# Hip Arthroscopy to Remove Loose Bodies After Traumatic Dislocation

*Brian H. Mullis, MD* and Laurence E. Dahners, MDT*

**Objectives:** This study was designed to review the incidence of arthroscopically detected intra-articular loose bodies found in patients after traumatic hip dislocation or small acetabular wall fracture which would not otherwise be treated without surgery.

**Design:** Retrospective review.

**Setting:** Level 1 academic trauma center.

**Patients:** Thirty-six patients who sustained traumatic hip injuries and subsequently had 39 hip arthroscopies between November 1997 and January 2004 were reviewed.

**Intervention:** All patients had standard AP pelvis x-rays and CT scans performed. At our institution, patients with hip dislocations or acetabular wall fractures not otherwise requiring surgery are routinely offered hip arthroscopy to remove loose bodies. The radiographs were reviewed to determine incidence of loose bodies or nonconcentric reduction before hip arthroscopy. Chart review provided incidence of loose bodies found during arthroscopy.

**Main Outcome Measurements:** Comparison was made between radiographic data obtained preoperatively and operative findings.

**Results:** Loose bodies were found in the hips of 33 of 36 patients (92%) who were arthroscoped. Loose bodies were found in 7 of 9 cases (78%) in which standard radiographic studies (AP pelvis x-rays and CT scan) found no loose bodies and a concentric reduction.

**Conclusions:** Loose bodies are routinely present after closed treatment of hip dislocations or wall fractures not otherwise requiring surgery, even when radiographs are negative. Hip arthroscopy may be indicated for loose body removal when open treatment is not otherwise necessary.

**Key Words:** hip dislocation, hip arthroscopy, loose bodies, acetabulum, femoral head
*(J Orthop Trauma* 2006; 20:22-26)

It has been known for some time that loose bodies are generated with traumatic hip dislocation as the femoral head shears against the acetabular lip.' In fact, in 1974 Epstein believed that loose bodies were so common that he recommended that *all* fracture dislocations be treated with open debridement.[2] Traumatic arthritis after hip dislocation also is a common complication, reported in 1 series at 24% of "simple" (no fracture) dislocations, and higher rates of arthritis with fracture dislocation [S.2-1] It is hard to understand why simple dislocations should have a high incidence of arthritis, but it is possible that unrecognized loose bodies might be responsible. There is animal evidence to suggest the presence of loose bodies leads to arthritis.'

It is generally accepted that after hip dislocation, standard radiographs, including AP pelvis and a CT scan, should be obtained to evaluate for loose bodies and a concentric reduction. The presence of a nonconcentric reduction is thought to be an absolute indication for surgical intervention .[`-5] A relative indication is the presence of loose bodies, but this is controversial in the presence of a concentric reduction, especially if the loose bodies are seen below the fovea.'

In the 1990s, the senior author (LED) began using arthroscopy to remove known osseous loose bodies. At that time, he anecdotally observed that patients frequently had unrecognized cartilaginous loose bodies in addition to the known osseous body. This led to the concern that patients without recognized osseous loose bodies might still have cartilaginous loose bodies, which might be responsible for eventual posttraumatic arthritis. Given this evidence, even with benign radiographic studies we have routinely offered (although not all have accepted) hip arthroscopy to patients after hip dislocation or acetabular wall fracture (if an open procedure is not otherwise indicated) in the hopes of reducing their risk of arthritis. The present study was undertaken to determine how many of these patients proved to have loose bodies.

## MATERIALS AND METHODS

Permission was obtained from our institutional review board to review the records of all patients who had undergone hip arthroscopy at our institution from November 1997 through January 2004. Records were selected for patients who had hip arthroscopy after traumatic hip dislocation or wall fracture. Charts, including history and physical, operative, and clinic notes, were available for 39 hip arthroscopies performed on 36 patients.

