

Bladder Tear During Revision Total Hip Arthroplasty

Jonathan N. Grauer, MD, Andrea Halim, MD, and Kristaps J. Keggi, MD

Abstract

Total hip arthroplasty (THA) and revision total hip arthroplasty are among the most commonly performed orthopedic procedures. There are many reported complications of THA, but intrapelvic complications are a rare subset. Bladder injuries have infrequently been described in association with this common procedure.

We present an unusual case of a bladder tear occurring intraoperatively during a revision THA. It is suspected that the patient's history of multiple prior hip procedures caused adhesions of the bladder to the pelvic floor and predisposed the bladder to injury

during acetabular revision.

Previous reports of bladder injury relating to THA have described thermal necrosis, component migration, and occasional direct perforation. There are no prior case reports describing bladder tears related to adhesions occurring intraoperatively during revision THA.

This case report highlights the importance of surgeon awareness of an unusual complication. In this case, intraoperative and postoperative recognition of a hematuria diagnosis led to the appropriate treatment, and this patient had an acceptable outcome.

Total hip arthroplasty (THA) is among the most commonly performed orthopedic procedures, and is associated with reliable outcomes and a reasonably low risk of complications. Although revision THA is 3 to 6 times less commonly performed compared with primary THA, it is associated with a significantly higher rate of complications.¹

Complications related to revision THA, such as pulmonary embolism, wound infection, and hip dislocation, are relatively common, but intrapelvic complications have rarely been reported.² Many of the existing reports regarding injury to the bladder or urinary tract describe late migration of components, intrusion of methyl methacrylate, or damage due to thermal necrosis.³⁻⁷

We present an unusual case of an intraoperative bladder perforation by an uncemented acetabular shell that occurred during acetabular revision. The patient was deceased at the time of manuscript submission, and the authors were unable to locate her next of kin for the purpose of obtaining written informed consent for publication of this case report.

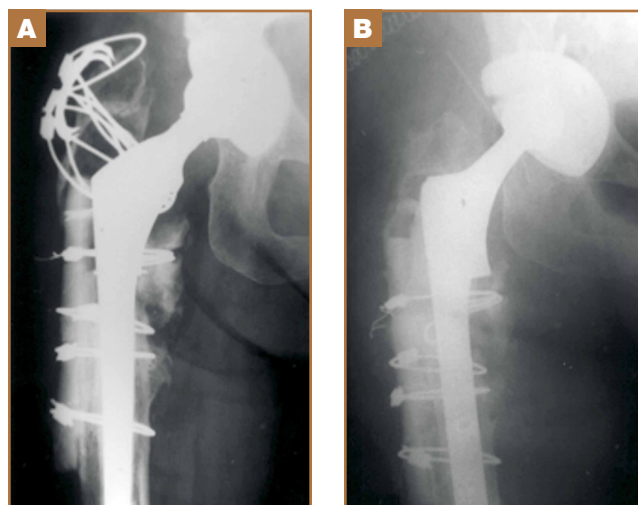
Case Report

A woman in her late 70s presented to our institution with chronic complaints of right hip pain and instability. She had previously undergone a right THA for degenerative joint disease approximately 20 years earlier. After sustaining a periprosthetic femur fracture 7 years after the right THA, the patient underwent revision of both components. Her cemented femoral

component was revised to a press-fit long stem prosthesis, and her cemented acetabulum was also revised to a press-fit component. Acetabular bone grafting was performed at that time.

The femoral component was again revised 2 more times (4 and 10 years after the initial revision) due to loosening

Figure 1. Anteroposterior radiographs of the patient's right hip (A) before and (B) after revision arthroplasty, which was performed for persistent pain and instability. Preoperative image demonstrates relatively vertical positioning of acetabular component.



