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Research article

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The clinical outcomes of arthroscopic hip labral repair: a comparison between athletes and non-athletes

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ABSTRACT

The objective of this study is to compare the clinical outcomes after arthroscopic hip labral repair in athletes and non-athletes. The design of this study is a retrospective comparative study. The setting of this study is an institutional study. One hundred and sixteen patients of hip labral tears who underwent arthroscopic labral repair were included. Eighty-five of these patients met the inclusion/exclusion criteria (25 athletes and 60 non-athletes). Hip labral tears underwent arthroscopic labral repair. The main outcome measures are as follows: visual analog scale (VAS) and modified Harris Hip Score (mHHS) 2 years postoperatively and the rate of return to sports at previous level. There was no significant difference in the gender, alpha angle, lateral center-edge angle between the two groups, except for the mean age (19.3 versus 42.2, $P < 0.001$), Marx activity rating scale (MARS) (14.6 versus 6.8, $P < 0.001$) and University of California, Los Angeles (UCLA) activity rating scale (9.6 versus 5.0, $P < 0.001$). The intraoperative findings were similar in the two groups. The VAS scores and mHHS both showed a significant improvement after surgery in both groups (VAS improvement 3.6 and mHHS improvement 22.4 in the athlete group; VAS improvement 3.9 and mHHS improvement 25.0 in the non-athlete group, all $P < 0.001$). There was no difference in VAS improvement or mHHS improvement between the athlete and non-athlete groups. All the patients in the athlete group return to sports at previous level 6 months after the operation. The mean time of return to sports at previous level was 5.4 months. Both athletes and non-athletes demonstrate significant VAS and mHHS improvement following arthroscopic labral repair. The VAS scores improvement and mHHS improvement were similar in the athlete and non-athlete groups after arthroscopic labral repair.

INTRODUCTION

Labral tears have been associated with hip pain in athletes [1]. Some specific sports may predispose athletes to extreme range of hip motion, pivoting on a loaded femur (dancers and gymnasts), repetitive impact loads (soccer, lacrosse, and track and field), or colliding with other athletes, and sustaining hip injury due to acute trauma [2]. Femoroacetabular impingement (FAI) is now recognized as a common cause of hip pain and intra-articular disorders in athletes. Current theories suggest that repetitive axial loading or hip flexion may stimulate anterolateral extension of the physis, resulting in the bony overgrowth of the cam deformity [3]. Among patients younger than 30 years, 70% of FAI cases were related to athletic activity [4]. More recently, Byrd JWT et al. reported that 96% of adolescents with FAI participated in athletic activity, which was significantly higher than the rate observed in an adult control group [5].

Some studies showed the significant success of arthroscopic treatment with labral repair. Also, in the recent studies, the clinical results of arthroscopic labral repair in the general population showed favorable clinical improvements on patient-reported outcomes [6, 7]. However, there was limited data comparing the clinical outcomes of arthroscopic labral repair in patients with sports injury and non-sports injury. Furthermore, it was difficult to differentiate whether the hip labral tear was caused by sports injury or non-sports injury. Hence the purpose of this study was to compare the clinical outcomes of arthroscopic labral repair in the athlete group (sports injury group) and the non-athlete group (non-sports injury group).

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We hypothesized that the athlete group with symptomatic labral tear may benefit from arthroscopic labral repair, similar to the non-athlete group.

MATERIAL AND METHODS

We performed a retrospective comparative study comprised of patients with hip labral tears who underwent arthroscopic labral repair from April 2010 to October 2016 in our institute, excluding patients with advanced osteoarthritis (OA) (Tonnis grade ≥2), frank developmental dysplastic hips (DDH) [lateral center-edge angle (LCEA) <20 degrees], tumor, such as synovial chondromatosis, or hyperlaxity. We used the Marx activity rating scale (MARS) [8] and UCLA activity rating scale [9] to assess the physical activity in their healthiest and most active state in the past year, which helps to divide patients into athlete group and non-athlete group. The MARS lists four items: running, cutting, decelerating and pivoting, ranging from 0 to 16, indicating how often the patient performed each activity. Although the MARS was developed as a knee-specific functional measure, the questions appear to be relevant to hip pain. The UCLA provides descriptive activity levels ranging from 1 to 10, where 1 is defined as wholly inactive and dependent on others and 10 is defined as regularly participating in impact sports such as jogging, tennis and skiing.

