

Hip dysplasia in wrestlers: three lessons learned

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ABSTRACT

Hip problems due to dysplasia are commonly associated with female athletes in sports demanding supraphysiologic motion, such as ballet, gymnastics and figure skating. However, hip problems are rarely mentioned among wrestlers, a male sport in which flexibility is advantageous. Dysplasia may have a mostly unrecognized prevalence among wrestlers that can lead to problems and benefit from reorientation periacetabular osteotomy (PAO). Study design in this research is Level 4 evidence case reports. Three consecutive intercollegiate wrestlers ages 20, 21 and 22 years underwent PAO for dysplasia and are reported. Two underwent concomitant arthroscopy. Each returned successfully to intercollegiate wrestling at 6, 8 and 11 months. There were no complications. This work concludes that dysplasia has an unknown but mostly unrecognized prevalence among wrestlers. With proper recognition and treatment with PAO, there is a reasonable expectation that they could return to wrestling.

INTRODUCTION

In athletics, dysplasia is commonly linked to activities that demand supraphysiologic hip motion such as ballet, gymnastics and figure skating [1]. Increased flexibility associated with dysplasia may be advantageous until breakdown of the joint begins to occur. While wrestlers have not been found to be as flexible as gymnasts; it is a sport in which flexibility is a distinguishing characteristic of elite competitors, but hip disorders are rarely mentioned [2]. Periacetabular osteotomy (PAO) can provide a durable, potentially lifelong solution for symptomatic dysplasia [3, 4]. Several studies note improved activities in sporting function based on UCLA scores [5–7]. However, only recently was a study published that reports specifically on return to sport following a PAO [8, 9].

The diagnosis of bony dysmorphism of the hip is not always clear. Hybrid conditions may exist with an element of dysplasia and femoroacetabular impingement (FAI) [10, 11]. It can be a challenge to determine which is the principal underlying etiology of joint damage including labrum

and articular surface. Consequently, it can be difficult to decide what and how much needs to be done to correct the dysmorphism in conjunction with restoring the labrum and addressing the articular cartilage.

The purpose of this report is to highlight the presence of dysplasia and return to sport following PAO in a small group of elite-level wrestlers. The authors hypothesize that dysplasia may be a factor in hip dysfunction among wrestlers and, with proper identification of appropriately selected athletes, may respond well to PAO with return to high-level competition.

METHODS

Three scholarship intercollegiate wrestlers were encountered by the first author with evidence of joint damage associated with dysplasia and were referred for PAO. This represents all such athletes who underwent this procedure with none excluded from this report. In each of these cases, the clinical assessment was consistent with the hip joint being the principal source of the athlete's pain and