Radiographs, including an AP pelvis film and a CT scan after hip reduction, had been obtained in all patients. Dictated

Accepted for publication September 7, 2005.
From the *Department of Orthopaedics, Florida Orthopaedic Institute, Tampa, FL, and the ~"Department of Orthopaedics, University of North Carolina, Chapel Hill, NC.
The authors did not receive grants or outside funding in support of their research or preparation of this work. The manuscript does not contain information about medical devices.
Reprints: Laurence E. Dahners, MD, Department of Orthopaedics, University of North Carolina, CB #7055, Room 3153, Bioinformatics Bldg, Chapel Hill, NC 27599 (e-mail: led@med.unc.edu).

radiology and orthopaedic notes regarding the radiographic findings were available for all cases, but only 29 cases had films obtained at our institution and were available for a repeat review for this study. Of the films available for review, all were evaluated for concentricity of reduction, presence of osseous loose bodies, and presence and type of fracture of the acetabulum or femoral head. Because this was a retrospective review, CT scans varied from 2- to 3-mm cuts with the exception of 1 CT scan performed with 5-mm cuts. This single CT with 5-mm cuts did show loose bodies and a nonconcentric reduction, indicating that it was an adequate study in that particular patient.

Our current technique for hip arthroscopy is to perform the arthroscopy in the lateral position with hip flexion and distraction achieved by a custom femoral distractor (Fig. 1), as previously described by Dahners.[8] Hypotensive anesthesia (systolic < 100 mm Hg) and an arthroscopy infusion pump set at 60 mm Hg has greatly improved visualization during initial arthroscopies performed using gravity irrigation in which bleeding from fracture surfaces created significant problems with visualizations. The senior author, with the assistance of a resident, performed all of the arthroscopies reported in this study.

## RESULTS

Thirty-nine hip arthroscopies were performed in 36 patients. Pattern of injury is shown in Table 1. Early in our learning curve, 3 patients had repeated hip arthroscopy because of persistent mechanical symptoms or repeat CT scans showing retained osseous loose bodies after the first arthros copy. All 3 repeat procedures were performed in the surgeon's first 2 years of experience with hip arthroscopy and initially failed as a result of excessive bleeding from fracture surfaces, which impaired visualization. Hypotensive anesthesia and higher pump pressures have made this much less of a problem.

Loose bodies were detected radiographically (directly or presumed because of nonconcentric reduction) in 25 of 36 patients (69%). A concentric reduction without radiographi cally visible loose bodies was found in 9 patients (25%). All 9 of these cases had adequate x-rays and CT scans of at least 3-mm cuts taken at our institution, which were available for repeated review in the course of this study. Two cases did not have outside films available for review, and the clinical chart did not indicate whether loose bodies were present preoperatively.

TABLE 1. Pattern of Injury and Association of Loose Bodies

| Injury Pattern | No. of Patients | Loose Bodies Seen Preoperatively | Loose Bodies Found Arthroscopically |
|---|---|---|---|
| Simple dislocation (no fracture) | 5 | 5 | 5 |
| Fracture dislocations | 22 | 16 | 19 |
| Wall fractures | 8 | 4 | 8 |
| Undocumented | I | Undocumented | 1 |

Loose bodies were found intraoperatively in 33 of 36 patients (92%). In 1 patient, no loose body was seen with the first hip arthroscopy; however, a CT scan after the first arthroscopy showed retained loose bodies, which were found and removed with a second arthroscopy. Because loose bodies were believed to be present but not visualized (because of hemarthrosis) during the first arthroscopy, this patient was counted as 1 of 33 patients with loose bodies. Two patients had loose bodies found and removed at the first arthroscopy but were offered a second arthroscopy, because postoperative CT scans showed that not all of the loose bodies had been removed.

Of 9 patients in whom no loose bodies were detected preoperatively, loose bodies were found at the time of hip arthroscopy in 7 (78%). In all 9 cases in which no loose bodies were seen preoperatively with a concentric reduction, an adequate AP pelvis and CT scan of 2- or 3-imn cut sections were available for re-review for this study and confirmed the original findings.

There were 2 arthroscopies in which loose bodies were seen preoperatively but could not be found at the time of hip arthroscopy. One patient had repeat hip arthroscopy I month after the first scope, with loose bodies found at the second arthroscopy, as noted above. Another patient did not complain of mechanical symptoms after the first hip arthroscopy and was managed conservatively. Of note, both of these negative arthroscopies were performed in the surgeon's first year of experience with this technique.

There were 5 simple (Epstein type 1) dislocations with no obvious fracture identified in the femoral head or acetabulum. In all 5 cases, CT and plain films showed the presence of a loose body or nonconcentric reduction, with loose bodies confirmed by hip arthroscopy in all 5 cases (Fig. 2).