All of the patients had one or more of the following symptoms: pain in the anterior hip or groin; pain during ambulation or long period of sitting; or a clicking sensation in the hip joint [10]. Positive signs during physical examination included forced flexion combined with internal rotation or abduction combined with external rotation. Sometimes these movements will produce an accompanying click or pain [11]. The anteroposterior pelvis, false profile, cross-table lateral view and Dunn view radiographs are routinely used to assess our patients. The LCEA is measured using the anteroposterior radiograph, whereas the alpha angle is measured using the Dunn view for assessing the cam deformity [12, 13]. Magnetic resonance arthrography (MRA) is routinely used to assess soft tissues including the acetabular labrum, articular surfaces, ligamentum teres, capsule and surrounding musculature. All patients had undergone failed conservative treatment before arthroscopy, including nonsteroidal anti-inflammatory medications, physical therapy and partial weight-bearing with crutches. Patients with positive MRA findings with a symptomatic hip were recommended to undergo arthroscopic hip surgery.

Arthroscopic hip procedure

Arthroscopy was performed in the supine position as described by J.W.T. Byrd [14]. Traction was applied to the operative extremity, and hip joint distraction was confirmed by fluoroscopic examination. The senior surgeon used two portals (anterior or anterolateral portals) or three portals (additional posterolateral portal). These were adapted from the description by Glick et al. in 1987 [15]. Minimal capsulotomy without capsule repair would be done if no peri-operative hyperlaxity existed.

Assessment of intra-articular structures was performed under direct arthroscopic visualization. The location of labral tear was recorded and the tear type was assessed according to Seldes classification [16]. The chondral injury was assessed by using Outerbridge classification [17]. The ligamentum teres injury was assessed using a descriptive classification system (grade 0: no tear, grade 1: <50% tear, grade 2: >50% tear, grade 3: complete tear) [18]. These labral tears were repaired with a bioresorbable suture anchor. The number of suture anchors used depended on the size of the labral tear lesion, one per centimeter of lesion. A pierced suture technique was performed if the tissue was adequate, involving passing one or both of the suture limbs through the labral tissue in a mattress fashion. If there was not enough tissue, a looped suture configuration provides a strong fixation by passing the limbs in a circumferential manner around the labral tissue to secure it to the acetabular rim [19]. Acetabuloplasty of the acetabular rim for pincer impingement or femoroplasty of the bony prominence at the junction of the femoral head and neck for cam impingement was performed in the setting of FAI. All surgeries were performed by the same senior surgeon.

Postoperative rehabilitation

The patients were instructed to bear weight with a crutch or walker and avoid internal or external rotation over 30 degrees or flexion over 90 degrees for the first 6 weeks. Early range-of-motion exercises were encouraged to prevent soft tissue adhesions and promote early recovery. Full strength and activity were allowed at 3 months, and return to sports was allowed at 6 months.

Outcome measures

The visual analog scale (VAS) for pain and modified Harris Hip Score (mHHS) for functional outcomes were assessed preoperatively and 2 years postoperatively [20]. The rate of return to sports at previous level 6 months postoperatively in the athlete group was also recorded.

These patients were divided into two groups. The athlete or sports injury group, consisting of elite, professional or school athletes, with MARS ≥12 and UCLA activity rating scale ≥8, may imply the labral tears can be attributed to a specific sport-related traumatic event. The non-athlete or non-sports injury group, including patients with MARS <12 or UCLA activity rating scale <8, and the labral tears were related to other non-sports etiology. Demographic and outcome measures were compared between the two groups.

Statistical analysis

The t-test and chi-square test were used to evaluate group differences in demographic characteristics. The independent t-test was used to evaluate group differences of VAS and mHHS in study measures at preoperatively and 2 years postoperatively. A P-value <0.05 was regarded as significant. All statistical analyses were performed using SAS version 9.2 (SAS Institute Inc., Cary, NC, USA) and Microsoft Excel 2017 software.