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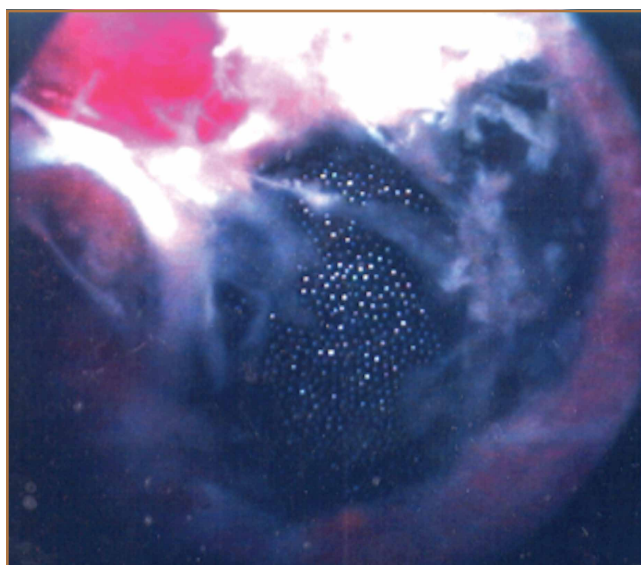


Figure 2. Image taken during postoperative cystoscopy, revealing the beaded back of the acetabular shell visible through the tear in the bladder wall.

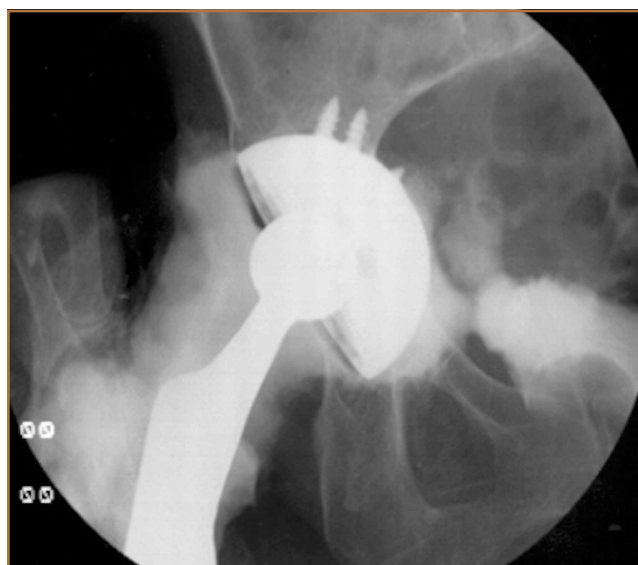


Figure 3. Cystogram revealing contrast extravasation into the right hip. This image confirms communication between the bladder and hip joint.

and avulsions of the greater and lesser trochanters. These procedures included lateral strut allografting and a trochanteric clamp and cables. The acetabulum was not revised at either of these procedures. During this period, the patient reported having had several dislocations. An anteroposterior radiograph demonstrated that the acetabulum was vertically oriented (**Figure 1A**).

The patient continued to have symptoms of pain. Primarily to address the problem of recurrent dislocation, she underwent another revision. Intraoperatively, after removing the acetabular component, an anteromedial bony deficit measuring approximately 2×2 cm was noted. This was filled with local reamings, and a 66-mm titanium, porous-coated shell was impacted into place. Additional fixation was achieved with 4 15- to 20-mm superior and posterior screws, and a 20° liner was implanted.

The femur was revised to a long-stem, calcar-replacing component solidly fixed with bone cement in the distal femur. The trochanteric clamps and some of the femoral cables were removed with as little soft-tissue damage as possible. In performing the revision, the leg was lengthened by approximately 2 cm, effectively tensioning the soft tissues. The operation was performed under spinal anesthesia with a Foley catheter in place.

The urine from the Foley catheter, which was initially yellow, was noted to be grossly bloody shortly after the acetabular component was implanted. This visible hematuria gradually improved to a near-normal color by the end of the procedure. It was thought that the hematuria was due to direct trauma from the Foley catheter or possibly kidney or bladder contusion from the shock waves produced by acetabular impaction. Perforation by screws seemed unlikely due to their anatomic location, and there had not been any penetration of surgical

instruments into the pelvis. No abnormal drainage was noted from the acetabular portion of the wound during the case. Final radiographs were obtained following the procedure and demonstrated improved acetabular position with no obvious complications (**Figure 1B**).

The first 3 postoperative days were remarkable for waxing and waning hematuria ranging from gross to essentially unremarkable. A computed tomography scan was obtained which demonstrated no renal or bladder pathology. Because the hematuria failed to resolve, the urology department was consulted to perform a cystoscopy. During this procedure, it was determined that there was a tear in the bladder wall, through which the beaded back of the acetabular component was visible (**Figure 2**). A cystogram showed contrast extravasation into the right hip but not into the peritoneum (**Figure 3**). There was clearly communication between the bladder and the hip. It was hypothesized that urine was not noted during the revision THA because the bladder was decompressed with a Foley catheter.

