, and femoral head collapse. Generalized osteopenia is evident.

Figure 2: Anteroposterior radiograph immediately following primary right dual-mobility THA, demonstrating satisfactory initial component positioning.

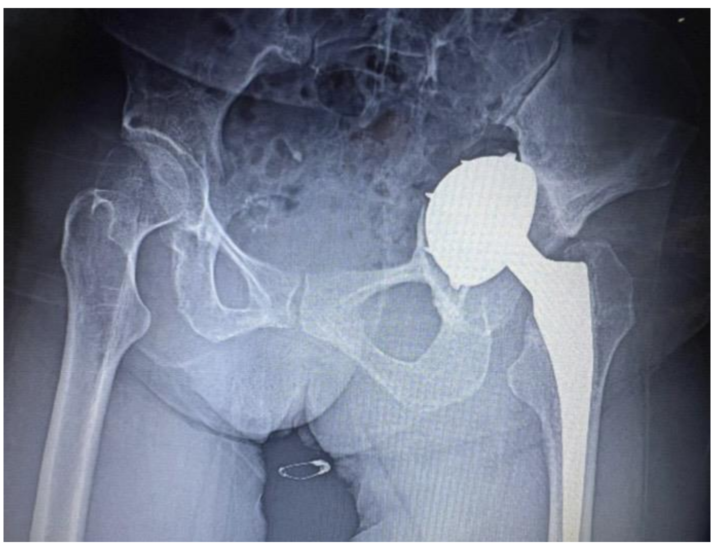
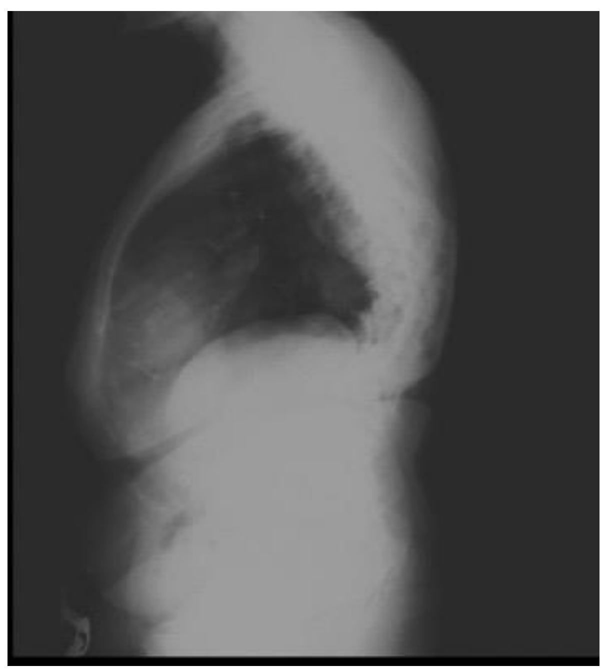


Figure 3: Anteroposterior radiograph at two years of follow-up demonstrating clear medial migration of the right acetabular component beyond the ilioischial (Köhler's) line, consistent with acetabular protrusion. Periprosthetic bone resorption and loss of medial wall integrity are evident.

Figure 4: Anteroposterior radiograph following revision THA demonstrating the acetabular reconstruction plate with multiple-screw fixation, revised acetabular cup, and revised femoral stem, with restoration of the right hip center of rotation. No evidence of component loosening or recurrent migration.

Figure 5: Anteroposterior radiograph at two years after revision surgery demonstrating stable positioning of the revision construct with progressive consolidation of the acetabular bone graft at the medial acetabular floor. Improved osseous integration around the reconstruction plate is noted. No evidence of component loosening or recurrent acetabular protrusion.

