Journal of Hip Preservation Surgery Vol. 7, No. 2, pp. 345–350
doi: 10.1093/jhps/hnaa029
Advance Access Publication 20 September 2020
Technical Tips

Cystoscopy as a tool for hip arthroscopy for treating morbidly obese patients: a case report of treating a Sumo wrestler

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Submitted 11 March 2020; Revised 17 April 2020; revised version accepted 12 June 2020

ABSTRACT

Sports medicine surgeons sometimes encounter morbidly obese athletes with femoroacetabular impingement, such as Sumo wrestlers. In such cases, traditional arthroscopic equipment will not reach the joint. This case report describes the use of a cystoscope to perform arthroscopy to treat borderline developmental dysplasia of the hip combined with cam impingement in a morbidly obese athlete. The cystoscope enables hip arthroscopy to be performed when traditional instruments are not of sufficient length to access the hip and/or an extra-long arthroscope is not available. The use of the cystoscope provides a practical, feasible and minimally invasive option to treat non-arthritic intraarticular hip pathology in the morbidly obese or extremely muscular athletes.

INTRODUCTION

Hip arthroscopy has been established as a viable, less invasive alternative to open surgical dislocation for patients with different non-arthritic hip conditions. Safe successful outcomes have been reported in symptomatic patients with femoroacetabular impingement (FAI) syndrome and borderline dysplasia with concurrent chondrolabral pathology [1–3]. Some patients may be morbidly obese or may be athletes who are extremely muscular.

Sumo is the official national sport of Japan. The average weight of competitors is around 140 kg. To win, a competitor must push their opponent outside a circle or knock them down. Sumo wrestling is recognized as a collision sport requiring agility and involving sudden multidirectional high-load impact movements, often in hip flexion and competitors are at risk for painful non-arthritic intra-articular hip conditions that may adversely affect continued athletic performance as well as daily activities. The large size and muscularity of these athletic patients present technical challenges. However, the current literature does not provide clear recommendations on how to perform hip arthroscopy on Sumo wrestlers presenting with non-arthritic hip pathology. The purpose of this article was to present a case report with lessons learned to provide further knowledge to aid future arthroscopic treatment of this unique type of athlete.

CASE

A 31-year-old male professional Sumo wrestler presented with right hip pain associated with a limited range of motion (ROM). His height was 190 cm, and his weight was 200 kg (body mass index [BMI] 55.4 kg/m^2). Physical examination revealed a positive flexion adduction internal rotation test, flexion abduction external rotation test and dial test. The lateral center-edge angle was 19°, and the Sharp angle was 46° with a double floor at the bottom of the acetabular fossa, increased tear-drop distance, and a pistol grip deformity on the well-centered anteroposterior

(AP) pelvis radiograph (Fig. 1A). A false profile view revealed that the vertical center anterior angle was 16° (Fig. 1B). A modified Dunn view revealed that the alpha angle was 87°, suggesting cam morphology (Fig. 1C). Three-dimensional computed tomography scan revealed an anterior inferior iliac spine (AIIS) morphology and a cam lesion (Fig. 1D). On magnetic resonance imaging (MRI), a T2-weighted coronal view demonstrated a high signal intensity area in the anterosuperior labrum (Fig. 1E). Proton-density fat suppression coronal view on MRI revealed increased cartilage width (Fig. 1F), and T2 mapping showed an increasing T2 value, suggesting articular cartilage damage.

SURGICAL TECHNIQUE

Hip arthroscopy was performed in the supine position on a traction table under general anesthesia. It was impossible to use the usual traction table because this patient's body weight exceeded the manufacturer's safe limits for the equipment. Thus, a special traction table (Hana table, Mizuho OSI, Ahem Avenue Union City, CA, USA) with a maximum load of 223 kg was utilized (Fig. 2A). Since the distance measured from the skin to the hip joint capsule in this patient was over 20 cm, we utilized a rigid (non-flexible) cystoscope, which is longer than a regular arthroscope (Fig. 2B).