RESULTS

A total of 116 consecutive patients were included in this study (Fig. 1). We excluded 31 patients with follow-up time <2 years ($n = 15$), incomplete data ($n = 10$), frank DDH ($n = 1$), advanced OA ($n = 3$) and synovial chondromatosis ($n = 2$). No hyperlaxity was found. A total of 85 patients were reviewed and

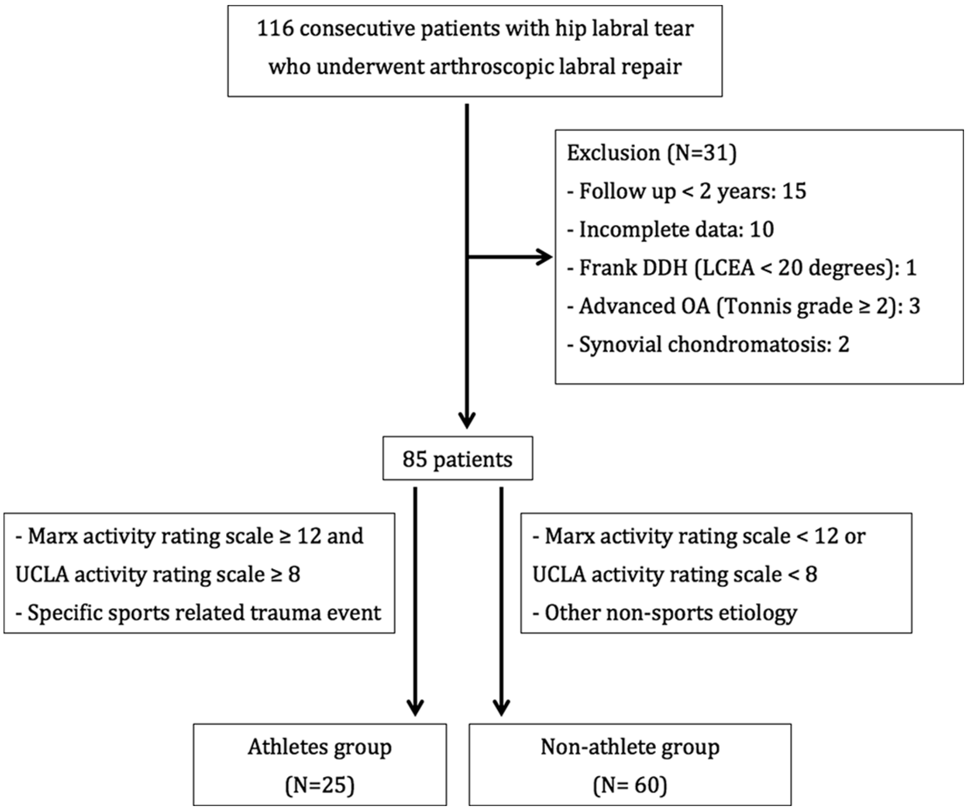

Fig. 1. Patient enrollment flow diagram.

Table I. The sports category in athlete group and the etiology in non-athlete group

	Number
Athletes group	25
Ballet	15
Basketball	4
Badminton	3
Boat rower	3
Non-athletes group	60
Trauma	10
Borderline DDH	7
Tonnis grade I OA	7
FAI	35

divided into the athlete group and non-athlete group according to the MARS and UCLA activity scale. The mean follow-up time was 38.3 ± 10.5 months (range, 25.2–54.6 months). Twenty-five patients were in the athlete group, including 15 ballet dancers, 4 basketball players, 3 badminton players and 3 boat rowers. Sixty patients were in the non-athlete group, including 10 patients with trauma, 7 patients with borderline DDH (LCEA of 20 to 25 degrees), 7 patients with Tonnis grade I OA and 35 patients with FAI (Table I). According to the demographic data (Table II), the age of the athlete group was younger than non-athlete group (19.3 versus 42.2, $P < 0.001$). The athlete group had significantly higher preoperative physical activity than that of the non-athlete group (MARS: 14.6 versus 6.8, $P < 0.001$, UCLA scale: 9.6 versus 5.0, $P < 0.001$). There was no significant difference in the gender, alpha angle and LCEA between the two groups. Regarding the intraoperative findings, the labral tears were all located at the anterosuperior site and the tear types were similar in the two groups. The prevalence of FAI, chondral injury and ligamentum teres tear rates was equivalent in the two groups. The VAS scores and mHHS both showed a significant improvement after surgery in both groups (VAS improvement 3.6 and mHHS improvement 22.4 in the athlete group; VAS improvement 3.9 and mHHS improvement 25.0 in the non-athlete group, all $P < 0.001$). There was no difference in the preoperative, postoperative VAS, VAS improvement or mHHS improvement between the athlete and non-athlete groups (Table III). However, the athlete group had higher preoperative and postoperative mHHSs (preoperative: 61.0 versus 52.3, $P = 0.02$; postoperative: 83.4 versus 76.5, $P = 0.03$). All the patients in the athlete group returned to sports at previous level 6 months after the operation. The mean time of return to sports at previous level was 5.4 months.