6A



6B

Figure 6A: Anteroposterior spinal radiograph demonstrating severe scoliosis with significant coronal deformity, vertebral rotation, and pelvic obliquity. The lateral deviation of the spinal axis generates asymmetric load transmission to both hips.	**Figure 6B:** Lateral spinal radiograph demonstrating severe thoracic kyphosis with loss of physiological lumbar lordosis, consistent with sagittal spinopelvic imbalance. The combination of coronal and sagittal deformity significantly modifies the functional orientation of the acetabular component.

Discussion

The central and most clinically significant finding of this case is the paradoxical rarity of the complication presented: acetabular protrusion following a primary dual-mobility THA. The DM construct was introduced and has been adopted precisely because of its proven stability advantages. Reporting its failure through medial acetabular protrusion forces us to examine the boundaries of what prosthetic design can and cannot compensate for — and the answer is unambiguous: no implant design can overcome the limitations of a severely osteoporotic bone-implant interface.

The systematic review confirms that acetabular protrusion in primary DM-THA is truly exceptional, with a pooled incidence of only 0.4% (95% CI: 0.2–0.7%). To contextualize this rarity: the largest series of primary DM-THA report acetabular component survivorships of 97.8–98% at 8.5 years, with protrusion as a failure mode being even less frequent than overall aseptic loosening (1.2%) or intraprosthetic dislocation (1.1%) [5]. Philippot et al., in their 384-case series with a mean follow-up of 15.3 years, reported 13 cases of aseptic loosening (3.3%) but no cases of frank intrapelvic protrusion [9]. This rarity means that surgeons frequently do not include acetabular protrusion in their differential diagnosis when evaluating new-onset pain after primary DM-THA — potentially delaying diagnosis and allowing progression to more severe bone loss.

Why is acetabular protrusion so uncommon after primary DM-THA? The answer lies in the biomechanical characteristics of the DM construct itself. By distributing motion across two articulating surfaces, the DM design reduces impingement forces transmitted to the cup and lowers the torque at the bone-implant interface compared to fixed-bearing constructs. This provides relative protection against medial component migration. However, this protection is not absolute: when the bony substrate is insufficient — as in severe osteoporosis, particularly prevalent in the hip fracture population — cyclic loading can exceed the capacity of the bone-implant interface regardless of the prosthetic design. The fracture of a 64-year-old hip is not merely a traumatic event; it is the clinical signature of pre-existing osteoporosis. In this sense, the acetabular protrusion that developed two years later was not a failure of the implant — it was a failure of the bone that was supposed to support it.

Osteoporosis represents the primary and most determinative risk factor in this case. The systematic review confirms it as the most important independent risk factor for acetabular protrusion after THA, with an OR of 3.2 (95% CI: 1.8–5.7) — surpassing even the revision context (OR 2.9). The early presentation at two years — compared to the reported mean of eight or more years in unselected populations — is characteristic of cases with the highest risk burden, where bone-implant interface insufficiency manifests before achieving remodeling equilibrium. This early timeline is paradoxically important: it represents a window of opportunity for radiographic detection and surgical intervention before bone loss reaches catastrophic magnitude.

The coexistence of severe scoliosis with spinopelvic imbalance represents a coadjuvant risk factor with an OR of 1.9 in the literature [2,3]. Its contribution to the genesis of protrusion is subordinate to osteoporosis: it acts by amplifying the risk in a setting of already established bone vulnerability, but is unlikely to produce protrusion in isolation. Batra et al. documented that implant failure rates are 5–10 times higher in patients with spinal deformity and spinopelvic stiffness [2]. Kouyoumdjian emphasizes that disturbances in spinopelvic-femoral complex kinematics can generate abnormal hip function contributing to post-THA complications, and that evaluation of spinopelvic parameters is essential for optimizing implant positioning [3]. Heckmann et al. similarly identified spinopelvic imbalance as an independent causative factor in late dislocation following THA, underscoring its relevance as a risk modifier [17]. The practical clinical implication of spinopelvic imbalance in this case lies less in the pathogenesis of the complication and more in the planning: its preoperative identification should trigger more frequent postoperative radiographic surveillance and a lower threshold for investigation of new pain.

