

Total Hip Arthroplasty for Advanced Femoral Head Osteonecrosis in a 24-Year-Old Competitive Wrestler: A Case Report

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Learning Point of the Article:

In this young, high-demand athlete, advanced femoral head collapse with secondary degenerative change made joint-preserving procedures less predictable, and total hip arthroplasty (THA) provided sustained pain relief and functional recovery through 9 months. The patient had resumed wrestling matches by 9 months without reported hip-related symptoms. This case should not be interpreted as evidence that THA is superior to joint-preserving surgery or as a general recommendation for young athletes.

Abstract

Introduction: Osteonecrosis of the femoral head (ONFH) in young, physically active patients poses a substantial diagnostic and therapeutic challenge. Joint-preserving surgery is generally preferred before femoral head collapse; however, advanced post-collapse disease with secondary degenerative change may make these options less predictable. We report a competitive wrestler with advanced ONFH in whom early total hip arthroplasty (THA) was selected after consideration of joint-preserving alternatives. The case is also notable for potential etiologic contributors, including approximately 7 months of prednisone exposure and heterozygous Factor V Leiden; the remainder of the documented thrombophilia work-up was negative.

Case Report: A 24-year-old male competitive freestyle wrestler presented with a 6-month history of insidious right groin pain. Imaging demonstrated extensive femoral head osteonecrosis with collapse and early secondary degenerative change. He underwent cementless THA through a posterior approach. At 6 months, the Harris hip score improved from 72 to 94, with substantial improvement in pain and hip range of motion. At 9 months, the clinical scores and range of motion remained approximately unchanged, post-operative radiographs remained normal, and the patient had resumed wrestling matches without reported hip-related problems.

Conclusion: This case illustrates that THA may be a reasonable, case-specific option for a young high-demand athlete with advanced post-collapse ONFH when joint preservation is considered unlikely to provide a predictable result. The 9-month outcome demonstrates sustained early-to-intermediate functional recovery in this individual, including return to wrestling matches, but it does not establish long-term implant survivorship, safety of contact sport, or superiority over joint-preserving procedures. Longer follow-up and comparative studies are required before routine early THA can be recommended in young athletes.

Keywords: Osteonecrosis of the femoral head, total hip arthroplasty, avascular necrosis, young athlete, wrestler, femoral head collapse.

Introduction

Osteonecrosis of the femoral head (ONFH) in young adults can progress to femoral head collapse and secondary osteoarthritis [1,2]. Joint-preserving procedures, including core

decompression, bone grafting, vascularized grafting, and proximal femoral osteotomy, are primarily intended to delay or avoid arthroplasty, particularly before collapse [3-6]. Once substantial collapse or secondary degenerative change is present,

Author's Photo Gallery



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the predictability of these procedures decreases, although selected post-collapse patients may still be candidates for head-preserving reconstruction [3,5,6]. In this patient, potential etiologic contributors included approximately 7 months of prednisone exposure and heterozygous Factor V Leiden rather than a strictly idiopathic diagnosis. The remainder of the documented thrombophilia evaluation was negative. Both corticosteroid exposure and thrombophilic states have been associated with ONFH, but the contribution of either factor in an individual patient cannot be established from a single case [7-9]. We therefore present this case as a case-specific treatment decision rather than evidence of superiority of total hip arthroplasty (THA) over joint-preserving surgery.

Case Report

Patient profile and history

A 24-year-old male competitive freestyle wrestler (74 kg weight class) presented with a 6-month history of insidious right groin pain, initially attributed to muscular strain. The pain became constant and progressively limited hip flexion and internal rotation. He reported taking oral prednisone 20 mg/day for approximately 7 months for allergic rhinitis, corresponding to an estimated cumulative exposure of approximately 4.2 g prednisone-equivalent if the reported daily dose was maintained throughout this period. He was subsequently found to be heterozygous for Factor V Leiden. The documented thrombophilia work-up was otherwise negative, including evaluation for other inherited and acquired hypercoagulable conditions. There was no history of trauma, significant alcohol use, sickle cell disease, or systemic lupus erythematosus (Table 1).