An anterolateral portal (ALP), mid-anterior portal (MAP) and proximal mid-anterior portal (PMAP) were established. After traction was applied, a longer cannulated needle (Smith and Nephew, Andover, MA, USA) was inserted into the joint through the ALP under fluoroscopic guidance. Subsequently, a guidewire was introduced through the needle, followed by the insertion of a cannulated switching rod. The sheath of cystoscope was slid into the joint over the switching rod, and then the cystoscope was then introduced into the central hip compartment

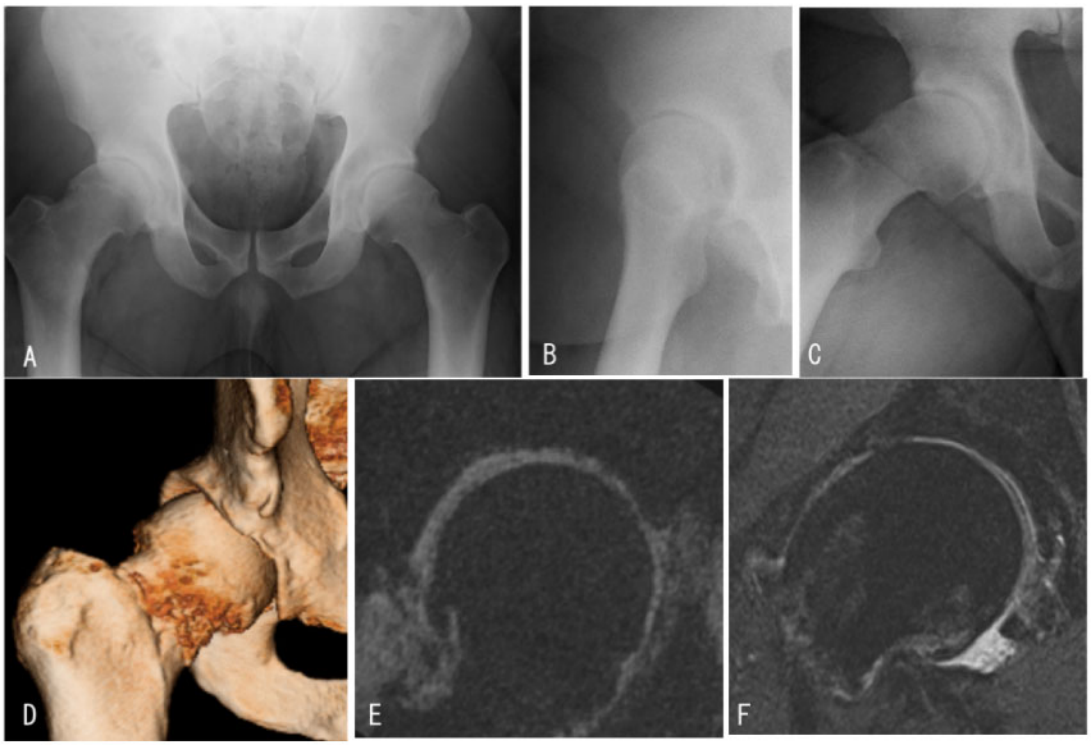

Fig. 1. Preoperative imaging: (**A**) preoperative anteroposterior (AP) radiograph of a right hip showing a non-dysplastic acetabulum, joint space narrowing and a pistol grip deformity. The lateral center-edge angle was 19°, Sharp angle was 46°; (**B**) preoperative false profile view of a right hip showing reduced anterior acetabular coverage. The vertical center anterior angle was 17°. (**C**) Preoperative modified Dunn view of a right hip showing that the alpha angle was 87°, and the offset ratio was 0.01, suggesting cam morphology. (**D**) Three-dimensional computed tomography scan of the right hip showing coverage of the acetabulum and a type II anterior inferior iliac spine (AIIS). (**E**) Three-dimensional computed tomography of the right hip showing cam morphology. (**F**) T2-weighted coronal magnetic resonance image (MRI) scan showing a high-intensity signal at the anterior-superior labrum. (**G**) T2-weighted oblique-axial MRI scan showing a high-intensity signal at the anterior-superior labrum. (**H**) Proton-density fat suppression MRI scan showing partial chondral thinning.

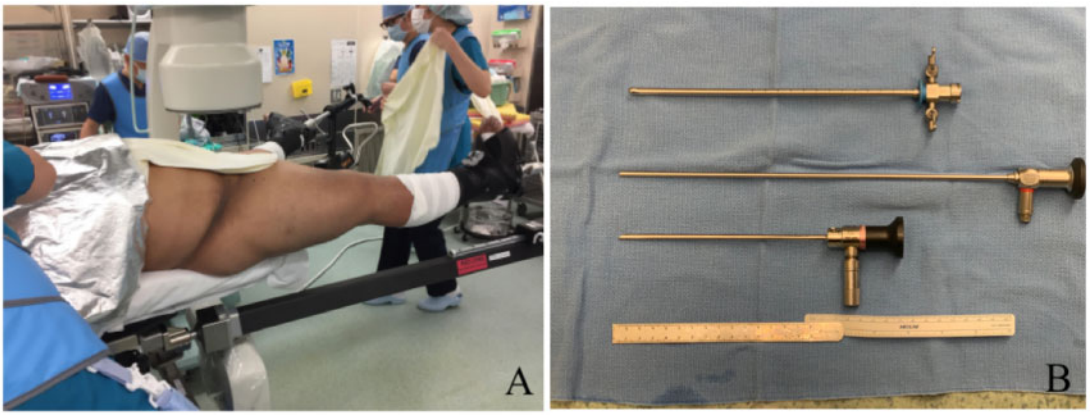

Fig. 2. (**A**) The patient was placed on a Hana traction table with well-padded peroneal post. (**B**) Comparison of a cystoscope to an arthroscope showing that the cystoscope was longer than the arthroscope.

