Arthroplasty Today 5 (2019) 269–275

Contents lists available at ScienceDirect

Arthroplasty Today

journal homepage: http://www.arthroplastytoday.org/

Case report

Simultaneous combined retroperitoneal and posterior hip approach for the treatment of iliopsoas abscess with extension to a metal-on-metal prosthetic hip joint

Andrea H. Stone, MSN, CRNP [a], Paul J. King, MD [b, *]

[a] Department of Surgical Research, Anne Arundel Medical Center, Annapolis, MD, USA
[b] Center for Joint Replacement, Anne Arundel Medical Center, Annapolis, MD, USA

ARTICLE INFO

Article history:
Received 31 December 2018
Received in revised form
4 June 2019
Accepted 5 June 2019
Available online 12 August 2019

Keywords:
Hip arthroplasty
Periprosthetic infection
Psoas abscess
Metallosis
Metal bearing arthroplasty

ABSTRACT

Iliopsoas abscess is an uncommon entity that has only rarely been associated with periprosthetic hip infection; to our knowledge, these are the first reported cases in patients with metal-on-metal (MoM) hip arthroplasty. We report 2 cases of iliopsoas abscess and concomitant periprosthetic hip infection in patients with a history of MoM hip arthroplasty. Case 1 presented with an acute infection 18 months after revision total hip arthroplasty (THA) for instability and adverse local tissue reaction after MoM THA. Case 2 presented with an acute infection in a previously well-functioning MoM THA. Both cases were treated with combined hip and retroperitoneal approaches and required more aggressive and longer treatment than is typical for periprosthetic infection, but ultimately resulted in successful revision THAs. We outline the treatment of these 2 patients and review the previously reported literature.

Introduction

Iliopsoas abscess is an uncommon process that has not been well documented in the literature. These abscesses can be divided into 2 categories, primary and secondary. Primary abscesses are thought to be seeded from a hematogenous source, and secondary abscesses from a nearby infection such as spondylodiscitis, intra-abdominal infection, urological infections, and other sources [1,2]. Iliopsoas abscess with concomitant periprosthetic joint (PJI) infection has been infrequently reported primarily in small series and single case reports with a variety of treatment approaches and clinical results [2-10]. This paper will discuss 2 case reports from a single surgeon's practice (Table 1) and outline the novel approach of combined hip and retroperitoneal approach in treating iliopsoas abscess leading to PJI in patients who had a metal-on-metal (MoM) hip arthroplasty.

The patients provided verbal consent for publication of the data.

Case histories

Case 1

A 69-year-old male presented with an approximately 1 week history of groin pain, chills, and shortness of breath. Past medical history includes coronary artery disease with ischemic cardiomyopathy and decreased ejection fraction, hypertension, gout, atrial fibrillation, and deep vein thrombosis. He also had a history of multiple joint replacements including left total hip arthroplasty (THA) performed 13 years prior to this encounter and was revised 18 months prior to this encounter for elevated serum metal levels, malpositioned acetabular component, and recurrent instability (Fig. 1). Prior to the revision THA he had a psoas fluid collection noted incidentally on a computed tomography (CT) scan performed for an unrelated issue (Fig. 2). Serum metal levels prior to revision were cobalt 105.0 ppb and chromium 16.9 ppb. During this revision surgery metal stained tissue and metal stained fluid were noted, consistent with adverse local tissue reaction (ALTR), but cultures

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to https://doi.org/10.1016/j.artd.2019.06.003.

* Corresponding author. 2000 Medical Parkway, Suite 101, Annapolis, MD 21401, USA. Tel.: +1 410 674 1641.
E-mail address: pking@osmc.net

https://doi.org/10.1016/j.artd.2019.06.003

Table 1
Summary of treatment.

