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Research article

The 'upper deck view' improves visualization during acetabuloplasty without chondro-labral detachment

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ABSTRACT

The 'upper deck' view is an arthroscopic perspective which visualizes the labral–osseous junction without detachment of the chondro-labral junction. The aim of this study was to evaluate the utility of the 'upper deck' view in preventing incomplete acetabuloplasty. Data were prospectively collected from September 2016 to November 2016 for all hip arthroscopies. We recorded the amount and clock-face of residual pincer-lesion acetabular bone resected using the 'upper deck' view. We noted whether this residual pincer-lesion acetabular bone was visible fluoroscopically, as well as the amount and clock-face of the overall acetabuloplasty. During the study period, 87 hip arthroscopies were performed; 50 met the inclusion criteria. Forty-six (92%) patients had residual pincer-lesion acetabular bone after completion of the acetabuloplasty resected from the bird's eye view. In all such cases the residual pincer-lesion acetabular bone was not visible under fluoroscopy and could only be detected using this specific view. The average maximum resection for the acetabuloplasty was 2.1 ± 0.9 and 1.4 ± 0.5 mm ($P = 0.16$) for resection of residual pincer-lesion acetabular bone. The 'upper deck' view provides the ability to decrease the risk of incomplete acetabuloplasty, due to the high likelihood (92%) of a residual beak of pincer-lesion acetabular bone when this view is not used during rim trimming.

INTRODUCTION

Hip arthroscopy is a technically challenging surgical procedure that carries a steep learning curve [1]. The primary reason for revision arthroscopy in the hip is residual impingement. A systematic review showed that of 348 hips that were revised, 81% had residual femoroacetabular impingement (FAI) (combined 56%, cam 34% and pincer 10%) [2]. Optimizing arthroscopic visualization and understanding of hip anatomy allows the surgeon and patient to avoid this problem and obtain the best possible outcomes.

Acetabular rim trimming for pincer-type FAI is commonly performed arthroscopically [3–5]. Inadequate or excessive resection of the acetabular rim is related to multiple complications [2]. Over-resection, especially in borderline dysplastic or retroverted patients, can be associated with iatrogenic instability, while under-resection is associated with residual impingement.

Recent technique modifications have made possible acetabuloplasty without labral detachment, and subsequent labral repair [6–8]. However, this technique may increase the risk of incomplete acetabuloplasty when conventional arthroscopic views are used. This has led to the development of the 'upper deck' view, an arthroscopic perspective which allows visualization of the labral–osseous junction without detachment of the chondro-labral junction [9].

The 'upper deck' view allows for complete resection of pincer impingement by direct visualization. Is it done with the 70 degrees scope through the anterolateral portal and

placed between the capsule and the non-detached labrum, after capsule elevation with the radiofrequency wand. It provides complete visualization of the entire acetabular rim during rim trimming. Inadequate visualization can lead to incomplete acetabuloplasty, increasing the risk of residual impingement and microtrabecular fractures.

The aim of this study was to assess the likelihood of incomplete acetabuloplasty if 'upper deck' view is not used routinely during hip arthroscopy. Our hypothesis was that using the 'upper deck' view would show a residual beak of bone in the anterosuperior area of the acetabular rim in a high percentage of the hip arthroscopies.

MATERIALS AND METHODS

During the study period from September 2016 to November 2016, we prospectively collected data on all hip arthroscopies performed by the senior surgeon (XXX). Patients were included if they underwent arthroscopic acetabuloplasty for the treatment of pincer-type impingement caused by acetabular over-coverage or retroversion. We excluded patients that underwent concomitant labral reconstruction. All patients participated in the YYY Hip Preservation Registry. While this study represents a unique analysis, data on some patients in this study may have been reported in other studies. All data collection received Institutional Review Board approval.

To assess the utility of the upper deck view, we recorded the amount and the clock-face range of any residual impinging bone that was resected using the upper deck view. We noted whether this residual bone was visible fluoroscopically, as well as the amount and clock-face of the overall acetabuloplasty. We also collected data on demographics, intraoperative findings and concomitant procedures.

