

# Hip arthroscopy protocol: expert opinions on post-operative weight bearing and return to sports guidelines

Ehud Rath<sup>1</sup>, Zachary T. Sharfman<sup>1,\*</sup>, Matan Paret<sup>1</sup>, Eyal Amar<sup>1</sup>,  
Michael Drexler<sup>1</sup> and Nicolas Bonin<sup>2</sup>

1. Department of Orthopaedic Surgery, Tel Aviv Sourasky Medical Center and the Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

2. Lyon Ortho Clinic, Clinique de la sauvegarde, 25 B avenue des sources, Lyon 69009, France

Correspondence to: Z. T. Sharfman. E-mail: zachsharfman@gmail.com

Submitted 4 March 2016; Revised 7 October 2016; revised version accepted 18 November 2016

## ABSTRACT

The objectives of this study are to survey the weight-bearing limitation practices and delay for returning to running and impact sports of high volume hip arthroscopy orthopedic surgeons. The study was designed in the form of expert survey questionnaire. Evidence-based data are scarce regarding hip arthroscopy post-operative weight-bearing protocols. An international cross-sectional anonymous Internet survey of 26 high-volume hip arthroscopy specialized surgeons was conducted to report their weight-bearing limitations and rehabilitation protocols after various arthroscopic hip procedures. The International Society of Hip Arthroscopy invited this study. The results were examined in the context of supporting literature to inform the studies suggestions. Four surgeons always allow immediate weight bearing and five never offer immediate weight bearing. Seventeen surgeons provide weight bearing depending on the procedures performed: 17 surgeons allowed immediate weight bearing after labral resection, 10 after labral repair and 8 after labral reconstruction. Sixteen surgeons allow immediate weight bearing after psoas tenotomy. Twenty-one respondents restrict weight bearing after microfracture procedures for 3–8 weeks post-operatively. Return to running and impact sports were shorter for labral procedures and bony procedures and longer for cartilaginous and capsular procedures. Marked variability exists in the post-operative weight-bearing practices of hip arthroscopy surgeons. This study suggests that most surgeons allow immediate weight bearing as tolerated after labral resection, acetabular osteoplasty, chondroplasty and psoas tenotomy. For cartilage defect procedures, 6 weeks or more non-weight bearing is suggested depending on the area of the defect and lateral central edge angle. Delayed return to sports activities is suggested after microfracture procedures. The level of evidence was Level V expert opinions.

## INTRODUCTION

Despite the exponential growth in volume of arthroscopic hip preservation surgery, there remains a paucity of high-level evidence to guide post-operative rehabilitation protocols. Clinical evidence has not always been adequate to evaluate best practices with regards to post-operative rehabilitation protocols for various hip-preservation procedures. A wide spectrum of pathologic conditions may be addressed in hip arthroscopy, including femoro-acetabular

impingement, labral injuries, capsular conditions, focal chondral injuries and peri-articular conditions. Although numerous pathologic conditions may be addressed through the common application of arthroscopy, weight-bearing restrictions and return to sports recommendations used during post-operative rehabilitation may vary significantly by surgeon or by the procedures performed.

Multiple post-operative protocols have been published. When choosing a post-operative weight-bearing protocol,

a surgeon should consider the clinical picture of the patient as well as what surgical procedures were performed and if it is necessary to protect those surgical procedures, repairs, or osteoplasties with restricted weight bearing [1]. Post-operative weight-bearing protocols are of specific interest after arthroscopic hip surgeries as the minimally invasive nature of the surgery may allow of early weight bearing.

Post-operatively a surgeon may prescribe weight bearing as tolerated (WBAT) if early mobilization and joint pressurization are beneficial and will not harm the work performed during surgery. A partial weight-bearing status may be prescribed, to protect the joint components and provide an optimal healing environment when full weight bearing could be detrimental to the patient. Specific procedure-based recommendations for post-operative weight-bearing status after hip arthroscopy are lacking scientific evidence. However, some recommendations are based upon available data for patients undergoing similar procedures for the knee [2]. Periods of weight-bearing restriction between 0 and 6 weeks have been reported [1]. However, little evidenced-based literature exists guiding surgeons to choose one post-operative protocol over another [3]. Thus, post-operative protocols are left to the discretion of the surgeon and are widely based on clinician experience and opinion [4–8]. The return to running and impact sports after hip arthroscopy is often delayed for 3–6 months post-operatively [9, 10]. However, return to sports protocols may vary significantly based on the procedures performed, the needs of the athlete and the clinical course of the patients' rehabilitation [9–11]. The design of this study was intended to collect the expert opinions of high volume hip arthroscopy surgeons regarding weight-bearing limitations and their post-operative rehabilitation protocols for various hip preservation procedures. These opinions are based on a combination of knowledge of scientific evidence and personal experience.