through the anterolateral portal (Fig. 2B). After interportal capsulotomy, an intra-articular evaluation was performed. A detached tear of the acetabular labrum at 2:30 – 12:00 o'clock positions, with adjacent cartilage damage, was observed at the anterosuperior aspect of the acetabulum (Fig. 3A). A prominent AIIS was observed adjacent to a torn anterosuperior labrum. Sub-spine decompression was performed using a motorized round burr (Smith and Nephew) (Fig. 3B). Labral fixation with suture anchors (PushLock, Arthrex, Naples, FL, USA; SutureFix, Smith and Nephew) was performed (Fig. 3C). Microfracture chondroplasty was performed for acetabular cartilage damage (Fig. 3D). After the controlled release of traction with subsequent confirmation of the perimetric labral fluid seal, the peripheral compartment was assessed, and cam osteoplasty was performed (Fig. 3E). Finally, shoelace capsular closure with non-absorbable sutures (Ultratape; Smith and Nephew) was performed (Fig. 3F) [4]. A post-operative X-ray showed improved femoral head and neck offset (Fig. 4A and B).

POST-OPERATIVE REHABILITATION PROTOCOL

Although microfracture was performed, weight-bearing with dual crutches was permitted as tolerated. Passive ROM exercises were initiated during the first week by physical therapists. Circumduction ROM was performed for 3 weeks to minimize adhesive capsulitis and capsulolabral adhesions. Stationary bike activity was initiated 2 weeks after surgery. The patient was allowed to advance his physical activity after achieving maximum ROM and a stable gait. Modified Harris Hip Score, Vail Hip Score, and iHot-12 score had improved 2 years after surgery compared with preoperatively (modified Harris Hip Score: 67.1–93.5, Vail Hip Score: 28–86, iHot-12: 40.8–92.5). This patient returned to his preinjury activity level 1 year after surgery, but ultimately retired from professional Sumo wrestling and became a stable master.

DISCUSSION

This case report describes an arthroscopic approach for treating a morbidly obese athletic patient with recalcitrant non-arthritic hip pathology using a cystoscope. In general, hip arthroscopy for obese patients can offer clinical benefits. Collins *et al.* reported in a series of 21 consecutive obese patients and 18 non-obese patients that there was no significant difference in patient-reported outcome (PRO) scores, but obese patients had an increased risk of complications [5]. Gupta *et al.* reported, in a series of 62 consecutive obese patients and 124 non-obese patients, that there was no significant difference in PRO scores, but the rate of conversion to total hip arthroplasty (THA) and the revision rate were significantly higher in the obese group [6]. In addition, Perets *et al.* reported, in a series of 74 consecutive obese patients and 74 non-obese patients, that there was no significant difference in PRO scores, but the rate of conversion to THA was significantly higher in the obese group at a minimum 5-year follow-up [7]. A recent systematic review has reported a higher rate of revision surgery and lower PRO scores in obese patients than in the non-obese patients [8]. Obesity in these reports was defined as a BMI $>30\,kg/m^2$, and to our knowledge, there was little reference to arthroscopic hip surgery management for morbidly obese (BMI $\geq 40\,kg/m^2$) patients in the setting of FAI.

Commercially produced rigid cystoscopes are typically 30 cm in length and are available in the following sheath dimensions: 17-French gauge (5.7-mm diameter),