Imaging

All patients in our study group were evaluated with a full set of preoperative and postoperative radiographic views comprising standard AP pelvic views, 45° Dunn view and false profile view. Pincer-type impingement was identified using standard radiographic measurements such as lateral center-edge angle >40°, anterior center-edge angle >40°, and presence of a crossover sign. Retroversion was assessed observing crossover sign, ischial spine sign and posterior wall sign in AP pelvic views.

Surgical technique

All hip arthroscopies were performed with the patient placed on a traction table in the supine position and under general endotracheal anesthesia [6–8, 10–12]. After routine draping and sterilization, anterolateral (AL) and mid-anterior (MA) portals were established, and capsulotomy was performed to access the joint. Diagnostic arthroscopy included evaluation of any pincer morphology and fluoroscopic guidance to determine the amount and location of acetabular rim to be resected. The capsule was elevated from the area of the pincer lesion with the ablator radiofrequency wand, and acetabuloplasty was performed using the 5.5 mm burr from the distal anterolateral accessory (DALA) portal, preserving the chondrolabral junction.

Rim trimming was initiated using the 'bird's eye' [9] view from the peripheral compartment, with the light source at 6 o'clock in the AL portal and the burr entering through the DALA portal (Fig. 1). Once the acetabuloplasty was apparently complete based on the 'bird's eye' view and fluoroscopic visualization, the arthroscope was placed in the 'upper deck' view (Fig. 1), above the labrum but still within the capsule and with the light source at 9 o'clock. From here, any residual pincer impingement was removed. The arthroscopy then proceeded with treatment of any other extant intra-articular pathology such as labral tears.

RESULTS

During the study period, the senior author performed 87 hip arthroscopies. Seventy-four of these cases included acetabuloplasty, and 24 with concomitant labral reconstruction were excluded to leave 50 in our study group. The study group was mostly female (66%). The average age was 39.5 ± 14.0, and the average BMI was 25.8 ± 5.1. The demographics data are summarized in Table I.

All patients had a labral tear that was treated with repair during their arthroscopy. There were six cases of Outerbridge IV damage to the acetabular cartilage which were treated with microfracture drilling. There were 13 (26%) patients with a notch osteophyte, and seven patients (14%) had subspine impingement that was resected. All patients underwent femoral head osteoplasty to treat cam-type impingement in addition to the acetabular rim trimming. Forty-one (82%) underwent capsular repair or plication, and the rest had an unrepaired capsulotomy. Our intraoperative findings and performed procedures data are summarized in Tables II and III.

In our study group, 46 (92%) of the patients had residual bone after apparent completion of the acetabuloplasty that was resected from the 'upper deck' view (Fig. 2). Notably, in all such cases the residual bone was not visible under fluoroscopy and therefore could only have been detected using this specific arthroscopic view. The average maximum resection for the total acetabuloplasty was 2.1 ± 0.9 mm, and the average maximum resection of residual bone was 1.4 ± 0.5 mm. On average, the