The purpose of this study was to create guidelines for post-operative weight-bearing limitations and the return to running and impact sports based on the expert opinions of 26 high volume hip arthroscopy orthopedic surgeons. We hypothesized that a lack of consensus regarding post-operative weight-bearing protocols, and return to running and impact sports exists between high volume hip surgeons.

## METHODS

The study was invited by the international society for hip arthroscopy (ISHA) organizing committee for the 2015 annual meeting. The study represents an international cross-sectional survey of 26 hip arthroscopy surgeons. The survey was undertaken to study particular post-operative

weight-bearing protocols after hip arthroscopy surgeries performed for various indications. The indications for hip arthroscopy included in this survey were labral resection, labral repair, labral reconstruction, chondroplasty or flap preservation, microfracture, chondral matrix repair, isolated acetabuloplasty, isolated femoroplasty, mixed acetabuloplasty and femoroplasty, capsular plication, psoas tenotomy and other surgeries clarified by the surgeons.

The questionnaire represents the common questions and concerns raised by orthopedic hip arthroscopy surgeons at educational conferences and venues. The questionnaire was delivered via email to 34 hip surgeons identified as high volume hip surgeons. Based on the previous work of Domb et al., high volume hip surgeons were defined as those who perform a minimum of 50 hip arthroscopies a year [12]. This survey took into account hip arthroscopists renowned for the volume of hip scopes they perform each year and more importantly, for their distinguished and established positions in the academic field of hip scopes as they are all very active members of scientific community such as ISHA (board members and committee directors) ISAKOS (Hip and groin committee) and ESSKA (Hip committee members). The questionnaire was composed of seven questions and allowed for both numerical and written responses as well as comments and clarifications. The questions primarily addressed post-operative weight-bearing protocols and delayed return to running and impact sports (see Table I).

**Table I. Survey questions**

Question #	Question
1	How many arthroscopies do you perform per year?
2	Do you give immediate weight bearing after hip arthroscopy?
3	If Never, how long do you recommend Non Weight Bearing (NWB)?
4	If depending on procedure, how long of NWB for these procedures?
5	How long do you delay return to running after Hip Arthroscopy?
6	How long do you delay return to impact sport after Hip Arthroscopy?
7	Which procedure will delay return to running and impact sports?

This table shows the survey questions asked of each hip arthroscopy expert.

As no personalized, private, or confidential medical health care data were created and the survey was anonymous, we determined that no institutional review board was necessary. Additionally, completion of the surveys implies consent from the survey participants. No compensation, financial or otherwise was provided for participation in this survey.

## RESULTS

A total of 34 orthopedic hip arthroscopy specialists were invited to complete this survey and 26 surgeons responded with a 76% response rate. Each respondent to this survey was an orthopedic subspecialists' surgeon performing a minimum of 50 hip arthroscopies a year with 69% performing more than 100 hip arthroscopy cases yearly. The pooled results of this survey were used to create recommendations regarding post-operative weight-bearing protocols and returning to sport after hip arthroscopy.

## Weight bearing after arthroscopy

Surgeons were asked whether or not they provide immediate weight bearing after hip arthroscopy procedures. Four (15.4%) surgeons always provided immediate weight bearing whereas 5 (19.2%) surgeons never provided immediate weight bearing. For those surgeons who never offered immediate weight bearing, the NWB protocols varied between 1 week NWB and 3 weeks NWB post-operatively. The majority of surgeons, 17 (65.4%), provide weight bearing depending on the specific pathology, clinical picture and procedures performed.