The corticosteroid exposure and Factor V Leiden status were considered potential contributors rather than definitive causes. The approximately 4.2 g cumulative prednisone-equivalent exposure represents a substantially longer exposure than previously described in the case, but a causal dose-response relationship cannot be established from this individual case. The thrombophilia evaluation was negative apart from Factor V Leiden heterozygosity, and therefore no additional inherited or acquired thrombophilic abnormality was identified.

Physical examination

Pre-operative range of motion of the right hip was as follows: flexion 110° (painful at end-range), internal rotation 15° (markedly restricted), external rotation 25°, and abduction 35°. The flexion, abduction, and external rotation (FABER) and log-roll tests were both positive.

Plain radiographs demonstrated flattening of the superolateral femoral head, a subchondral crescent sign, and early joint-space narrowing (Fig. 1a). Magnetic resonance imaging (MRI) revealed an extensive lesion involving more than 50% of the femoral head, with subchondral collapse, extensive bone marrow edema, a double-line sign on T2-weighted fat-suppressed sequences, and secondary chondral thinning (Fig. 1b and c). The collapse component met the criteria for late Association Research Circulation Osseous (ARCO) Stage III (Stage IIIB, >2 mm depression); however, because the radiographs also demonstrated joint-space narrowing/secondary degenerative change, the final stage was classified as ARCO Stage IV under the 2019 revised ARCO system [10]. No post-operative MRI was performed; post-operative assessment was based on serial plain radiographs and clinical evaluation.

Right-sided advanced ONFH with post-collapse deformity and secondary osteoarthritis, classified as ARCO Stage IV (with ARCO Stage IIIB collapse features)/Ficat Stage III, with potential corticosteroid and thrombophilic contributors.

Despite the patient's young age, joint-preserving options were considered. Core decompression is best supported for pre-collapse disease, whereas vascularized bone grafting and osteotomy may be considered in selected post-collapse hips but have heterogeneous results and greater technical demands [3,5,6]. In this patient, more than 2 mm of femoral

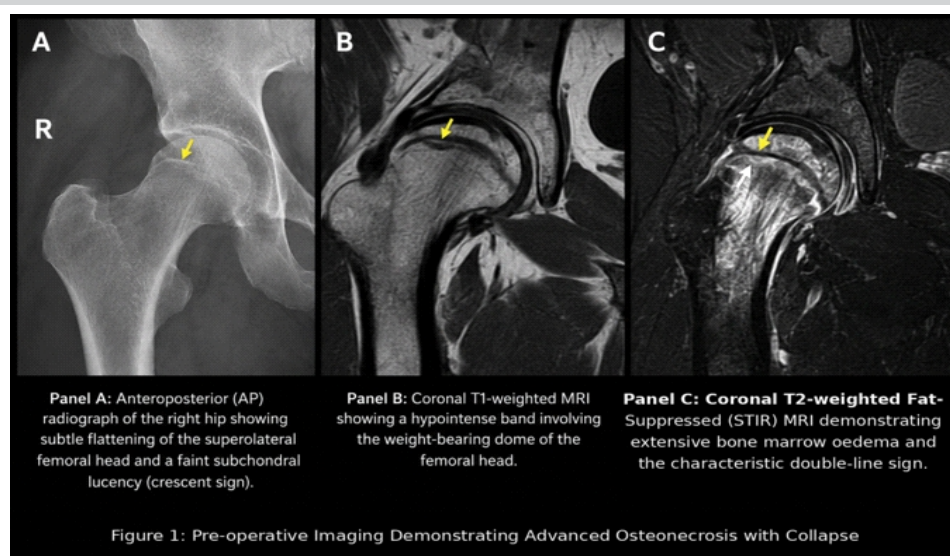


Figure 1: (a, b, and c) pre-operative imaging demonstrating advanced osteonecrosis of the right femoral head with collapse and secondary degenerative change.