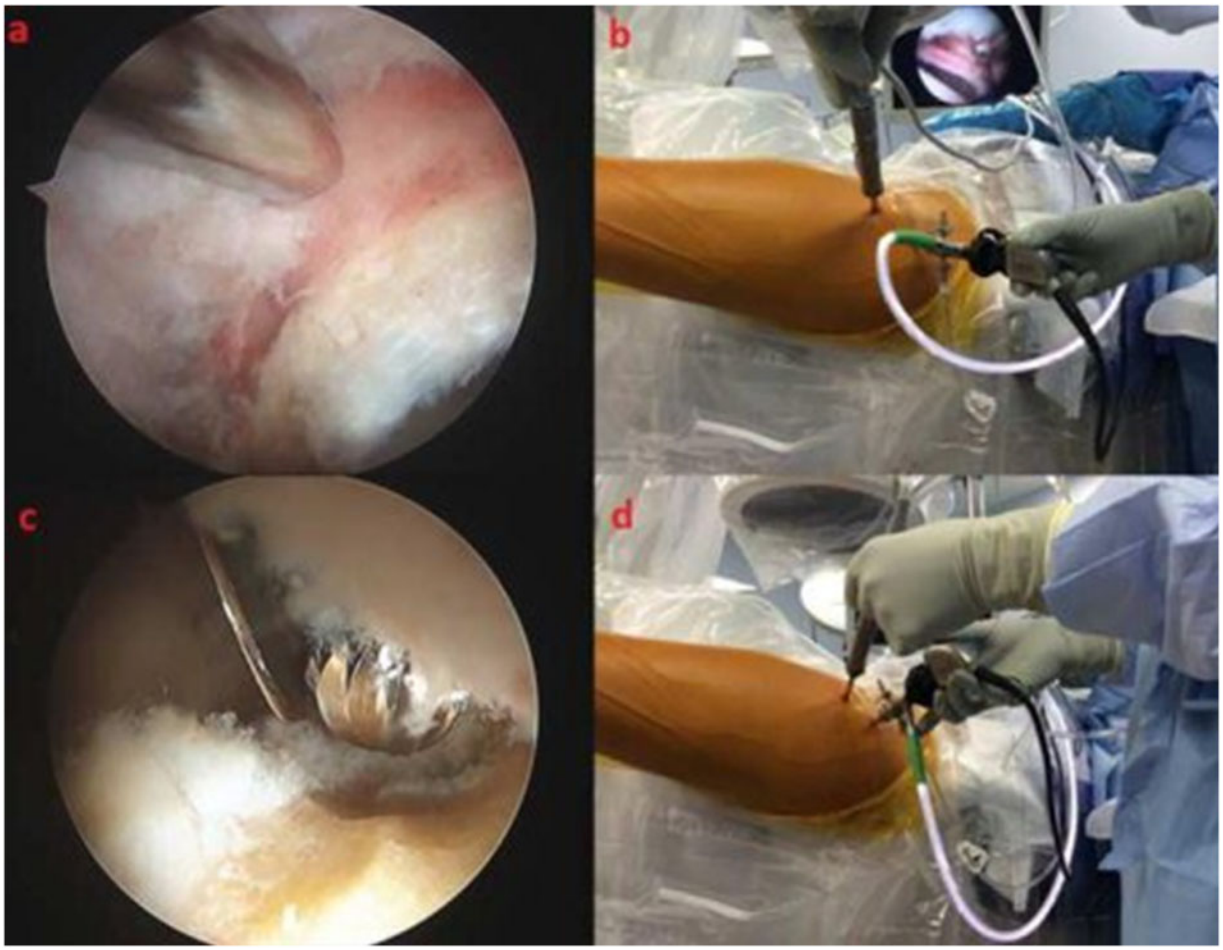

Fig. 1. (**a**) Acetabuloplasty using the 'bird's eye' view, and (**b**) light source of the scope at 6 o'clock for a left hip while performing acetabuloplasty where the scope is at the peripheral compartment at the level of the capsulotomy, (**c**) acetabuloplasty using the 'upper deck' view and (**d**) light source of the scope at 9 o'clock for a left hip while performing acetabuloplasty, where the scope is between the capsule and labrum viewing the labro-osseous junction [9].

Table I. Demographics

Patients	*49*
Hips	50
Left	26 (52%)
Right	24 (48%)
Gender	
Female	33 (66%)
Male	17 (34%)
Age at time of surgery	39.5 ± 14.0 (14.1–70.2)
BMI	25.8 ± 5.1 (17.2–39.0)

overall pincer lesion extended from 11.6 ± 0.8 to 15.1 ± 0.4 (just past 11:30 o'clock to just past 3 o'clock). The average residual lesion extended from 12.0 ± 0.9 to 15.0 ± 0.3 (about 12 o'clock to 3 o'clock). We found that the posterior edge of the residual bone began significantly more anteriorly ($P = 0.027$). The results of our rim trimming data collection can be found in Table IV.