## Procedure specific weight-bearing limitations

Table II displays the surgeons' post-operative weight-bearing protocol based on the procedures performed. The majority of surgeons allowed weight bearing as tolerated, immediately after labral resection (17 out of 24 surgeons) and psoas tenotomy (16 out of 24 surgeons) procedures. Twenty-one out of twenty-four (87.5%) respondents restrict weight bearing after microfracture procedures and

**Table II. Procedure-specific indications for non-weight bearing after hip arthroscopy**

*If depending on procedure, how long of NWB for these procedures?*

<i>Answer options</i>	<i>Immediate WB</i>	<i>1 week</i>	<i>3 weeks</i>	<i>6 weeks</i>	<i>8 weeks</i>	<i>12 weeks</i>	<i>Non concerned</i>	<i>Response count</i>
Labral resection	17	4	2	1	0	0	0	24
Labral repair	10	3	9	2	0	0	0	24
Labral reconstruction	8	1	8	0	1	0	6	24
Chondroplasty/chondral flap preservation	12	2	7	3	0	0	0	24
Microfracture	3	0	10	7	4	0	0	24
Chondral matrix repair	2	0	7	4	2	0	8	23
Isolated acetabuloplasty	14	5	4	1	0	0	0	24
Isolated femoroplasty	12	4	5	3	0	0	0	24
Mixt acetabuloplasty + femoroplasty	11	4	5	3	0	0	0	23
Capsular plicature	8	3	8	1	0	1	3	24
Psoas tenotomy	16	5	2	0	1	0	0	24
Other = please clarify								6
<i>Answered question</i>								26
<i>Skipped question</i>								0

This table shows the responses of surgeons who restrict weight bearing after hip arthroscopy based on the index procedure and shows the time of non-weight bearing they employ for their patients. Six surgeons responded with comments to this question regarding partial weight bearing, the depth and extend of cartilaginous defects and microfracture and the size of labral tears. These comments are covered in the results and discussion sections.

thirteen out of fifteen (86.7%) respondents restrict weight bearing after chondral matrix repair for 3–8 weeks post-operatively. Only three of twenty-four surgeons allowed immediate weight bearing after microfracture procedures and only two of twenty-four surgeons allowed immediate weight bearing after chondral matrix repair. Four surgeons allowed partial weight bearing immediately after microfracture and chondral matrix repair and had patients progress to full weight bearing between 2 days and 2 weeks post-operatively. Additional post-operative weight-bearing protocols are listed in [Table II](#).

**Return to running and impact sports**

The range of post-operative delay in the return to running was between 1 month (2 surgeons) and 6 months (2 surgeons). The majority of surgeons allowed patients to return to running between 3 and 4 months post-operatively (18 surgeons) ([Table IIIa](#)). The range of post-operative delay in the return to impact sports ranged from 2 months (2 surgeons) to six months (10 surgeons) ([Table IIIb](#)). Regarding procedure-specific delayed return to running and impact sports, greater than 40% of surgeons responded that labral repair and reconstruction, chondroplasty and chondral matrix repair require delayed return. Less than 10% of surgeons responded that labral resection or isolated acetabuloplasty require delayed return to running and impact sports. Finally, 82.6% of surgeons expressed that microfracture procedures required delayed return to running and impact sports. Responses to the above-mentioned and additional procedures can be seen in [Table IIIc](#).

**Table IIIa. Delay in return to running after hip arthroscopy**

<i>How long do you delay return to running after hip arthroscopy</i>		
<i>Answer options</i>	<i>Response percent</i>	<i>Response count</i>
1 month	7.7	2
2 months	15.4	4
3 months	46.2	12
4 months	23.1	6
6 months	7.7	2
<i>Answered question</i>		26
<i>Skipped question</i>		0

This table shows how long the surgeons surveyed delayed return to running activities after hip arthroscopy.

**Table IIIb. Delay in return to impact sports after hip arthroscopy**

<i>How long do you delay return to impact sport after hip arthroscopy</i>		
<i>Answer options</i>	<i>Response percent</i>	<i>Response count</i>
1 month	0.0	0
2 months	7.7	2
3 months	26.9	7
4 months	26.9	7
6 months	38.5	10
<i>Answered question</i>		26
<i>Skipped question</i>		0

This table shows how long the surgeons surveyed delayed return to impact sports activities after hip arthroscopy.

**Table IIIc. Procedure-specific indications for delayed return to running and impact sports**

<i>Which procedure will delay return to running and impact sports</i>		
<i>Answer options</i>	<i>Response percent</i>	<i>Response count</i>
Labral resection	8.7	2
Labral repair	56.5	13
Labral reconstruction	43.5	10
Chondroplasty/chondral flap preservation	43.5	10
Microfracture	82.6	19
Chondral matrix repair	43.5	10
Isolated acetabuloplasty	8.7	2
Isolated femoroplasty	17.4	4
Mixt acetabuloplasty + femoroplasty	17.4	4
Capsular plicature	34.8	8
Psoas tenotomy	13.0	3
Comments		4
<i>Answered question</i>		23
<i>Skipped question</i>		3

This table shows the procedure-specific indications for delayed return to running and impact sports. Four surgeons registered comments for this question regarding shortening the return to sports activity based on functional recovery, shortening recovery period for competitive athletes and considering all procedures performed during hip arthroscopy.