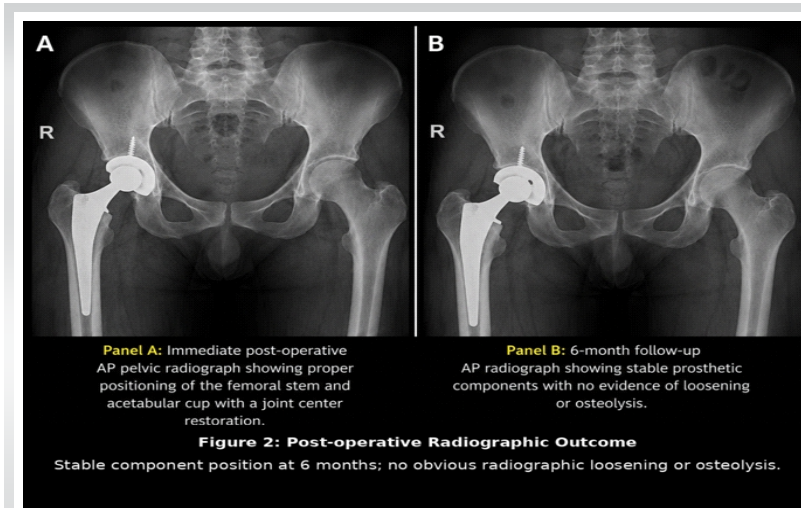


Figure 2: Post-operative radiographic outcome following total hip arthroplasty. The figure shows immediate post-operative and 6-month representative radiographs; radiographs at 9 months were also normal, with stable component position and no obvious radiographic loosening or osteolysis.

head flattening, involvement of more than 50% of the femoral head, early acetabular chondral compromise, and the requirement for reliable restoration of high-demand function made the expected result of joint-preserving surgery less predictable. THA was therefore selected after discussion of the alternatives, including the potential for later revision in a 24-year-old patient. This was a case-specific treatment decision and not a conclusion that THA is superior to all joint-preserving procedures. The patient subsequently underwent cementless THA through a minimally invasive posterior approach; the surgical details and prosthetic components are summarized in Table 3.

At 6-month follow-up, the patient reported minimal pain and near-full range of motion. The Harris hip score (HHS) [11] improved from 72/100 (fair) to 94/100 (excellent), and the Merle d'Aubigné-Postel score [12] improved from 11/18 (moderate) to 17/18 (excellent). Pain on the Visual Analogue Scale (VAS) fell from 7/10 to 1.5/10. Internal rotation improved from 15° to 35°, flexion from 110° to 135°, external rotation from 25° to 40°, and abduction from 35° to 50° (Table 2). At 9 months, these scores and range-of-motion measurements remained approximately unchanged from the 6-month assessment. Serial post-operative plain radiographs, including the 9-month assessment, showed stable, well-positioned components without obvious radiographic loosening, osteolysis, or other abnormality (Fig. 2). No post-operative MRI was performed. Objective endurance testing was performed as part of the sports assessment and did not identify a clinically significant endurance

limitation. The patient had progressed from supervised drills to participation in wrestling matches by 9 months and reported no hip-related problems.

THA was traditionally reserved for older patients due to concerns regarding long-term component survivorship [13,14]. Contemporary cementless fixation and highly cross-linked polyethylene have broadened its use in younger patients with advanced ONFH [15], but long-term revision remains an important concern. Contemporary systematic reviews demonstrate substantial functional improvement after THA in young patients, while also showing that survivorship and complication profiles vary with age, diagnosis, implant design, and duration of follow-up [16,17]. These data provide context for counseling but cannot be used to predict the long-term outcome of this individual 24-year-old patient. The present 9-month radiographic stability is reassuring but remains insufficient to assess

polyethylene wear, osteolysis, aseptic loosening, instability, or lifetime revision risk.

In this case, the marked improvement in HHS and Merle d'Aubigné-Postel score illustrates restoration of pain-free function, but these general hip scores do not by themselves establish wrestling-specific performance. Athlete-focused instruments such as the Kerlan-Jobe Orthopaedic Clinic (KJOC) athletic hip score and activity scales such as the University of California, Los Angeles (UCLA) activity scale or the High-Activity Arthroplasty Score (HAAS) can provide additional information about sport participation and activity

Table 1: Patient demographics and risk-factor profile

Parameter	Details
Age/sex	24-year-old male
Occupation/sport	Competitive freestyle wrestler (74 kg class)
Affected side	Right hip
Duration of symptoms	6 months (insidious onset)
Key risk factors	Prednisone 20 mg/day for ~7 months (estimated cumulative exposure ~4.2 g if the reported daily dose was maintained); heterozygous Factor V Leiden. Other documented inherited/acquired thrombophilia testing was negative. These findings are considered potential contributors, not proven causes.
Excluded causes	Trauma, significant alcohol use, sickle cell disease, systemic lupus erythematosus; other inherited/acquired thrombophilia testing negative.
Diagnosis	Advanced osteonecrosis of the femoral head with potential corticosteroid/thrombophilic contributors; not classified as strictly idiopathic.
Staging	ARCO Stage IV (with Stage IIIB collapse features)/Ficat Stage III.