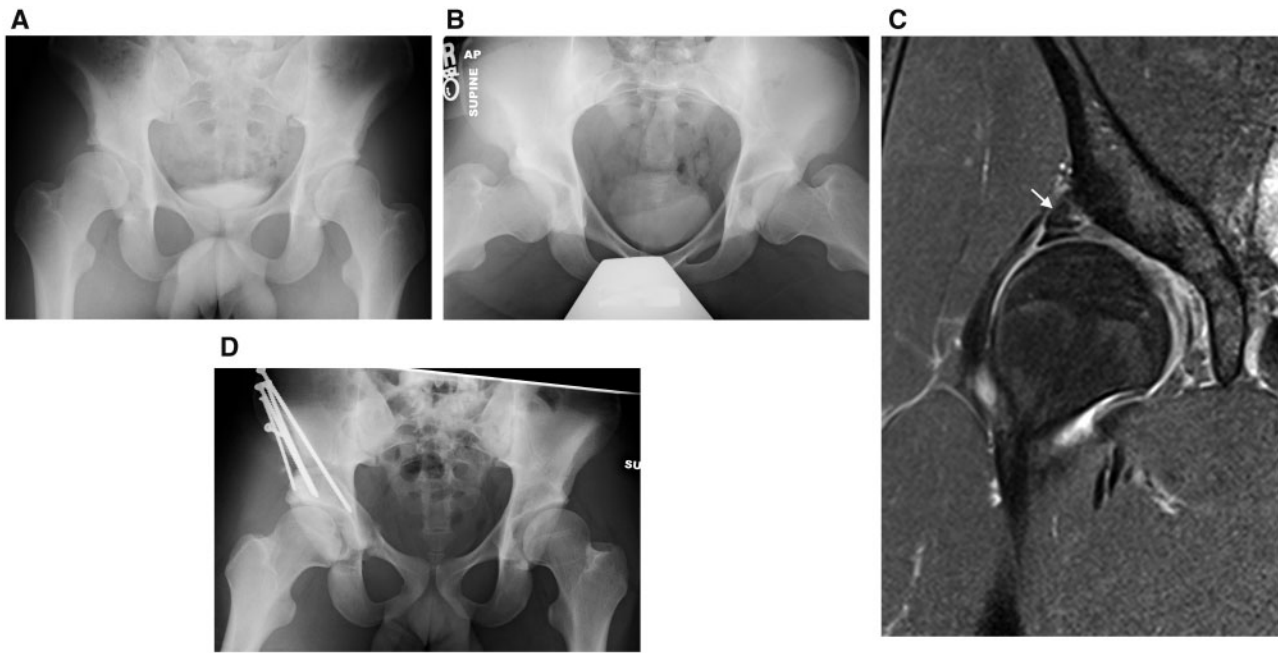


Fig. 1. A 21-year-old male wrestler with 16-month history of right hip pain. (A, B) AP and lateral projections of the pelvis demonstrate dysplasia with a CE angle of 15 and accompanying os acetabulum on the right. (C) Coronal MRI image reveals labral pathology (arrow). (D) Post-operative AP pelvis view demonstrates correction with improved coverage of the femoral head.

dysfunction. This report was granted exemption status from the Investigational Review Board.

CASE ONE

In 2009, a 21-year-old, sophomore, male wrestler with a 16-month history of right hip pain was referred for consideration of arthroscopy to address labral damage. Radiographs revealed a lateral center edge (CE) angle of 15° with a small accompanying os acetabulum (Fig. 1A and B), and magnetic resonance imaging (MRI) showed evidence of labral damage (Fig. 1C).

It was felt that arthroscopy was contraindicated, and he was referred for open surgical correction, including PAO and arthrotomy for femoral head/neck osteoplasty (Fig. 1D).

He resumed training and at 11 months post-op returned to wrestling success the following season, earning conference honors and qualifying for the national tournament.

CASE TWO

In 2013, a 22-year-old, junior, male, intercollegiate wrestler was referred to the first author for consideration of arthroscopy due to a 1-year history of right hip pain with MRI evidence of labral pathology. Plain radiographs revealed a lateral CE angle of 21° and a significant cam lesion (Fig. 2A and B).

An MRI showed substantial labral damage, but also subchondral changes within the femoral head (Fig. 2C).

In order to assess more thoroughly for the presence of dysplasia, a false profile view was obtained, revealing concomitant anterior undercoverage with an anterior CE angle of 22° (Fig. 2D).

A 3D CT scan further delineated the hybrid pattern of dysplasia and cam-type FAI (Fig. 2E and F).

Arthroscopy without addressing the dysplasia was felt to be contraindicated, and the athlete was referred for definitive surgical correction. He underwent arthroscopy with labral repair and microfracture, and concomitant PAO and femoral head/neck osteoplasty, correcting the cam lesion (Fig. 2G and H).

Post-operatively, he was able to resume training and compete by the opening of his senior season 6 months following surgery with a winning record, earning conference honors.

CASE THREE

In 2014, a 20-year-old, sophomore, male wrestler who had a 1-year history of left hip pain. Radiographs revealed a lateral CE angle of 14° and a significant cam lesion (Fig. 3A and B).

An MRI with intra-articular contrast reflected some of the accompanying labral damage (Fig. 3C).