## DISCUSSION

Evidence-based medicine informing post-operative rehabilitation protocols after hip arthroscopy is scarce [5, 8, 13]. Therefore, post-operative rehabilitation and weight-bearing protocol application is left to the clinical decision of the operating surgeon and physical therapist. Due to this scarcity, the opinions and practices of hip arthroscopy experts serve as guiding signposts for all hip arthroscopy surgeons. The primary outcome of this study reports that most hip arthroscopy specialists allow immediate weight bearing as tolerated after labral resection, acetabular osteoplasty, chondroplasty and psoas tenotomy.

A recent systematic review of literature found 18 studies with minimum 2-year follow up reporting post-operative protocols [13]. However, reporting of rehabilitation protocol parameters (weight bearing, motion, strengthening and return to sport) was poor [13]. The study concluded that hip arthroscopy rehabilitation guidelines lack high-quality evidence to support a specific protocol. Bennell et al. [14] performed a randomized controlled trial of physiotherapy protocols for young active patients undergoing hip arthroscopy for FAI. This study provided evidence for the efficacy of physiotherapist-supervised rehabilitation. However, this study did not focus on weight-bearing post-operatively as their guideline states “Patients will be asked to use crutches until they can walk without pain and without limping, likely 10 days or less”. Considering the lack of high quality evidence to support-specific lengths for non-weight-bearing rehabilitation, this discussion will outline expert opinions and post-operative protocols based on those opinions. Two-thirds of respondents to this survey provided post-operative weight-bearing protocols based on the index procedures performed. In analyzing the index procedure and post-operative weight-bearing protocols, three categories of tissue-based procedures linked to three basic protocols were found. The basic categories induced labral procedures, bony procedures and cartilage procedures.

Procedures performed on the labrum of the hip joint surveyed in this study were labral resection, labral repair and labral reconstruction. In the case of labral treatments, labral-healing and labral suture failure are the main concerns with early post-operative weight bearing and return to sports activities. However, few studies exist reporting labral suture failure rate. In 24 revision hip arthroscopy cases, Hayworth et al. [15] found eight cases with labral suture failure. However, in six of those eight cases, the cause of suture failure could be traced to intraoperative or radiographic residual bony impingement. This finding is confirmed by numerous studies which conclude that residual cam or pincer type deformity, unaddressed or under resected during the index operation, leads to suture failure,

poor labral healing and ultimately revision hip arthroscopy [16–20]. It is likely that inadequate osteoplasty of bony impingement, cam or pincer lesions, leads to labral suture failure and poor labral healing rather than early post-operative weight bearing. Additionally, consideration of borderline dysplasia in patients with broken shenton line, femoral neck shaft angle  $>140^\circ$ , lateral central edge angle  $<19^\circ$  or BMI  $>23 \text{ kg/m}^2$  must be taken into account, as this is a potential cause of labral suture failure [21].

Surgeries focused on repairing cartilaginous pathology surveyed in this study included chondroplasty/chondral flap preservation, microfracture and chondral matrix repair. In these procedures, inadequate healing of the cartilage due to excessive cartilage loading is a chief concern. The post-operative protocols and weight-bearing guidelines after these procedures are commonly based on similar procedures performed in the knee joint [2, 22]. In the knee joint, 6–8 weeks non-weight bearing with slow active continuous mobilization and return to impact sports at 6 months is recommended [22]. Cartilage defect complications of microfracture procedures in the hip are relatively rare. A recent systematic review of 12 studies with 267 patients found that 0.7% of patients had cartilage defect complications [23]. Post-operative weight-bearing protocols of the studies included in this review varied from partial weight bearing as tolerated post-operatively with crutches to no weight bearing for 16 weeks post-operatively. Factors leading to failures in chondral procedures may include residual cam and pincer lesions of the hip, borderline dysplasia and early weight bearing.