Complications from these arthroscopic procedures included repeat hip arthroscopy in 3 cases for retained loose bodies found by postoperative CT scan. Also, it was frequently noted that fluid had extravasated into the gluteal compartment, but this resolved without incident in all cases. Of note, there were no nerve palsies with this custom distractor technique (Fig. 1).

On average, hip arthroscopy was performed 17 (range, 2-92) days after injury. Excluding the repeat arthroscopies

**FIGURE 1.** Lateral position with a femoral distractor using a post in the groin and distal femoral traction pin.

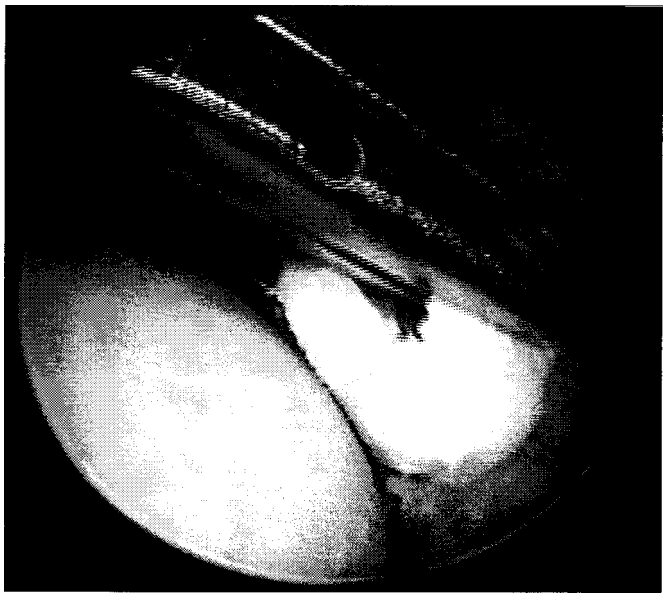

FIGURE 2. Typical cartilaginous loose body that might be found even if preoperative radiographs show a concentric reduction with no osseous loose bodies. This loose body came from delaminated cartilage bordering a posterior wall fracture.

(but not the initial procedure), the average time to arthroscopy was 15 days from injury.

## DISCUSSION

It has been known for many years that loose bodies result from hip dislocation or fracture dislocation. Epstein reported on 559 dislocated hips from 1928 to 1970, and because of his concern regarding loose bodies, emergent open reduction of all fracture dislocations became the standard of care at his institution. Of 151 open procedures for hip fracture dislocations, only 13 cases (9%) were free of loose bodies.' Despite his aggressive management of fracture dislocations, closed reduction of simple dislocations was and remains the standard of care.

It is unknown how often simple dislocation leads to formation of loose bodies after the femoral head shears against the acetabular lip, both during the original injury and then with the reduction. In our series, all 5 simple hip dislocations were found to have loose bodies or nonconcentric reductions by preoperative radiography, and loose bodies were confirmed in all 5 cases by arthroscopy.

There is basic scientific evidence to indicate loose bodies may play a role in degenerative changes. Evans et a1[6] ground up articular cartilage and gave rabbits a 1-mg suspension injection 3 times per week for up to 5 months. At 1 month, a modest effusion was noted. At 2 months, moderate synovitis had started with external symptoms of joint dysfunction. By 3 months, there was severe synovitis with early histologic changes in the articular cartilage itself. By 5 months, there was degradation of cartilage, even cartilage not near synovium, with inflammatory changes noted throughout the joint. Although systemic inflammatory markers remained negative throughout the experiment, the same experiment was repeated with inbred rabbits with the same results. For these reasons, many experts, such as Epstein,' have advocated primary open reduction of dislocations with known loose bodies. He believed that retained loose bodies would increase the rate of arthritis, because he had found much better clinical results in those patients treated with primary open reduction than with closed reduction for fracture dislocations.

There was a recent case controversy presented in the *Journal of Orthopaedic Trauma* involving a 45-year-old woman with a closed reduction of an anterior hip dislocation with retained loose bodies in the fovea.' Dr. Routt advocated open debridement of the loose body if mechanical symptoms were present on examination, whereas Dr. Stover suggested starting with conservative management followed by "operative treatment" if the patient continued to have problems. Dr. Routt only mentioned hip arthroscopy in this case controversy, with the focus of the discussion on a case report complication.