DISCUSSION

The purpose of this study was to compare the differences in clinical and functional outcomes after arthroscopic hip labral repair between the athlete and non-athlete groups. The current study showed that the athlete and non-athlete groups both achieved significant improvement in VAS scores and mHHS after arthroscopic labral repair. The VAS scores improvement and mHHS improvement were similar in the two groups after arthroscopic labral repair.

Table II. Demographic, radiographic data and intraoperative finding for the athlete group and non-athlete injury group

	Athletes (*n* = 25)	*Non-athletes* (*n* = 60)	*P-value*
Demographic data			
Age (years)	19.3 ± 6.8	42.2 ± 5.4	<0.001
Gender (M:F)	6:19	30:30	0.41
Marx activity rating scale	14.6 ± 1.9	6.8 ± 1.4	<0.001
UCLA activity rating scale	9.6 ± 0.7	5.0 ± 1.3	<0.001
Radiographic data			
Alpha angle (degrees)	63.6 ± 9.8	60.2 ± 3.3	0.35
Center-edge angle (degrees)	32.0 ± 5.6	34.7 ± 4.5	0.51
Intraoperative finding			
Operative traction time (min)	66.6 ± 18.9	69.9 ± 10.2	0.72
Labrum tear	25 (100%)	60 (100%)	1.00
Seldes I:II	16:9	38:22	
Location	AS (100%)	AS (100%)	
FAI	87.5% (22)	58.3% (35)	0.21
Cam:pincer:mixed	11:1:10	19:1:15	
Chondral injury	37.5% (9)	41.7% (25)	1.00
Grade I:II:III:IV	6:3:0:0	15:9:1:0	
Ligamentum teres tear	25.0% (6)	16.7% (10)	0.62
Grade I:II:III	6:0:0	9:1:0	

M, male; F, female; AS, anterosuperior.

Table III. The preoperative and postoperative VAS scores and mHHSs for the athlete group and non-athlete group

	Athletes (*n* = 25)	*Non-athletes* (*n* = 60)	*P-value*
VAS			
Pre-op	5.6 ± 1.6	5.4 ± 1.2	0.695
Post-op	1.8 ± 0.7	1.9 ± 0.7	0.659
VAS improvement	3.6 ± 1.6	3.9 ± 1.4	0.692
P-value	<0.001	<0.001	
mHHS			
Pre-op	61.0 ± 5.0	52.3 ± 8.8	0.020
Post-op	83.4 ± 3.7	76.5 ± 5.6	0.030
mHHS improvement	22.4 ± 3.6	25.0 ± 8.8	0.417
P-value	<0.001	<0.001	

Pre-op, preoperative; Post-op, postoperative.

Similar to our study, some studies showed promising outcomes for hip arthroscopic surgery in patients with sports injuries. Mohan et al. [21] reported a minimum 2-year follow-up of 50 young amateur athletes treated by arthroscopic labral repair. The mHHS improved from 63.6 to 84.8 points, the hip outcome score (HOS) of activity daily living and sport increased from 78.1 to 91.3 and from 43.7 to 80.1, and the return to sports rate was 92%. Ramos et al. [22] demonstrated that all the elite-level water polo players who underwent hip arthroscopy for FAI returned to the same level of play and were highly satisfied. Sochacki et al. [23] reported the return to sports rate for National Hockey League athletes after hip arthroscopy is above 90% at less than 1 year, without a significant decrease in postoperative performance. On the other hand, some literature also showed the good results of hip arthroscopic management in patients with non-sports injury. Kamath et al. [6] evaluated 52 patients with a mean age of 42 years who underwent arthroscopic labral repair, with a mean follow-up period of 58 months. The good or excellent outcome was 56–66% and 84% of patients were able to return to sports. Ben Tov et al. [6] reported a case series of 20 patients aged older than 50 years who had undergone arthroscopic repair with a mean follow-up period of 22 months. The mHHS improved from 62.5 to 87.2 points, the HOS increased from 52.7 to 82.3 and the return to sports rate was 92%. The authors advocated repair of the labrum in patients aged older than 50 years when possible.