Regarding osteoplasty and procedures that focus on correcting mechanical causes of impingement, the most severe complications are femoral neck fractures. However, femoral neck fractures are rare complications. In a systematic review of 14 945 proximal femoroplasties, only 11 proximal femur fractures were recorded, resulting in 0.07% incidence of proximal femoral fractures after femoroplasty [24]. Risk factors for fractures were female gender and increased age. Laude et al. [25] modified their post-operative weight-bearing protocol in an effort to prevent femoral neck fractures, principally in older patients and those with poor bone quality. Other authors have also suggested protected weight bearing in patients at risk for femoral neck fractures [26–28].

In capsular plication procedures, luxation and dislocation are key concerns. However, hip dislocations are rare complications. Of 6134 patients from 92 studies, only four hip dislocations (0.067%) were reported [29]. Furthermore, these complications may be attributable to over aggressive acetabular rim resection [30] and borderline dysplasia [31].

### Suggested guidelines

This study suggests immediate weight bearing as tolerated after labral resection, repair and reconstruction procedures. For osteoplasty procedures, immediate weight bearing as tolerated is suggested with caution in women above the age of 50 and patients with borderline dysplasia. For procedures of cartilage defects, a period of 6 weeks or more non-weight bearing is suggested depending on the area of the defect and lateral central edge angle. In capsular procedures, 6 weeks or more non-weight bearing depending on joint laxity, lateral central edge angle and the tonnis angle is suggested. With regard to return to running and impact sports, this study suggests delayed return after microfracture procedures. In the case of other cartilaginous procedures, tendinous procedures and bony procedures, the patient's specific circumstances and protecting repaired tissues should be taken into account when planning return to running and impact sports activities.

### Limitations

The survey format of this study constitutes a limitation. Furthermore, individual questions may be bias or suggestive and open-ended questions allow for ambiguity and the survey used in this study is not a validated survey. However, questions were ultimately chosen based on a literature review of current protocols, possible complications and pathomechanical considerations after hip arthroscopy. The respondents to this survey are experienced and expert hip arthroscopy surgeons; however; the conclusions are drawn based on their opinions and experiences, and are not solely based on empirical data. As such, the suggestions for post-operative weight-bearing protocols must be weighted and practiced with respect to the knowledge and experience of the operating surgeon.

### CONCLUSIONS

Marked variability exists in the post-operative weight-bearing practices of hip arthroscopy surgeons. This study suggests that most surgeons allow immediate weight bearing as tolerated after labral resection, acetabular osteoplasty, chondroplasty and psoas tenotomy. For cartilage defect procedures, 6 weeks or more non-weight bearing is suggested depending on the area of the defect and lateral central edge angle. Delayed return to sports activities is suggested after microfracture procedures.

### ETHICAL APPROVAL

As no personalized, private, or confidential medical health care data was created and the survey was anonymous we determined that no institutional review board was

necessary. Additionally, completion of the surveys implies consent from the survey participants.

### CONFLICT OF INTEREST STATEMENT

None declared.

### REFERENCES

1. Enseki KR, Kohlrieser D. Rehabilitation following hip arthroscopy: an evolving process. *Int J Sports Phys Ther* 2014; **9**: 765–73.
2. Steadman JR, Briggs KK, Rodrigo JJ *et al*. Outcomes of microfracture for traumatic chondral defects of the knee: average 11-year follow-up. *Arthroscopy* 2003; **19**: 477–84.
3. Edelman J, Ranawat A, Enseki KR *et al*. Post-operative guidelines following hip arthroscopy. *Curr Rev Musculoskelet Med* 2012; **5**: 15–23.
4. Enseki KR, Martin R, Kelly BT. Rehabilitation after arthroscopic decompression for femoroacetabular impingement. *Clin Sports Med* 2010; **29**: 247–55, viii.
5. Enseki KR, Martin RL, Draovitch P *et al*. The hip joint: arthroscopic procedures and postoperative rehabilitation. *J Orthop Sports Phys Ther* 2006; **36**: 516–25.
6. Garrison JC, Osler MT, Singleton SB. Rehabilitation after arthroscopy of an acetabular labral tear. *N Am J Sports Phys Ther* 2007; **2**: 241–50.
7. Stalzer S, Wahoff M, Scanlan M. Rehabilitation following hip arthroscopy. *Clin Sports Med* 2006; **25**: 337–57.x.
8. Wahoff M, Ryan M. Rehabilitation after hip femoroacetabular impingement arthroscopy. *Clin Sports Med* 2011; **30**: 463–82.
9. Byrd JW, Jones KS. Hip arthroscopy in high-level baseball players. *Arthroscopy* 2015; **31**: 1507–10.
10. Philippon MJ, Christensen JC, Wahoff MS. Rehabilitation after arthroscopic repair of intra-articular disorders of the hip in a professional football athlete. *J Sport Rehabil* 2009; **18**: 118–34.
11. McDonald JE, Herzog MM, Philippon MJ. Return to play after hip arthroscopy with microfracture in elite athletes. *Arthroscopy* 2013; **29**: 330–5.
12. Domb BG, Stake CE, Finch NA *et al*. Return to sport after hip arthroscopy: aggregate recommendations from high-volume hip arthroscopy centers. *Orthopedics* 2014; **37**: e902–5.
13. Grzybowski JS, Malloy P, Stegemann C *et al*. Rehabilitation following hip arthroscopy – a systematic review. *Front Surg* 2015; **2**: 21.
14. Bennell KL, O'Donnell JM, Takla A *et al*. Efficacy of a physiotherapy rehabilitation program for individuals undergoing arthroscopic management of femoroacetabular impingement – the FAIR trial: a randomised controlled trial protocol. *BMC Musculoskelet Disord* 2014; **15**: 1–11.
15. Heyworth BE, Shindle MK, Voos JE *et al*. Radiologic and intraoperative findings in revision hip arthroscopy. *Arthroscopy* 2007; **23**: 1295–302.
16. Sardana V, Philippon MJ, de Sa D *et al*. Revision hip arthroscopy indications and outcomes: a systematic review. *Arthroscopy* 2015; **31**: 2047–55.