In our series, the 3 complications were limited to repeat arthroscopies for incomplete removal of loose bodies because of poor visualization during the initial procedure. These 3 procedures were performed in the surgeon's first 2 years of experience with hip arthroscopy, and the use of hypotensive anesthesia and higher pump pressures now make possible good visualization even in the first 2 to 5 days after injury. However, there are multiple, although often case report, complications reported in the literature. These include a pressure wound to the scrotum, lateral femoral cutaneous nerve transection, transient nerve injuries involving the peroneal, pudendal, sciatic, and femoral nerves, articular cartilage injury from instrumentation, and even a cardiac arrest.'-" Of note, many of these complications arise from prolonged operative times, including the cardiac arrest reported by Bartlett et a1.[9] In that case, the patient had fluid extravasation into the abdomen during hip arthroscopy after a both-column fracture treated by open reduction internal fixation 12 days before the arthroscopy. An intra-abdominal compartment syndrome developed more than 2 hours into the arthroscopy.

We use a radiolucent custom femoral distractor device previously described for use in intramedullary nailing of femur fractures, but which works equally well for hip arthroscopy.[x] The patient is placed in the lateral position with the hip and knee both flexed. Knee flexion protects the sciatic nerve and hip flexion places the perineal post anterior to the pudendal nerve. Significant distraction is easily achieved with this technique (Fig. 3), which substantially reduces the risk of articular damage during instrumentation of the joint. Two lateral portals are made: 1 just anterior, and the other just posterior to the greater trochanter with the flouro machine positioned AP (Fig. 1).

Because complications can occur with hip arthroscopy, offering arthroscopy to all patients after hip trauma, especially those with no loose bodies seen with a concentric reduction on postreduction plain films and CT, may seem aggressive. However, our data indicate that standard imaging does not see all loose bodies, especially if only chondral loose bodies are present. Baird et al" showed in a cadaver study that polymethylmethacrylate cube spacers placed in the hip joint


**FIGURE 3.** AP fluoroscopy view showing typical distraction easily achieved with custom femoral distractor with 5.5-mm cannula (5.65 outer diameter) placed intraarticular.

could not be seen by plain radiography below 4 mm in width, but CT could detect 2-mm wide spacers. Frick and Sims[13] concluded that a CT is not indicated after reduction of simple dislocations because the CT did not change their intervention in 23 patients at their institution, where no loose bodies were seen on 3-mm cut CT scans after reduction. This is in contrast to our series of 5 simple dislocations in which loose bodies or a nonconcentric reduction were seen in all cases preoperatively. Furthermore, there were 9 cases in our series where no loose body and a concentric reduction were seen with CT after reduction; however, 7 of these 9 cases had loose bodies seen and removed with hip arthroscopy. Many of these loose bodies were small and some probably would have found their way down into the inferior joint capsule where they would be unlikely to cause third body wear and further cartilaginous debris. However, some undoubtedly would have resulted in significant problems, including bodies that were partially impacted into the cartilage of the acetabulum yet protruding significantly out into the joint space.

Only 3 patients in our series had no loose body found at hip arthroscopy. One patient had 2 arthroscopies, with no loose bodies found during the first procedure. Repeat CT scan confirmed the presence of loose bodies, which were found with the second procedure. Of the 3 patients in whom no loose bodies could be found intraoperatively, there was radiographic evidence in 1 patient that loose bodies were present. It is likely that a loose body migrated into the inferior hip capsule where it could not be visualized (but was unlikely to do harm) rather than that there was a radiographic misdiagnosis. This leaves 2 of 36 patients (6%) who did not have loose bodies present after hip dislocation or acetabular wall fracture.

Removal of loose bodies has been a relative indication for hip arthroscopy since Glick et al" and Eriksson et al" brought attention to the procedure. In Glick's original report of his technique, he described 12 cases performed in the lateral approach. Two of these cases had been for loose bodies after trauma." In Eriksson's classic article, he describes 4 of his 30 cases performed at that time for loose bodies.