Case	Organism	Type of procedure	Antibiotic	Duration of treatment
Case 1	*Bacteroides fragilis*, *Staphylococcus epidermidis* (initial hip aspirate only)	1. Fluoroscopic-guided hip aspiration 2. Open irrigation and debridement, exchange of modular components 3. Explant of THA prosthesis 4. Open irrigation and debridement, removal of cement spacer 5. Open irrigation and debridement psoas abscess and repeat irrigation and debridement hip 6. Cement spacer insertion 7. Revision and reimplant THA prosthesis	Ertapenem, metronidazole	8 wk from explant (6 wk IV, 2 wk PO), 6 wk IV, 6 wk PO after insertion of cement spacer
Case 2	Methicillin-sensitive *Staphylococcus aureus*	1. CT-guided psoas abscess aspiration 2. Fluoroscopic-guided hip aspiration 3. Open debridement psoas abscess and explant of THA prosthesis 4. Revision and reimplant THA prosthesis	Cefazolin, cephalexin	10 wk IV, 4 wk PO

PO, oral.

and pathology specimens were negative. There was significant metal-related osteolysis around the acetabular component. The acetabular component was revised and the bearing changed to a polyethylene liner and metal head; there was no evidence of trunnionosis and a metal head was the only implant available. The femoral component was well ingrown with no evidence of osteolysis. Postoperatively, metal levels decreased as anticipated; 4 months after revision cobalt was 10.0 ppb and chromium 10.7 ppb. One year after revision cobalt was 1.9 ppb and chromium 6.1 ppb.

On initial examination 18 months after his revision THA he was ill-appearing, febrile to 101.1°F, with difficulty bearing weight on the left leg, and painful and limited left hip range of motion. Radiographs were within normal limits. Because of concern for prosthetic joint infection, he was sent for labs including erythrocyte sedimentation rate, c-reactive protein (CRP), and complete blood count, and scheduled for hip aspiration under fluoroscopic guidance. Labs revealed erythrocyte sedimentation rate >140 (normal 0-mm/h), CRP >15.6 (normal <1.0 mg/dL), and white blood cell count 10.0 (normal 4.8-10.8 $10^3/\mu L$). Antibiotics were held pending aspiration of the hip and infectious disease consultation was obtained. The hip aspiration returned frankly purulent fluid and the patient was urgently taken to the operating room (OR) for irrigation and debridement (I&D). Upon opening the hip, there was found to be >100 cc of pus and metal stained fluid that tracked through a rent in the anterior capsule around the iliopsoas tendon and into the pelvis. A wide debridement, synovectomy, and thorough irrigation were performed. The prosthetic components were well fixed on examination. During this procedure, the patient was hypotensive requiring inotropic support, and underwent extensive debridement and exchange of modular components including the use of a ceramic head with titanium sleeve. The initial hip aspirate grew out *Staphylococcus epidermidis* and *Bacteroides fragilis*, and all subsequent tissue cultures only grew out *B fragilis*, leading to the possibility that the *S epidermidis* was a skin contaminant from the aspiration procedure. The patient was treated with organism appropriate intravenous (IV) antibiotics and showed initial improvement, though 6 days later became febrile with increasing drainage from the incision and drain holes and increasing leukocytosis. Serial CT scans of the abdomen and pelvis showed myositis in the psoas muscle with no abscess. When medically stable he was taken back to the OR for further exploration and explantation of the prosthetic hip. Intraoperatively, there was some osteolysis noted with extensive purulence tracking down the femur. All components were explanted without difficulty, all areas were extensively irrigated and debrided, the psoas muscle was decompressed via the posterior approach, and a limited debridement was performed