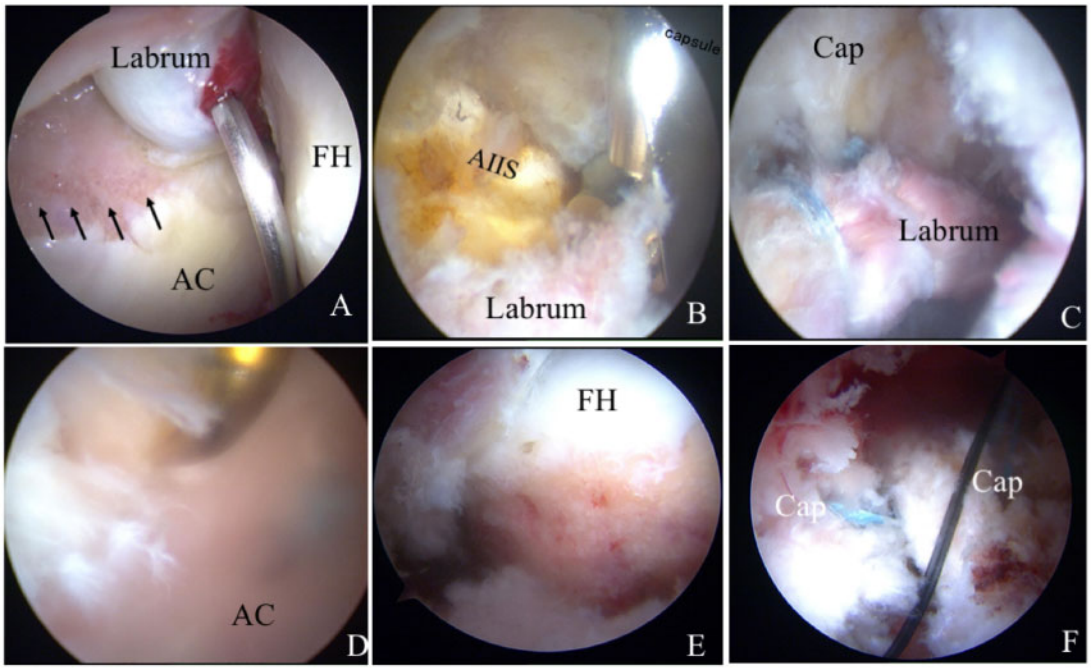

Fig. 3. (**A**) Arthroscopic findings from the anterolateral portal in the right hip showing a complete labral tear and acetabular chondral damage classified as International Cartilage Repair Society grade 4 (arrows). (**B**) Arthroscopic view from the anterolateral portal in the right hip showing anterior inferior iliac spine decompression. (**C**) Arthroscopic view from the anterolateral portal in the right hip showing labral repair with suture anchors. (**D**) Arthroscopic view from anterolateral portal in the right hip showing microfracture chondroplasty for acetabular cartilage damage. (**E**) Peripheral compartment view from the mid-anterior portal of the right hip showing cam osteochondroplasty. (**F**) Endoscopic extra-articular view from the anterolateral portal in the right hip showing shoelace capsular closure (AC, acetabulum; AIIS, anterior inferior iliac spine; CP, capsule; FH, femoral head; L, labrum).

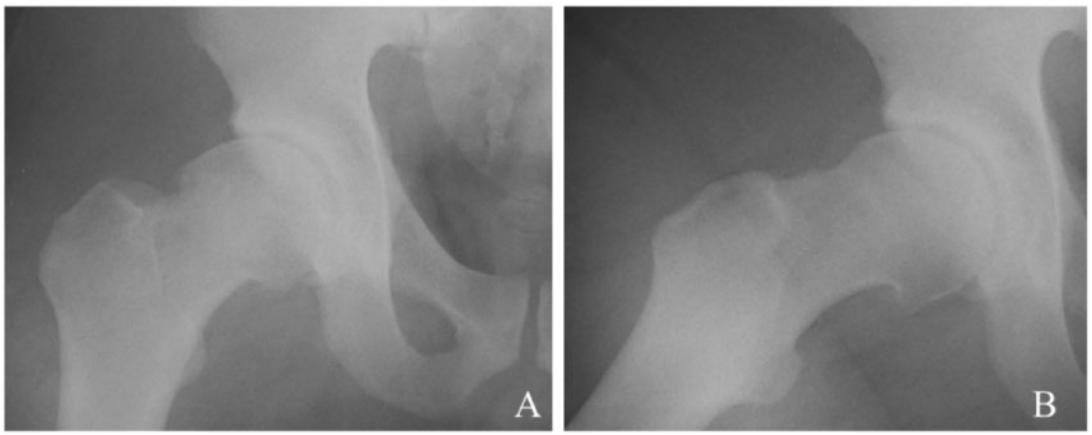

Fig. 4. Post-operative AP radiograph of the right hip showing improved femoral head neck offset of the pistol grip deformity (**A**) and post-operative modified Dunn view showing improved femoral head neck offset (**B**).