With this bladder injury defined, the urologists' recommended treatment was continued Foley catheter decompression of the bladder. The catheter was left in place, and the patient was placed on suppressive antibiotics.

Direct repair of the bladder tear was considered but not performed. Not only was this procedure believed to carry its own associated morbidities and potential complications, but bladder repairs are not watertight until epithelialization occurs. Thus, bladder repair was not considered to be an efficient means of isolating the hip from the bladder. Irrigation and debridement of the hip itself was not believed to offer significant advantages, and removal of the components was felt to be associated with risks for significant morbidity.

After 6 weeks of Foley catheter decompression and sup-

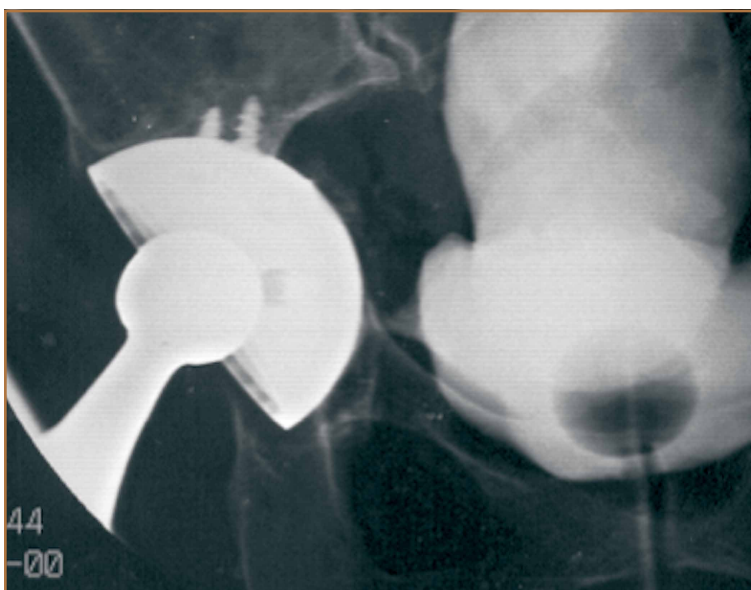


Figure 4. Fluoroscopic image during cystoscopy performed 6 weeks postoperatively revealing no further extravasation into the right hip.

pressive antibiotics, a follow-up cystogram was obtained. This revealed no contrast extravasation from the bladder (**Figure 4**). It was determined that the bladder tear had sealed, and the Foley catheter was discontinued. Antibiotics were stopped at this time as direct seeding of the hip via the urine was no longer possible. The patient's hip healed without further related complications.

Discussion

Intrapelvic complications, including injury to the iliac vessels and to the bladder, are rare following THA.² In general, rates of complications, including dislocation and wound infection, following revision THA are significantly higher than following primary THA.¹ Injury to the bladder has only rarely been presented as a complication related to primary or revision THA.

Intraoperative detection of penetrating injury from improperly placed acetabular screws has been reported.³ Other case reports have described acute bladder injury due to the exothermic curing of methyl methacrylate.⁴⁻⁶ Greenspan and Norman⁴ reported 4 such cases, all of which led to hematuria. In those cases, methyl methacrylate abutting the bladder in addition to the damage from heat was thought to have caused bladder irritation, which consistently resolved without intervention. Other authors have reported more significant damage to the bladder from similar mechanisms. Several reports have presented cases of vesiculo-acetabular sinus tracts.^{5,6} These reports suggested that the exothermic curing of methyl methacrylate led to injury of the bladder.⁴⁻⁶ Another report ascribed a postoperative ureteral stricture to the exothermic curing of methyl methacrylate.⁸

In addition to acute injury to the bladder, several cases have been reported of delayed bladder injury after THA.^{9,10} Medial migration of the acetabular component leading to delayed

impingement and/or erosions of the urinary tract has been described.^{9,10} Medial migration of methyl methacrylate without gross displacement of the acetabular component has also been reported.⁷ One case report described a patient who presented with chronic infected THA and who was found intraoperatively to have an occult fistula between bladder and hip joint, causing ongoing fluid extravasation that led to wound breakdown. This patient was successfully treated with 2-stage revision and ureteral stent placement.¹¹

Memon and colleagues¹² reported a case of intraoperative bladder injury with removal of an acetabular component. In their case, methyl methacrylate was preoperatively known to have been causing painless hematuria and chronic inflammation.¹² The scenario described approximates that of the present case in the sense that mechanical injury to the bladder was sustained at the time of revision arthroplasty. The present case, however, did not involve the removal of any methyl methacrylate. Although a cemented prosthesis had been implanted and removed earlier in this patient's history, the

procedure at hand was a revision of one noncemented acetabulum to another.