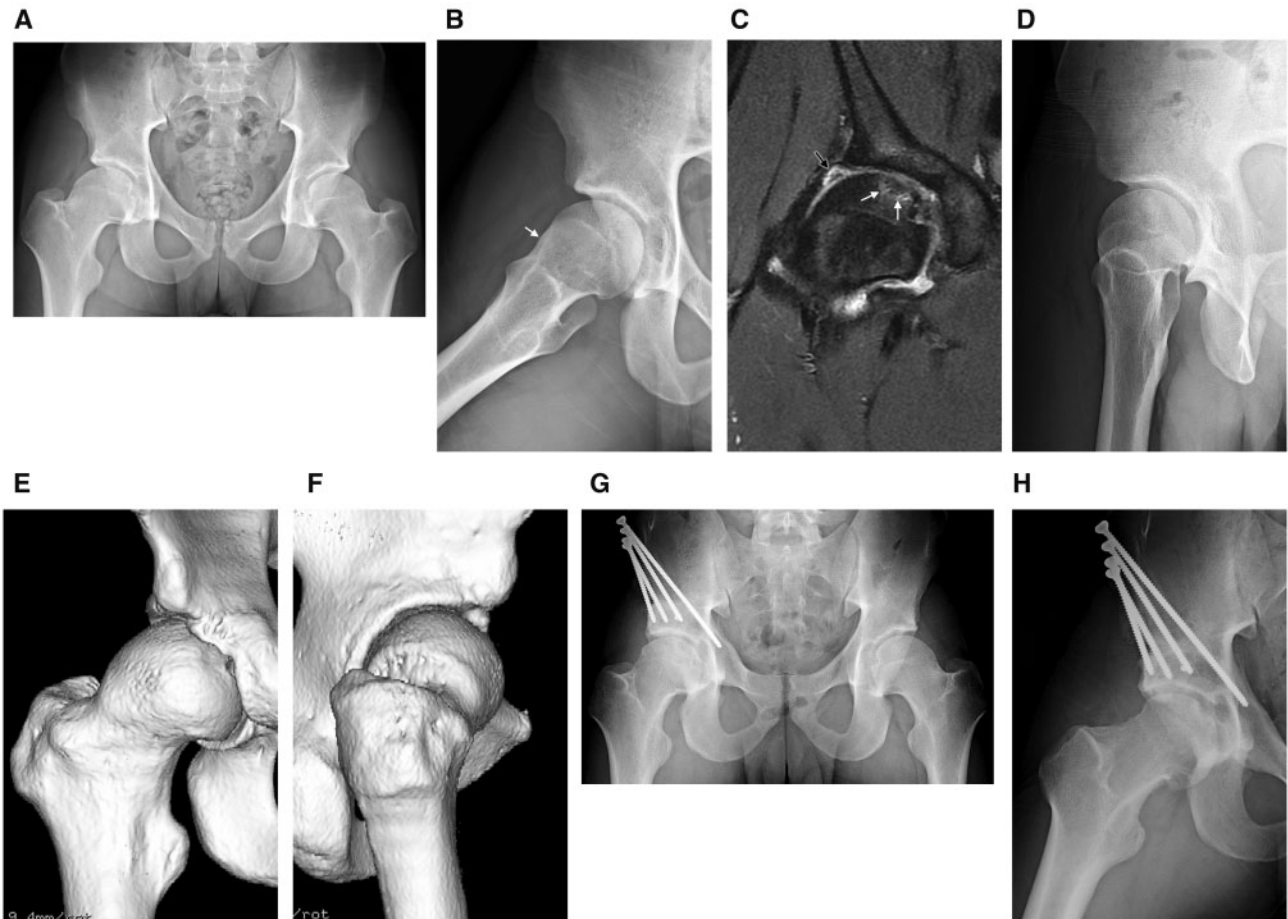


Fig. 2. A 22-year-old male wrestler with 1-year history of right hip pain. (A) AP pelvis view reveals a CE angle of 21° on the right. (B) Frog lateral view demonstrates the presence of a cam lesion (arrow). (C) Coronal MRI image reveals an enlarged lateral labrum with substantial deterioration (black arrow) and subchondral changes in the femoral head (white arrows). (D) False profile view reveals anterior undercoverage of the femoral head. (E, F) 3D CT images further illustrate the combined pattern of cam and femoral undercoverage. (G, H) AP pelvis and lateral view of right hip illustrate acetabular reorientation and femoroplasty.

It was felt that an arthroscopic approach without addressing the dysplasia was contraindicated, and he was referred for definitive correction. He underwent arthroscopic chondroplasty and head/neck osteoplasty in conjunction with a PAO (Fig. 3D and E).