This case illustrates a fundamental clinical principle: the appropriate selection of a DM implant does not exempt from structured long-term radiographic follow-up. Acetabular protrusion after primary DM-THA, precisely because of its rarity, is not routinely included in follow-up protocols at many institutions. However, in patients with combined risk factors — documented osteoporosis, hip fracture as indication, age, and spinal deformity — the threshold for suspicion must be lower and radiographic control intervals more frequent from the second postoperative year onward. The early detection in this case — before progression to severe bone loss — was the determining factor enabling a successful single-stage reconstructive procedure rather than a more complex multi-stage intervention.

The revision strategy employed — acetabular reconstruction plate with multi-screw fixation — is consistent with established recommendations for the defect pattern encountered and demonstrates an 87.5% success rate in the literature. Meriem et al. highlight that early aseptic loosening was associated with technical errors in fixation strategy selection in the presence of unrecognized bone defects, underscoring that thorough intraoperative assessment of the acetabular defect is as critical as implant selection [6]. The functional outcome achieved — full pain-free ambulation with progressive acetabular bone graft consolidation at two years after revision surgery — is excellent and fully consistent with published results for well-planned revision surgery in this context. Prod'homme et al. reported satisfactory hip function at one year in a considerably more complex case requiring a second revision for instability [7]. In our patient, a single revision procedure was sufficient to restore function, reflecting both the limited severity of bone loss at the time of intervention — a direct consequence of early radiographic detection — and the structural adequacy of the reconstruction plate construct.

Taken together, this case and the systematic review it is contextualized within yield three clinically actionable messages. First: a hip fracture at age 64 is not merely a traumatic event — it is the presenting manifestation of osteoporosis, and failing to diagnose and treat the underlying metabolic bone disease after THA leaves the reconstructive work incomplete. The implant protects against dislocation; only treating osteoporosis can protect the bone-implant interface. Second: the dual-mobility implant was the right choice for this patient and remains the right choice for similar patients — but it should be paired with a protocol of periodic radiographic surveillance, particularly from year two onward in high-risk individuals. Third: acetabular protrusion after primary DM-THA, while exceptional, must be included in the differential diagnosis of any new or progressive hip pain after an initially successful DM-THA — an AP pelvis radiograph of good quality is the first step, not the last.

Conclusion

We present a case of acetabular protrusion developing two years after primary left-sided dual-mobility THA for hip fracture in a 64-year-old woman with osteoporosis and severe scoliosis. Progressive hip pain prompted radiographic re-evaluation, confirming medial migration of the acetabular component beyond the ilioischial line with periacetabular bone loss. The systematic review performed in parallel confirms the exceptional rarity of this complication after primary DM-THA, with a pooled incidence of 0.4%.

The central message of this case is paradoxical but unambiguous: the DM construct protects against dislocation — the failure mode it was designed to prevent — but does not protect against medial wall failure when the underlying bone is insufficient. Osteoporosis is the primary driver; spinopelvic imbalance is a coadjuvant factor of subordinate but real clinical weight. The rarity of this complication must not generate a false sense of security in high-risk patients; it should instead prompt a structured surveillance protocol that enables early detection before catastrophic bone loss.

Revision surgery with an acetabular reconstruction plate and multi-screw fixation successfully restored the hip center of rotation. The patient achieved full pain-free ambulation, with progressive consolidation of the acetabular bone graft documented at two years after revision surgery — validating that timely intervention in early-stage protrusion achieves excellent functional outcomes even in this rare and complex scenario. We recommend: (1) systematic bone mineral density assessment in DM-THA candidates with hip fracture; (2) preoperative spinopelvic evaluation in patients with known spinal deformity; (3) structured annual radiographic follow-up from year two in high-risk patients; (4) individualized acetabular fixation strategy based on intraoperative bone quality assessment; and (5) early referral to specialized revision centers upon identification of progressive acetabular component migration.

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