DISCUSSION

This case series of patients undergoing hip arthroscopy demonstrates the presence of residual bone after acetabuloplasty if the entire rim is not optimally visualized in 92% of the cases. Initial rim trimming is done with the 'bird's eye' view, where the scope is located just below the level of the interportal capsulotomy, with the light source looking at

Table II. Intraoperative findings

Ligamentum teres tear	21 (42%)
Partial	18 (36%)
Complete	3 (6%)
Labral tear	50 (100%)
Seldes I	11 (22%)
Seldes II	6 (12%)
Seldes I and II	33 (66%)
ALAD	
0	3 (6%)
1	22 (44%)
2	11 (22%)
3	14 (28%)
4	0
Acetabular Outerbridge	
0	3 (6%)
I	21 (42%)
II	11 (22%)
III	9 (18%)
IV	6 (12%)
Femoral head Outerbridge	
0	47 (94%)
I	0
II	0
III	2 (4%)
IV	1 (2%)

Table III. Procedures

Labral repair	50 (100%)
Capsular release	9 (18%)
Capsular repair/plication	41 (82%)
Acetabuloplasty	50 (100%)
Femoroplasty	50 (100%)
Acetabular microfracture	6 (12%)
Femoral head microfracture	1 (2%)
Ligamentum teres debridement	9 (18%)
Iliopsoas fractional lengthening	23 (46%)
Trochanteric bursectomy	10 (20%)
Gluteus medius tear	8 (16%)
Trochanteric micropuncture	3 (6%)
Subchondral cyst removal	3 (6%)
Notchplasty	13 (26%)
Subspine decompression	7 (14%)
Iliotibial band release	1 (2%)
Loose body removal	3 (6%)
Synovectomy	2 (4%)

the acetabular rim. It provides adequate perspective of the capsule for elevation before acetabuloplasty and suture anchor placement, but some regions of the acetabular rim remain obscured. The residual impinging bone remains hidden even with fluoroscopic visualization. With the 'upper deck' view technique, performed after this initial trimming, the scope is placed between the elevated capsule and the torn labrum with the light source at 9 o'clock. Using this view allows the surgeon to finalize the rim trimming and reduce the chances of residual impingement or microtrabecular fractures.

Fig. 2. Beak of bone visualized using 'upper deck' view [9].

Table IV. Rim trimming data

	Total acetabuloplasty	*Residual bone*	P *value*
Patients	50 (50%)	46 (92%)	—
Maximum resection	2.1 ± 0.9 (1–5)	1.4 ± 0.5 (1–3)	—
Posterior clock face	11.6 ± 0.8 (9.0–13.0)	12.0 ± 0.9 (9.0–13.5)	0.027
Anterior clock face	15.1 ± 0.4 (14.0–17.0)	15.0 ± 0.3 (14.0–16.0)	0.853

Complete resection of pincer impingement is important to restore function of the hip. In addition, with the emergence of arthroscopic techniques that preserve the chondro-labral junction, instead of detaching it, better visualization is needed for acetabuloplasty [6–8]. The rationale for acetabular rim trimming is to directly address the offending morphology causing the impingement as in pincer-type or combined-type FAI and to protect the repaired labrum from further impingement [3, 13, 14]. When the acetabulum is inadequately resected, there is a chance of continued impingement or labral tear. Therefore, techniques that improve visualization of the acetabuloplasty may decrease the chances of revision surgery.

The biggest challenge with the upper deck technique is exposure; an incomplete capsulotomy, may block motion of the instruments in the joint making the upper-deck view harder. Also, if the capsule is not elevated properly, placing the scope between the labrum and the capsule will be difficult. All of this may lead to incomplete acetabuloplasty [9].