Regarding the present case, we postulate that there was a limited thermal and/or mechanical injury to the pelvic floor at the time of the earlier surgeries. This could have caused adhesions to form between the bladder and the medial aspect of the acetabulum. Extraction of the acetabular component may have caused disruption of the adherent tissues, leading to a bladder wall tear.

Treatment of this extraperitoneal rent in the bladder was directed at diverting urine from the acetabulum with a Foley catheter. This was done to allow epithelialization of the torn region of the bladder. Suppressive antibiotics were an important part of the treatment plan to prevent a urinary tract infection and a subsequent seeding of the joint.

This case highlights the need to consider the possibility of bladder adhesions preoperatively when performing a revision THA. Careful evaluation of preoperative radiographs may help to identify an adherent bladder. Use of a Foley catheter to fully decompress the bladder during surgery may help to avoid injury. In the event that persistent hematuria occurs, it should be carefully evaluated and any bladder injury addressed in order to prevent a chronic fistula from forming. Although some authors have suggested that hematuria in this setting is self-limiting,⁴ the cystography and cystogram presented clearly altered the treatment of this patient.

The present case is not presented to imply that routine cystography and/or cystoscopy should be performed prior to acetabular revisions. Rather, it is our intention to raise awareness of the potential for bladder injury during revision THA and to present a diagnostic work-up and treatment modality that was successful in this situation.

In summary, this case highlights the need to be cognizant

of the proximity and potential for injury of the intrapelvic structures when performing revision THA. Intrapelvic penetration by screws, instruments, methyl methacrylate, or bone graft must be avoided. Persistent hematuria should be carefully evaluated.

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References

1. Mahomed NN, Barrett JA, Katz JN, et al. Rates and outcomes of primary and revision total hip replacement in the United States medicare population. *J Bone Joint Surg Am.* 2003;85(1):27-32.
2. Bach CM, Steingruber IE, Ogon M, Maurer H, Nogler M, Wimmer C. Intrapelvic complications after total hip arthroplasty failure. *Am J Surg.* 2002;183(1):75-79.
3. Kinmont JC. Penetrating bladder injury caused by a medially placed acetabular screw. *J South Orthop Assoc.* 1999;8(2):98-100.
4. Greenspan A, Norman A. Gross hematuria: a complication of intrapelvic cement intrusion in total hip replacement. *AJR Am J Roentgenol.* 1978;130(2):327-329.
5. Lowell JD, Davies JA, Bennett AH. Bladder fistula following total hip replacement using self-curing acrylic. *Clin Orthop.* 1975(111):131-133.
6. Schneider HJ, Mufti GR. Vesico-acetabular fistula after total hip replacement. *Br J Urol.* 1993;71(6):754.
7. Wheeler JS Jr, Babayan RK, Austen G Jr, Krane RJ. Urologic complications of hip arthroplasty. *Urology.* 1983;22(5):499-503.
8. Waters E, Bouchier Hayes DM, Hickey D. Delayed presentation of ureteric injury after thermal insult at total hip replacement. *Br J Urol.* 1998;82(4):594.
9. Schneider W, Knahr K. Bladder fistula after loosening of a cementless self-cutting acetabular component--a case report. *Acta Orthop Scand.* 1997;68(6):601-602.
10. Pitfield J, Saxton HM. Urinary tract complications of total hip replacement. *Clin Radiol.* 1981;32(4):429-430.
11. Russell RD, Incavo SJ, Mineo MT, Dinh T. Vesicoacetabular fistula in a chronically infected total hip arthroplasty. *J Arthroplasty.* 2010;25(4):659.e9-e12.
12. Memon FR, Foss MV, Towler JM. Haematuria and vesico-cutaneous fistula after hip surgery. *Br J Urol.* 1997;79(6):1005-1006.