Table 2: Pre- and post-operative functional outcomes with 9-month follow-up

Outcome measure	Pre-operative	Post-operative (6 months)	Post-operative (9 months)	Change
Harris hip score	72/100 (Fair)	94/100 (Excellent)	Approximately unchanged from 6 months	+22 points at 6 months; maintained at 9 months
Merle d'Aubigné-Postel score	11/18 (Moderate)	17/18 (Excellent)	Approximately unchanged from 6 months	+6 points at 6 months; maintained at 9 months
Visual analogue scale pain	07-Oct	1.5/10	Approximately unchanged from 6 months	-5.5 points at 6 months; maintained at 9 months
Flexion	110°	135°	Approximately unchanged from 6 months	+25° at 6 months; maintained at 9 months
Internal rotation	15°	35°	Approximately unchanged from 6 months	+20° at 6 months; maintained at 9 months
External rotation	25°	40°	Approximately unchanged from 6 months	+15° at 6 months; maintained at 9 months
Abduction	35°	50°	Approximately unchanged from 6 months	+15° at 6 months; maintained at 9 months
Return to activity	Limited to light training	Supervised light wrestling drills	Participation in wrestling matches by 9 months; no hip-related issues reported	Progressed from supervised drills to matches
Athlete-specific activity score (e.g., KJOC/HAAS)	Not collected	Not collected	Not collected	Not available
Objective sport-performance testing	Not performed	Not performed	Objective endurance testing performed; no clinically significant endurance limitation reported	Endurance assessment completed
HAAS: High-activity arthroplasty score, KJOC: Kerlan-Jobe orthopedic clinic athletic hip score				

progression rather than an assumption that contact sport is universally safe. In this individual, the patient progressed to wrestling matches by 9 months without reported symptoms or clinical problems. Nevertheless, 9 months remains insufficient to evaluate long-term polyethylene wear, osteolysis, aseptic loosening, instability, periprosthetic fracture, or revision risk.

Rehabilitation and return-to-sport assessment: The post-operative rehabilitation framework was structured in phases consistent with published THA rehabilitation literature [21,22] (Table 4). Early rehabilitation emphasizes gait training, restoration of functional mobility and appropriate hip range of motion, followed by progressive strengthening of the operated limb, including quadriceps and hip-abductor musculature. After approximately 8 weeks, literature supports progression to weight-bearing strengthening, with particular emphasis on hip-abductor eccentric strengthening,

level [18-20]. These measures were not prospectively collected in the present case and therefore cannot be retrospectively added without introducing unsupported data. The patient's return to wrestling was additionally assessed clinically and included objective endurance testing, which did not demonstrate a clinically significant endurance limitation.

Several considerations are specific to young athletic patients undergoing THA. The posterior approach carries a recognized dislocation risk, and high-impact/contact activity may expose the implant to traumatic injury and potentially increased mechanical demands. Evidence on return to sport after THA is largely derived from heterogeneous patient populations and shows lower and less certain return rates for high-intensity sports than for low- or moderate-impact activities [20]. The literature therefore supports cautious, criterion-based

Table 3: Surgical details and prosthetic components

Parameter	Details
Surgical approach	Minimally invasive posterior approach
Femoral component	Cementless, tapered-wedge titanium alloy stem
Acetabular component	Cementless porous-coated titanium shell with HXLPE liner
Bearing surface	36 mm metal-on-highly cross-linked polyethylene (MoP)
Implant size	Femoral head 36 mm; acetabular cup 50 mm
Operative time	90 min
Blood loss	150 mL
Complications	No complications reported through 9 months; serial radiographs, including 9-month assessment, showed stable components without obvious loosening or osteolysis.
HXLPE: Highly cross-linked polyethylene, MoP: Metal-on-polyethylene	