19-French gauge (6.3-mm diameter) and 22-French gauge (7.3-mm diameter). Hence, a slightly longer skin incision for the viewing portal than that is used for the standard arthroscope may be required. Most patients undergoing hip arthroscopy have a skin to socket distance at the 12 and 3 o'clock positions of 11 cm or less, thus enabling the use of standard-length arthroscopes, such as those used in knee and shoulder arthroscopy [9]. One of our co-authors [D.K.M.] has used a standard-length arthroscope in the setting of very obese or muscular patients by extending the incision to enable antegrade placement of the arthroscope bridge into the subcutaneous tissue of the anterolateral-

viewing portal. However, he cautions that this technique typically gains ∼3–4 cm of further excursion to access the central compartment. The standard arthroscope telescope length is ∼16 cm in length. An extra-long arthroscope (Smith and Nephew) is commercially available with a working length of 20 cm. Hence, the cystoscope enables hip arthroscopy to be performed when other options provide insufficient length to access the hip and/or an extra-long arthroscope is not available. Most hip arthroscopies are performed with a standard-length arthroscope with viewing angles of 70° and 30°. Commercially available cystoscopes offer 0°–120° viewing angles but are also available with more familiar viewing angles of 70° and 30° for hip arthroscopy.

The pitfalls of using a cystoscope are described as follows. It takes a long time for surgeons to adjust to handling a cystoscope owing to its longer length. The standard arthroscopy hip cannula set does not facilitate cystoscope insertion. However, the cystoscope can connect to a standard arthroscopic camera system and light cable. The cystoscope sheath can connect to the inflow/outflow tube set (Smith and Nephew) for typical fluid management via arthroscopic pump or gravity fluid management.

This surgical technique has several advantages and disadvantages, as summarized in Table I. In general, open treatment of FAI showed good clinical outcomes [10, 11]. However, in the case of morbidly obese patients, it appears to be difficult to obtain a clear surgical view by open surgical hip dislocation owing to thicker subcutaneous tissue [8]. Cystoscopic visualization may contribute to a relatively shorter surgical time and to reduce the occurrence of complications. In addition, less invasive treatment by this arthroscopic technique may enable an earlier return to sports activities. Surgical pearls and pitfalls for this technique are detailed in Table II.

In obese patients, there is an increasing risk of potential complications (e.g. pressure ulcer and wound healing problems, infection and deep vein thrombosis) from arthroscopic surgery [12, 13]. Thus, valid indications for hip arthroscopic surgery and detailed informed consent should be commensurate with the increasing risks of these complications.

Long-term clinical and radiographic outcomes from multiple cases will be required to substantiate the benefits of this procedure because the risk of conversion to THA in obese patients is significantly higher than that in non-obese patients. However, this technique offers a less invasive alternative for morbidly obese patients. Moreover, these techniques may find applicability in the arthroscopic treatment of very muscular non-obese patients exhibiting compromising hip pathology.

Table I. Advantages and disadvantages of hip arthroscopic surgery in the morbidly obese patient compared with open surgical dislocation

Advantages	*Disadvantages*
• Minimally invasive	• Technically demanding
• No trochanteric non-union or hardware-related problems	• Cystoscope required
Clear surgical view	Complications from excessive traction
Early rehabilitation	
• Quick recovery	
• Improved cosmesis	

Table II. Pearls and pitfalls

Pearls	*Pitfalls*
Preoperative evaluation and planning with radiographic image examination are indispensable.	Difficulty of using cystoscopy instead of arthroscopy.
Use traction table supportive of increased patient body weight.	
Use the cystoscope instead of arthroscopy.	

CONCLUSION

The use of the cystoscope provides a practical, feasible and minimally invasive option to treat non-arthritic intra-articular hip pathology in the morbidly obese or extremely muscular athletes.

AUTHORS' CONTRIBUTIONS

Authors have contributed as follows: S.U. and H.N. had the major role in elaborating the plan, formulating this manuscript and interpreting the data. A.S., Y.Y. and D.M. contributed in data collection, formulating the plans and writing this manuscript.

ACKNOWLEDGMENTS

We would like to thank Editage (www.editage.jp) for editing and reviewing this manuscript for English language

FUNDING

Each author certifies that he has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangements etc.) that might pose a conflict of interest in connection with the submitted article. Informed consent has been obtained from the patient. The patient approved the use of his data for the publication of this manuscript.

CONFLICT OF INTEREST STATEMENT

One of the authors (S.U.) is a consultant for Smith and Nephew, ConMed and Sigmax and receive research fund from Smith and Nephew and Stryker. D.K.M. is a consultant for Zimmer-Biomet. This article is unrelated to any funds. The authors report no other conflicts of interest to disclose that may affect the information and recommendations presented in the manuscript. Each author certifies that he has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangements etc.) that might pose a conflict of interest in connection with the submitted article. Informed consent has been obtained from the patient. The patient approved the use of his data for the publication of this manuscript.

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