There are multiple case reports of hip arthroscopy after hip dislocation for removal of loose bodies."" The largest series to our knowledge previously reported is by Yamamoto et al." Hip arthroscopy was performed after dislocation in 11 patients. In 8 cases, loose bodies were found that had not been seen by preoperative CT. Similar results were found in our study, in which 7 of 9 patients were found to have loose bodies despite negative preoperative plain films and CT.

Whether the removal of these loose bodies makes a difference in patient outcome cannot be answered by this study. It is clear that direct injury occurs to the articular cartilage with axial load and shear forces generated during the dislocation and reduction. Although some basic science studies would suggest that loose bodies might lead to inflammatory changes in the joint, it also is possible that loose bodies could remain in the fovea and adsorb to the synovium. We suspect that undetected loose bodies are responsible for the development of degenerative arthritis in some of the patients with simple dislocations or fracture dislocations, with the lowest rates of posttraumatic arthritis reported at 24% for simple dislocations and higher for fracture dislocations.'' Further, long-term, prospective studies are needed to determine whether early arthroscopic debridement of the hip after dislocation might decrease the incidence of such posttraumatic hip arthritis and whether the low risk of an arthroscopy is outweighed by the benefit of removal of occult loose bodies.

## REFERENCES


I. Levin PE. Hip dislocations. In: Browner BD, Jupiter JB, Levine AM, et al, *eds. Skeletal Trauma.* Philadelphia: WB Saunders; 1998:1713- 1750.

2. Epstein HC. Posterior fracture-dislocations of the hip: long-term follow-up. *J Bone Joint Surg Am. 1974;56:1103-1127.*

3. Upadhyay SS, Moulton A. The long-term results of traumatic posterior dislocation of the hip. *JBone Joint Sing Br.* 1981;63:548-551.

4. Upadhyay SS, Moulton A, Srikrishnamurthy K. An analysis of the late effects of traumatic posterior dislocation of the hip without fractures. *J Bone Joint Surg Br. 1983;65:150-152.*

5. Epstein HC. Traumatic dislocations ofthe hip. *Clin Orthop.* 1973;92:116-142.

6. Evans CH, Mazzocchi RA, Nelson DD, et al. Experimental arthritis induced by intra-articular injection ofallogenic cartilaginous particles into rabbit knees. *Arthritis Rheum.* 1984;27:200-207.

7. Routt ML, Stover M. Case controversy: osteochondral fragment removal from the hip joint. *J Orthop Trauma.* 2005;19:223-225.

8. Dahners LE. Technical notes on a radiolucent distractor for indirect reduction and intramedullary nailing. *J Orthop Trauma. 1997;* 11:374377.

9. Bartlett CS, DiFelice GS, Buly RE, et al. Cardiac arrest as a result of intra-abdominal extravasation of fluid during arthroscopic removal of a loose body from the hip joint of a patient with an acetabular fracture. *J Orthop Trauma.* 1998;12:294-300.

10. Sampson TG. Complications of hip arthroscopy. *Clin Sports Med.* 2001; 20:831-835.

11. Eriksson E, Arvidsson 1, Arvidsson H. Diagnostic and operative arthroscopy of the hip. *Orthopedics.* 1986;9:169-176.

12. Baird RA, Schobert WE, Pais MJ, et aL Radiographic identification of loose bodies in the traumatized hip joint. *Radiology*. 1982;145:661-665. 13. Frick SL, Sims SH. Is computed tomography useful after simple posterior hip dislocation. *J Orthop Trauma*. 1995;9:388-391.
14. Glick JM, Sampson TG, Gordon RB, et al. Hip arthroscopy by the lateral approach. *Arthroscopy*. 1987;3:4-12.
15. Keene GS, Villar RN. Arthroscopic loose body retrieval following hip dislocation. *Injury*. 1994;25:507-510.
16. Kashiwagi N, Suzuki S, Seto Y. Arthroscopic treatment for traumatic hip dislocation with avulsion fracture of the ligamentum teres. *Artln•Oscopy*. 2001;17:67-69.
17. Svoboda SJ, Williams DM, Murphy K('. Hip arthroscopy for osteochondral loose body removal after a posterior hip dislocation. *Arthroscopy*. 2003;19:777--781.
18. Yamamoto Y, Ide T, Ono T, et al. Usefulness of arthroscopic surgery in hip trauma cases. *Arthroscopv*. 2003;19269 -273.