Table 4: Literature-informed post-operative rehabilitation framework used for phased recovery and return-to-sport progression

Rehabilitation phase	Literature-supported components	Application to this case
Early post-operative phase	Gait/functional mobility training; appropriate hip range-of-motion work; early activation and strengthening of the operated limb.	Supervised physiotherapy with progressive functional recovery.
Progressive strengthening phase	Progressive resistance training, including quadriceps and hip-abductor strengthening; progression based on patient-specific functional response rather than a fixed timetable [21,22].	Strengthening progressed before higher-demand wrestling drills.
Late rehabilitation (>8 weeks)	Weight-bearing exercise with emphasis on hip-abductor eccentric strengthening, together with aerobic/endurance and balance training [21,22].	Endurance assessment and higher-level conditioning were incorporated.
Sport-specific progression	Task-specific training and graded progression as strength, gait, balance and endurance improve; high-impact/contact sport requires individualized counseling and monitoring [20, 22].	Graded wrestling drills preceded return to wrestling matches at 9 months.

informed approach incorporating gait and functional recovery, progressive strengthening, weight-bearing hip-abductor work, endurance and balance training, followed by sport-specific conditioning [21,22]. However, as with most rehabilitation literature, there is no universally validated protocol or single evidence-based timetable for progression after THA [22]. The patient's return to wrestling matches at 9 months therefore represents an individualized clinical decision rather than a general recommendation. In addition, the case remains a single observation without a comparative treatment arm; the relative effectiveness of THA versus core decompression, vascularized grafting, osteotomy, or other joint-preserving procedures cannot be inferred.

Conclusion

This case demonstrates that THA can provide sustained functional improvement through 9 months in a young, high-demand athlete with advanced post-collapse ONFH when joint preservation is considered unlikely to provide a predictable result. The patient remained clinically well, had stable plain radiographs, and returned to wrestling matches by 9 months, with approximately maintained hip scores and range of motion and no clinically significant endurance limitation. These findings represent an encouraging individual outcome but do not establish THA as superior to joint-preserving procedures, demonstrate long-term implant durability, or prove the safety of contact wrestling after THA. Larger comparative studies with long-term follow-up are needed before early THA can be recommended routinely for young athletes with ONFH.

together with aerobic/endurance and balance-oriented exercise [21]. Rehabilitation should be progressed according to patient-specific functional responses rather than a fixed timetable, with task-specific training added as strength, gait, balance and endurance improve [22]. For this athlete, progression was subsequently directed toward sport-specific conditioning, including endurance assessment and graded wrestling drills before return to matches at 9 months. Published return-to-sport literature suggests that high-impact/contact activities require careful counseling and monitoring because evidence for their long-term safety after THA remains limited [20].

Limitations

This report has several limitations. It describes a single patient, so the findings cannot be generalized to young athletes with advanced ONFH. Follow-up is 9 months; although the patient remains clinically well with stable radiographs, it is still insufficient to establish implant survivorship, polyethylene wear, osteolysis, aseptic loosening, instability, periprosthetic fracture, or lifetime revision risk. Post-operative assessment was based on serial plain radiographs and clinical evaluation; no post-operative MRI was performed, and advanced imaging or standardized radiographic migration/osteolysis measurements were not obtained. Athlete-specific patient-reported measures were not collected, although objective endurance testing was performed. The return to wrestling matches represents an important individual functional outcome but cannot establish the safety of contact sport.

The rehabilitation program was based on a phased, literature-

Clinical Message

Persistent groin pain in a young athlete should prompt consideration of ONFH, particularly when potential risk factors such as corticosteroid exposure or thrombophilia are present. In patients with advanced collapse and secondary degenerative change, THA may be considered after individualized discussion of joint-preserving alternatives, expected functional goals, activity modification, and lifetime revision risk. In this individual, 9-month follow-up showed stable radiographs, maintained clinical scores and range of motion, satisfactory endurance testing, and return to wrestling matches without reported hip-related problems. These findings support a case-specific decision for THA rather than a general recommendation for young athletes.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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