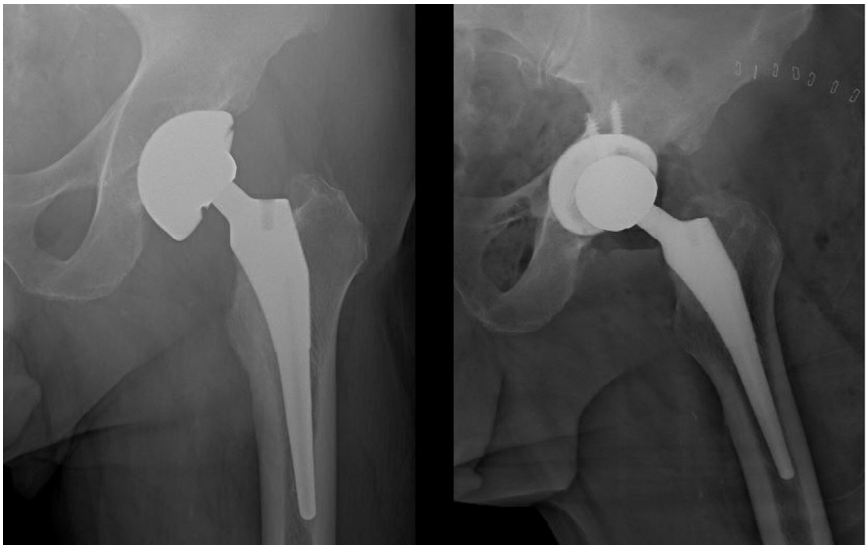

Figure 1. Case 1: Radiographs prior to and after initial revision for instability and ALTR.

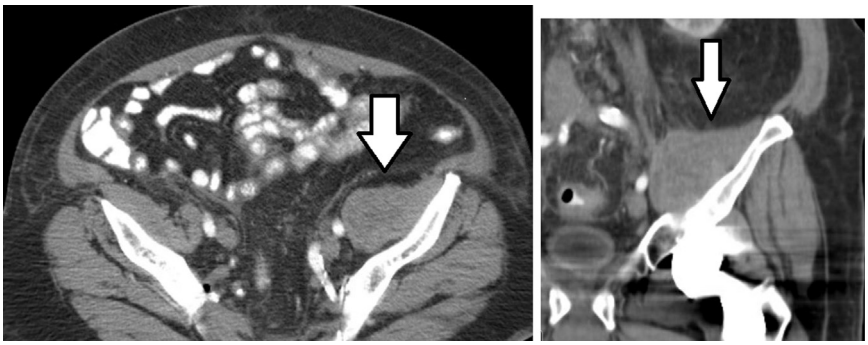

Figure 2. Case 1: CT scan performed prior to initial revision THA showing psoas fluid collection. Arrow pointing to incidentally noted psoas abscess.

through the anterior capsule and an antibiotic laden cement spacer was placed (Fig. 3a). Eleven days later the patient presented with increasing drainage from the surgical wound. On examination, the incision was not healing well, and a large amount of frank pus was evacuated after gentle debridement. The patient was readmitted to the hospital and underwent another hip arthrotomy, I&D, and removal of the antibiotic laden cement spacer (Fig. 3b). Subsequent CT scans showed a large psoas abscess (Fig. 4) and the patient was taken back to the OR for a simultaneous combined retroperitoneal approach by general surgery and repeat hip debridement by orthopedic surgery performed in the lateral decubitus position. A large psoas abscess was identified at the time of the retroperitoneal approach, and both wounds were left open to heal by secondary intention. Three months after explantation of the antibiotic laden cement spacer with clinical and serologic evidence of improvement, he underwent placement of a new antibiotic laden cement spacer device into the left hip without incident (Fig. 3c). He was treated with 6 additional weeks of IV antibiotics and 6 weeks of oral antibiotics. One year after the initial presentation he underwent revision THA (Fig. 3d) with culture and pathology indicating that the infection was eradicated and at the time of this writing has remained infection free for 4 years after this surgery and is being closely followed. The patient has returned to normal activities and is ambulating without assistive devices.