17. Cvetanovich GL, Harris JD, Erickson BJ *et al.* Revision hip arthroscopy: a systematic review of diagnoses, operative findings, and outcomes. *Arthroscopy* 2015; **31**: 1382–90.
18. Philippon MJ, Schenker ML, Briggs KK *et al.* Revision hip arthroscopy. *Am J Sports Med* 2007; **35**: 1918–21.
19. Ward JP, Rogers P, Youm T. Failed hip arthroscopy: causes and treatment options. *Orthopedics* 2012; **35**: 612–7.
20. Larson CM, Giveans MR, Samuelson KM *et al.* Arthroscopic hip revision surgery for residual Femoroacetabular Impingement (FAI): surgical outcomes compared with a matched cohort after primary arthroscopic FAI correction. *Am J Sports Med* 2014; **42**: 1785–90.
21. Uchida S, Utsunomiya H, Mori T *et al.* Clinical and radiographic predictors for worsened clinical outcomes after hip arthroscopic labral preservation and capsular closure in developmental dysplasia of the hip. *Am J Sports Med* 2015; **44**: 28–38.
22. Steadman JR, Hanson CM, Briggs KK *et al.* Outcomes after knee microfracture of chondral defects in alpine ski racers. *J Knee Surg* 2014; **27**: 407–10.
23. MacDonald AE, Bedi A, Horner NS *et al.* Indications and outcomes for microfracture as an adjunct to hip arthroscopy for treatment of chondral defects in patients with femoroacetabular impingement: a systematic review. *Arthroscopy* 2015; **32**: 190–200.
24. Merz MK, Christoforetti JJ, Domb BG. Femoral neck fracture after arthroscopic femoroplasty of the hip. *Orthopedics* 2015; **38**: e696–700.
25. Laude F, Sariali E, Nogier A. Femoroacetabular impingement treatment using arthroscopy and anterior approach. *Clin Orthop Relat Res* 2009; **467**: 747–52.
26. Ayeni OR, Bedi A, Lorch DG *et al.* Femoral neck fracture after arthroscopic management of femoroacetabular impingement. *A case report. J Bone Joint Surg (American Volumes)* 2011; **93**: 893.
27. Mardones RM, Gonzalez C, Chen Q *et al.* Surgical treatment of femoroacetabular impingement: evaluation of the effect of the size of the resection. *J Bone Joint Surg Am* 2005; **87**: 273–9.
28. Papavasiliou A, Bardakos N. Complications of arthroscopic surgery of the hip. *Bone Joint Res* 2012; **1**: 131–44.
29. Harris JD, McCormick FM, Abrams GD *et al.* Complications and reoperations during and after hip arthroscopy: a systematic review of 92 studies and more than 6,000 patients. *Arthroscopy* 2013; **29**: 589–95.
30. Matsuda DK. Acute iatrogenic dislocation following hip impingement arthroscopic surgery. *Arthroscopy* 2009; **25**: 400–4.
31. 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.