Eight months following surgery, he returned for a successful junior season, culminating as the conference champion in his weight class.

DISCUSSION

The association between dysplasia and athletic activities in which flexibility is a premium, especially among females in dance/ballet, gymnastics, and figure skating, has been well documented [1]. Although flexibility is a favorable attribute among elite wrestlers, the hip is rarely even noted as a source of problems, and no correlation has been made with dysplasia in this male-oriented sport [2, 12]. This

small case series strongly suggests that a previously unrecognized prevalence may exist of clinically relevant dysplasia in this sport.

Hybrid conditions are not uncommon in which dysplasia may coexist with FAI [10, 11]. It is important to try to differentiate which is the principal etiology of joint pain and subsequent dysfunction in the athlete. FAI can be corrected arthroscopically, while correction of dysplasia requires an open procedure. Arthroscopic correction of FAI carries low morbidity with highly successful outcomes and high probability of returning to sports [13]. However, inappropriate arthroscopy in the presence of dysplasia can lead to iatrogenic instability and potentially catastrophic consequences [14]. In the first author's experience, the pattern of pathology carries clues to whether the principal problem is dysplasia or FAI. Labral damage with FAI usually begins anteriorly and then propagates laterally.

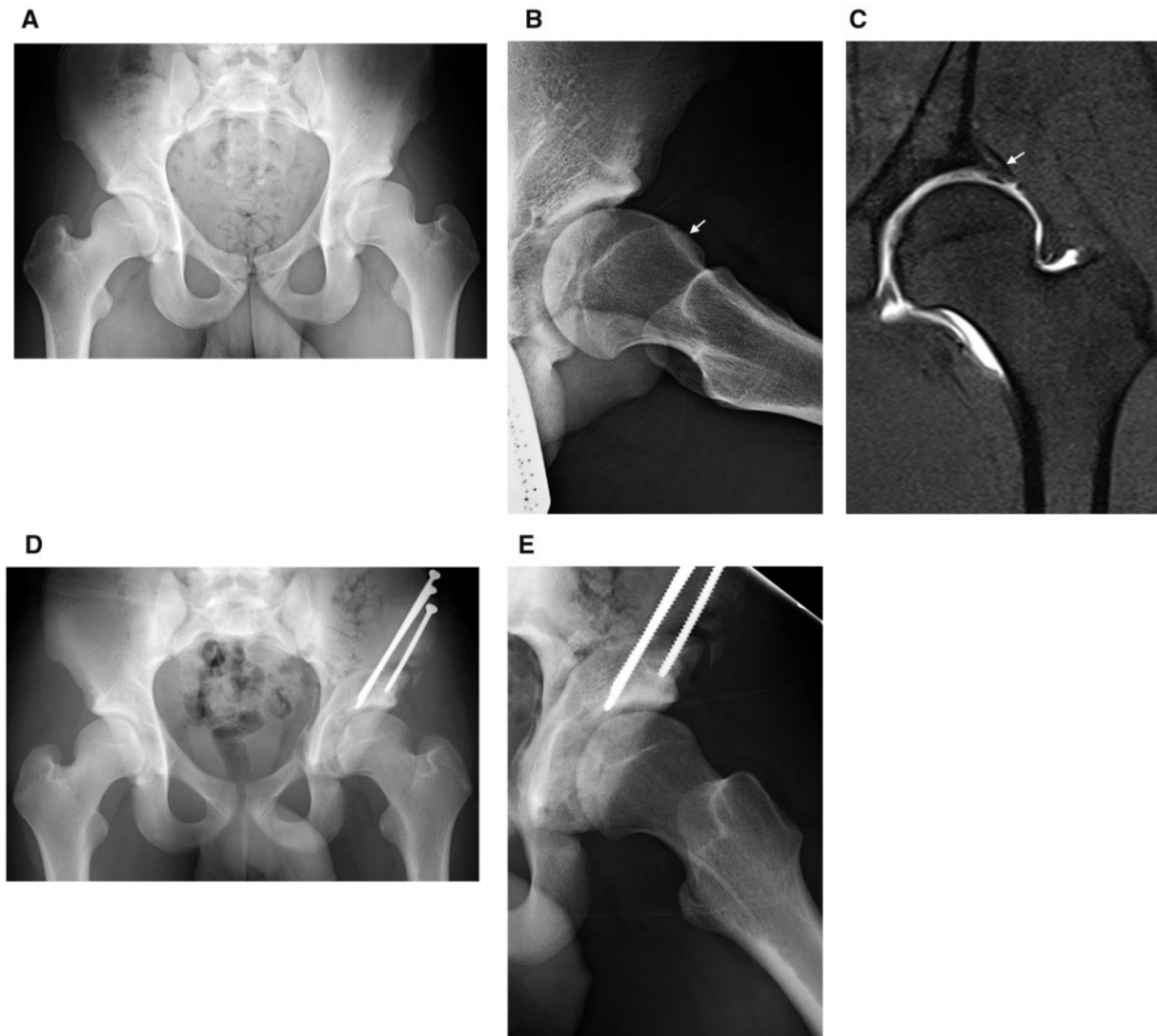


Fig. 3. A 20-year-old male wrestler with 1-year history of left hip pain. **(A)** AP Pelvis reveals a lateral CE angle of 14° . **(B)** A lateral view illustrates an accompanying cam lesion (arrow). **(C)** Coronal MRA image illustrates lateral labral pathology (arrow). **(D, E)** AP pelvis and lateral view of the left hip illustrate acetabular reorientation and femoroplasty.

Additionally, articular damage on the acetabular side is far advanced, while the femoral surface remains healthy until late in the disease course. Conversely, with dysplasia the labrum is hypertrophic, often with more substantial lateral damage, and articular failure begins earlier on both sides of the joint. This author frequently performs arthroscopic correction of FAI in the presence of a lateral CE angle in the low 20s. However, as illustrated in case number one, the worst labral pathology was lateral based and hypertrophic but, even more important, was evidence of disproportionate subchondral femoral-sided changes suggesting articular damage to the femoral head. This leads to obtaining the false profile view, further revealing the uncoverage