The average of residual bone was 1.4 mm. Philippon *et al.* found that 1 mm of bony resection equals 2.4 degrees of change in the center-edge (CE) angle [13]. This emphasizes the importance of having a complete perspective of the acetabular rim, where even 1 mm of residual bone can represent a significant change in the CE angle. In addition, newer techniques of labral fixation that preserve the chondrolabral junction can make the acetabuloplasty more difficult [6–8], making this view essential to avoid residual impingement.

Limitations from this study mainly stemmed from being a case series which represent a low level of evidence. In addition, we do not know the clinical significance that can be added with the additional rim trimming using the 'upper deck' view. Another limitation is that the arthroscopic measurements of rim trimming data were not compared with radiographic measurements to evaluate the amount of resection. Finally, because of being an arthroscopic finding study, patient reported outcomes and complications are not reported.

In conclusion, the 'upper deck' view, as an innovative and new arthroscopic perspective of the hip, provides the surgeon with the ability to decrease the chance of under-resection, due to the high likelihood (92%) of a residual beak of bone if this view is not used for rim trimming. Addressing this minimizes complications associated with residual impingement. We advocate for the routine utilization of this technique as a tool for complete acetabuloplasty in patients with pincer-type impingement.

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REFERENCES

1. Hoppe DJ, de SA D, Simunovic N *et al.* The learning curve for hip arthroscopy: a systematic review. *Arthroscopy* 2014; **30**: 389–97.
2. 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.
3. Philippon MJ, Schenker ML. A new method for acetabular rim trimming and labral repair. *Clin Sports Med* 2006; **25**: 293–7.
4. Zumstein M, Hahn F, Sukthankar A *et al.* How accurately can the acetabular rim be trimmed in hip arthroscopy for pincer-type femoral acetabular impingement: a cadaveric investigation. *Arthroscopy* 2009; **25**: 164–8.
5. Syed HM, Martin SD. Arthroscopic acetabular recession with chondrolabral preservation. *Am J Orthop Belle Mead NJ* 2013; **42**: 181–4.
6. Fry R, Domb B. Labral base refixation in the hip: rationale and technique for an anatomic approach to labral repair. *Arthroscopy* 2010; **26**: S81–9.
7. Jackson TJ, Hammarstedt JE, Vemula SP *et al.* Acetabular labral base repair versus circumferential suture repair: a matched-paired comparison of clinical outcomes. *Arthroscopy* 2015; **31**: 1716–21.
8. Redmond JM, El Bitar YF, Gupta A *et al.* Arthroscopic acetabuloplasty and labral refixation without labral detachment. *Am J Sports Med* 2015; **43**: 105–12.
9. Ortiz-Declet V, Mu B, Chen AW *et al.* The "bird's eye" and "upper deck" views in hip arthroscopy: powerful arthroscopic perspectives for acetabuloplasty. *Arthrosc Tech* 2018; **7**: e13–6.

10. Domb B, Hanypsiak B, Botser I. Labral penetration rate in a consecutive series of 300 hip arthroscopies. *Am J Sports Med* 2012; **40**: 864–9.
11. Suarez-Ahedo C, Martin TJ, Walsh JP *et al*. Anatomic labral repair in the hip using a knotless tensionable suture anchor. *Arthrosc Tech* 2016; **5**: e1089–e1094.
12. Jackson TJ, Stake CE, Trenga AP *et al*. Arthroscopic technique for treatment of femoroacetabular impingement. *Arthrosc Tech* 2013; **2**: e55–9.
13. Philippon MJ, Wolff AB, Briggs KK *et al*. Acetabular rim reduction for the treatment of femoroacetabular impingement correlates with preoperative and postoperative center-edge angle. *Arthroscopy* 2010; **26**: 757–61.
14. Philippon MJ, Stubbs AJ, Schenker ML *et al*. Arthroscopic management of femoroacetabular impingement: osteoplasty technique and literature review. *Am J Sports Med* 2007; **35**: 1571–80.