In the current study, the VAS scores improvement and mHHS improvement were similar in athlete and non-athlete groups after arthroscopic labral repair. It is not surprising that preoperative and postoperative mHHSs were higher in the athlete group, because they were younger and had better physical activity levels.

Labral tears in athletes can result from isolated athletic injury events or repetitive traumatic activity, and athletes can be predisposed to injury by FAI and developmental abnormalities [24]. Philippon et al. [25] reported that FAI was more prevalent in athletes than in non-athletes, leading to more hip labral tears. FAI accounts for 73% of Korean athletes with hip labral tears and mostly presents as the degenerative type [26]. However, Jonasson et al. found no differences in cam morphology between top-level athletes (ice-hockey and soccer players) and non-athletes [27]. In the current study, the prevalence of FAI was higher in the sports group (87.5%) than in the non-sports group (58.3%), although the difference was not significant.

Ballet dancing is one of the sports requiring frequent external rotation and has been linked to labral abnormalities [2, 24, 28–30]. Furthermore, the repetitive torsional loading of the hip joint in extreme ranges of motion while performing ballet movements, along with FAI and subluxation due to capsular laxity, puts ballet dancers at risk of hip labral tear [31, 32]. In our study, ballet dancing was the most common sport among the athlete group. Although no hyperlaxity was found in our series, the capsule should be managed cautiously to avoid peri-operative instability.

Limitations

There were limitations in this study. First, the main limitation of this retrospective study was the limited number of participants. Second, the athletes and non-athletes were not matched for labral tears and method of repair. Third, the current study was a retrospective review of a heterogeneous patient population and different sports athletes, which might have biased and confounded the results.

CONCLUSION

Both athletes and non-athletes demonstrate significant VAS and mHHS improvement following arthroscopic labral repair and management of FAI. The VAS scores improvement and mHHS improvement were similar in athlete and non-athlete groups after arthroscopic labral repair.

DATA AVAILABILITY

The data used to support the findings of this study are included within the article.

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CONFLICT OF INTEREST STATEMENT

None declared.