of the femoral head, which was then more precisely reflected by the 3D CT scan. It is also important to note that the lateral CE angle is but a single 2D index used in interpreting the complex 3D anatomy of potential bony under or over coverage [15].

In the presence of clinically relevant dysplasia, an open reorientation acetabular osteotomy is a more durable strategy for joint preservation in young adults [3, 4]. Among active individuals, Novais *et al.* [5], Ettinger *et al.* [6] and Bogunovic *et al.* [7] have each reported improved physical activity using the UCLA activity score. However, only Heyworth *et al.* [8] recently commented on the specific ability to return to sport following reorientation osteotomy;

reporting 80% return to sport, 75% at the same level and 58% return to sport among competitive athletes. In this current small group, all returned to excel in intercollegiate wrestling. This is not statistically meaningful data, but simply reinforces that return to high levels of sport can occur following PAO.

These three cases illustrate that arthroscopy may still be contraindicated despite an athlete's desires. Naturally, none of these athletes preferred a PAO over arthroscopy. However, this small group also illustrates the emerging role of arthroscopy as an adjunct in reorientation acetabular osteotomy [16, 17]. The two most recent underwent arthroscopy as a means of addressing the intra-articular pathology in conjunction with PAO.

This study is nothing more than three case reports with all of the inherent methodological limitations and is not meant as anything more. The numbers are too small to provide any statistically meaningful information. Even within these three case examples, there are dissimilarities, and treatment was spread out over four different centers.

In conclusion, this report simply establishes a sense of awareness. First, an awareness that dysplasia may have a meaningful prevalence among wrestlers, who participate in a sport in which flexibility is advantageous, and this dysplasia may expose them to joint damage and concomitant athletic dysfunction. Second, an awareness that in cases of hybrid morphology the pattern of joint damage can provide clues to the level of contribution of dysplasia versus FAI, and the clinician should certainly not rely solely on the lateral CE angle as a measure of coverage. Third, reflected in this small body of evidence, an awareness that athletes can return to an elite level of competition following PAO.

CONFLICT OF INTEREST STATEMENT

J.W. Thomas Byrd is a consultant for Smith & Nephew; he is a non-paid consultant and has stock in A3 Surgical. John C. Clohisy is a consultant for Microport Orthopaedics, Zimmer-Biomet, and Smith & Nephew; he receives royalties from Wolters Kluwer Health (publication) and from Microport Orthopaedics (product). Young-Jo Kim is a consultant for Orthopediatrics. Winston F. Gwathmey receives research support from Depuy Mitek and Ceterix; he receives royalties from Elsevier. Michael B. Millis receives editorial royalties from Elsevier-Williams and Wilkins.

REFERENCES

1. Weber AE, Bedi A, Tibor LM *et al.* The hyperflexible hip: managing hip pain in the dancer and gymnast. *Sports Health* 2015; 7: 346–58.

2. Yoon J. Physiological profiles of elite senior wrestlers. *Sports Med* 2002; 32: 225–33.
3. Matheney T, Kim YJ, Zurakowski D *et al.* Intermediate to long-term results following the Bernese periacetabular osteotomy and predictors of clinical outcome. *J Bone Joint Surg Am* 2009; 91: 2113–23.
4. Steppacher SD, Tannast M, Ganz R *et al.* Mean 20-year followup of Bernese periacetabular osteotomy. *Clin Orthop Relat Res* 2008; 466: 1633–44.
5. Novais EN, Heyworth B, Murray K *et al.* Physical activity level improves after periacetabular osteotomy for the treatment of symptomatic hip dysplasia. *Clin Orthop Relat Res* 2013; 471: 981–8.
6. Bogunovic L, Hunt D, Prather H *et al.* Activity tolerance after periacetabular osteotomy. *Am J Sports Med* 2014; 42: 1791–5.
7. Ettinger M, Berger S, Floerkemeier T *et al.* Sports activity after treatment of residual hip dysplasia with triple pelvic osteotomy using the Tönnis and Kalchschmidt technique. *Am J Sports Med* 2015; 43: 715–20.
8. Heyworth BE, Novais EN, Murray K *et al.* Return to play after periacetabular osteotomy for treatment of acetabular dysplasia in adolescent and young adult athletes. *Am J Sports Med* 2016; 44: 1573–81.
9. van Bergayk AB, Garbuz DS. Quality of life and sports-specific outcomes after Bernese periacetabular osteotomy. *Bone Joint J* 2002; 84-B: 339–43.
10. Nawabi DH, Degen RM, Fields KG *et al.* Outcomes after arthroscopic treatment of femoroacetabular impingement for patients with borderline hip dysplasia. *Am J Sports Med* 2016; 44: 1017–23.
11. Fukui K, Trindade CA, Briggs KK *et al.* Arthroscopy of the hip for patients with mild to moderate developmental dysplasia of the hip and femoroacetabular impingement: outcomes following hip arthroscopy for treatment of chondrolabral damage. *Bone Joint J* 2015; 97-B: 1316–21.
12. Jarret GJ, Orwin JF, Dick RW. Injuries in collegiate wrestling. *Am J Sports Med* 1998; 26: 674–80.
13. Byrd JWT, Jones KS. Arthroscopic management of femoroacetabular impingement in athletes. *Am J Sports Med* 2011; 39(Suppl): 7S–13S.
14. Mei-Dan O, McConkey MO, Brick M. Catastrophic failure of hip arthroscopy due to iatrogenic instability: can partial division of the ligamentum teres and iliofemoral ligament cause subluxation? *Arthroscopy* 2012; 28: 440–5.
15. Clohisy JC, Carlisle JC, Beaulé PE *et al.* A systematic approach to the plain radiographic evaluation of the young adult hip. *J Bone Joint Surg Am* 2008; 90(Suppl 4): 47–66.
16. Ross JR, Zaltz I, Nepple JJ *et al.* Arthroscopic disease classification and interventions as an adjunct in the treatment of acetabular dysplasia. *Am J Sports Med* 2011; 39(Suppl): 72S–8S.
17. Domb BG, LaReau JM, Hammarstedt JE *et al.* Concomitant hip arthroscopy and periacetabular osteotomy. *Arthroscopy* 2015; 31: 2199–206.