REFERENCES

1. Cianci A, Sugimoto D, Stracciolini A *et al.* Nonoperative management of labral tears of the hip in adolescent athletes. *Clin J Sport Med* 2019; **29**: 24–8.
2. Lewis CL, Sahrmann SA. Acetabular labral tears. *Phys Ther* 2006; **86**: 110–21.
3. Nepple JJ, Vigdorchik JM, Clohisy JC. What is the association between sports participation and the development of proximal femoral cam deformity? *Am J Sports Med* 2015; **43**: 2833–40.
4. Byrd JWT, Jones KS, Gwathmey FW. Femoroacetabular impingement in adolescent athletes: outcomes of arthroscopic management. *Am J Sports Med* 2016; **44**: 2106–11.
5. Byrd JWT, Jones KS, Gwathmey FW. Arthroscopic management of femoroacetabular impingement in adolescents. *Arthroscopy* 2016; **32**: 1800–6.
6. Kamath AF, Componovo R, Baldwin K *et al.* Hip arthroscopy for labral tears: review of clinical outcomes with 4.8-year mean follow-up. *Am J Sports Med* 2009; **37**: 1721–7.
7. Ben Tov T, Amar E, Shapira A *et al.* Clinical and functional outcome after acetabular labral repair in patients aged older than 50 years. *Arthroscopy* 2014; **30**: 305–10.
8. Marx RG, Stump TJ, Jones EC *et al.* Development and evaluation of an activity rating scale for disorders of the knee.pdf. *Am J Sports Med* 2001; **29**: 213–8.
9. Zahiri CA, Schmalzried TP, Szuszczewicz ES *et al.* Assessing activity in joint replacement patients. *J Arthroplasty* 1998; **13**: 890–5.
10. Chan Y-S, Lien L-C, Hsu H-L *et al.* Evaluating hip labral tears using magnetic resonance arthrography: a prospective study comparing hip arthroscopy and magnetic resonance arthrography diagnosis. *Arthroscopy* 2005; **21**: 1250–e1.
11. Thomas Byrd JW, Jones KS. Hip arthroscopy in athletes. *Am J Sports Med* 2009; **37**: 2140–3.
12. Perets I, Hartigan DE, Chaharbakhshi EO *et al.* Outcomes of hip arthroscopy in competitive athletes. *Arthroscopy* 2017; **33**: 1521–9.
13. Noötzli HP, Wyss TF, Stoecklin CH *et al.* The contour of the femoral head-neck junction as a predictor for the risk of anterior impingement. *J Bone Joint Surg Br* 2002; **84**: 556–60.
14. Byrd JWT. Hip arthroscopy utilizing the supine position. *Arthroscopy* 1994; **10**: 275–80.
15. Glick JM, Sampson TG, Gordon RB *et al.* Hip arthroscopy by the lateral approach. *Arthroscopy* 1987; **3**: 4–12.
16. Seldes RM, Tan V, Hunt J *et al.* Anatomy, histologic features, and vascularity of the adult acetabular labrum. *Clin Orthop Relat Res* 2001; **382**: 232–40.
17. Outerbridge RE. The etiology of chondromalacia patellae. *J Bone Joint Surg* 1961; **43–B**: 752–7.
18. Botser IB, Martin DE, Stout CE *et al.* Tears of the ligamentum teres. *Am J Sports Med* 2017; **39**: 117–25.
19. Sawyer GA, Briggs KK, Dornan GJ *et al.* Clinical outcomes after arthroscopic hip labral repair using looped versus pierced suture techniques. *Am J Sports Med* 2015; **43**: 1683–8.
20. Aprato A, Jayasekera N, Villar RN. Does the modified Harris Hip Score reflect patient satisfaction after hip arthroscopy? *Am J Sports Med* 2012; **40**: 2557–60.
21. Mohan R, Johnson NR, Hevesi M *et al.* Return to sport and clinical outcomes after hip arthroscopic labral repair in young amateur athletes: minimum 2-year follow-up. *Arthroscopy* 2017; **33**: 1679–84.
22. Ramos N, Youssefzadeh K, Gerhardt M *et al.* Results of hip arthroscopy in elite level water polo players with femoroacetabular impingement: return to play and patient satisfaction. *J Hip Preserv Surg* 2020; **7**: 116–21.
23. Sochacki KR, Jack RA, Hirase T *et al.* Performance and return to sport after hip arthroscopy for femoracetabular impingement syndrome in National Hockey League players. *J Hip Preserv Surg* 2019; **6**: 234–40.
24. Bharam S. Labral tears, extra-articular injuries, and hip arthroscopy in the athlete. *Clin Sports Med* 2006; **25**: 279–92.
25. Philippon MJ, Nepple JJ, Campbell KJ *et al.* The hip fluid seal—part I: the effect of an acetabular labral tear, repair, resection, and reconstruction on hip fluid pressurization. *Knee Surg, Sports Traumatol Arthrosc* 2014; **22**: 722–9.
26. Kang C, Hwang D-S, Cha S-M. Acetabular labral tears in patients with sports injury. *Clin Orthop Surg* 2009; **1**: 230.
27. Jonasson P, Thoreson O, Sansone M *et al.* The morphologic characteristics and range of motion in the hips of athletes and non-athletes. *J Hip Preserv Surg* 2016; **3**: 325–32.
28. Groh MM, Herrera J. A comprehensive review of hip labral tears. *Curr Rev Musculoskelet Med* 2009; **2**: 105–17.
29. Mason JB. Acetabular labral tears in the athlete. *Clin J Sport Med* 2001; **20**: 779–90.
30. Binningsley D. Tear of the acetabular labrum in an elite athlete. *Br J Sports Med* 2003; **37**: 84–8.
31. Mayes S, Ferris A-R, Smith P *et al.* Similar prevalence of acetabular labral tear in professional ballet dancers and sporting participants. *Clin J Sport Med* 2015; **26**: 307–13.
32. Charbonnier C, Kolo FC, Duthon VB *et al.* Assessment of congruence and impingement of the hip joint in professional ballet dancers. *Am J Sports Med* 2010; **39**: 557–66.