Case 2

A 72-year-old female presented to the emergency room with a 1-day history of increasing right hip pain, inability to bear weight on the leg, and swelling. Past medical history includes type II diabetes, hypertension, osteoarthritis, lumbar and cervical spine surgeries, fibromyalgia, obesity, and polycythemia vera. She had an apparently well-functioning and asymptomatic right MoM THA 7 years prior for osteoarthritis. Serum cobalt and chromium levels had been evaluated 2 and 3 years after the initial surgery. The first series of labs cobalt was 2.9 ppb and chromium <0.5 ppb, and on the second, cobalt was 4.2 ppb and chromium 0.5 ppb. Two months prior to admission she had also been conservatively treated for a right leg non-healing wound.

She was admitted to the hospital to treat presumed infection, with initial labs white blood cell count 16.7 (normal 4.8-10.8 10^3/μL) and CRP 2.87 (normal <1.0 mg/dL). She underwent magnetic resonance imaging lumbar spine and CT of abdomen, pelvis and right femur which showed degenerative change and post surgical change in the lumbar spine and enlarged iliopsoas muscle and possible abscess. A CT-guided aspiration of the psoas yielded grayish purulent fluid; drain placement was attempted but not successful. Cobalt and chromium levels were also rechecked, with cobalt being 3.1 ppb and chromium 1.2 ppb. Psoas aspirate grew out methicillin-sensitive *Staphylococcus aureus* and she was started on appropriate antibiotics after consultation with infectious disease. Repeat CT scan 5 days later was essentially unchanged (Fig. 5), but due to new onset fever, a right hip aspiration was performed with fluoroscopic guidance. These cultures grew out the same organism, methicillin-sensitive *S aureus*. She was taken to the OR for a combined hip and retroperitoneal I&D performed in the lateral decubitus position. The psoas was entered via a right lower quadrant retroperitoneal incision. Frank pus and necrotic debris was noted

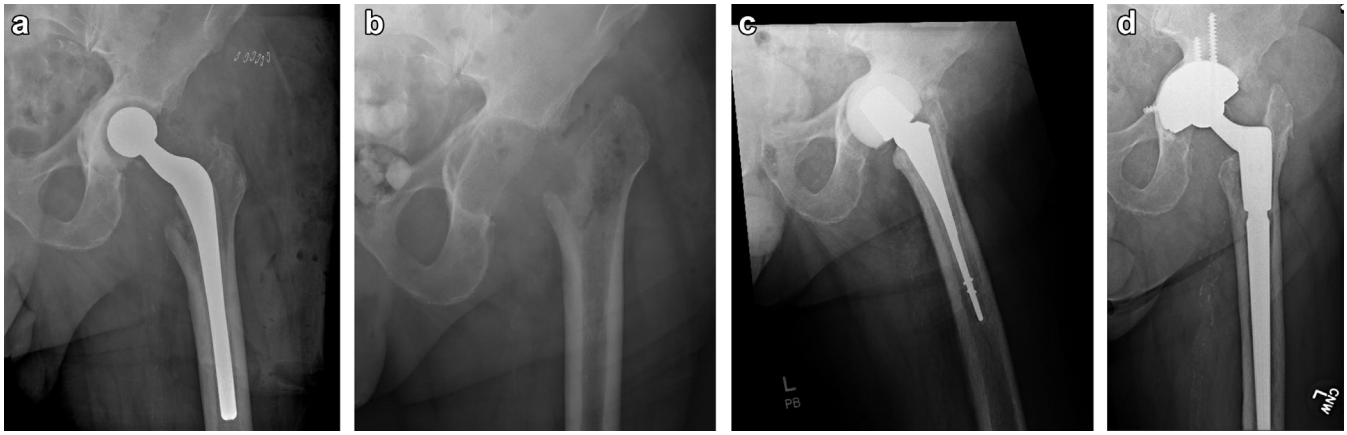

Figure 3. Case 1: (a) Radiograph after explant and cement spacer insertion. (b) Radiograph after removal of cement spacer. (c) Radiograph after cement spacer insertion. (d) Final revision components (3 years postoperative).

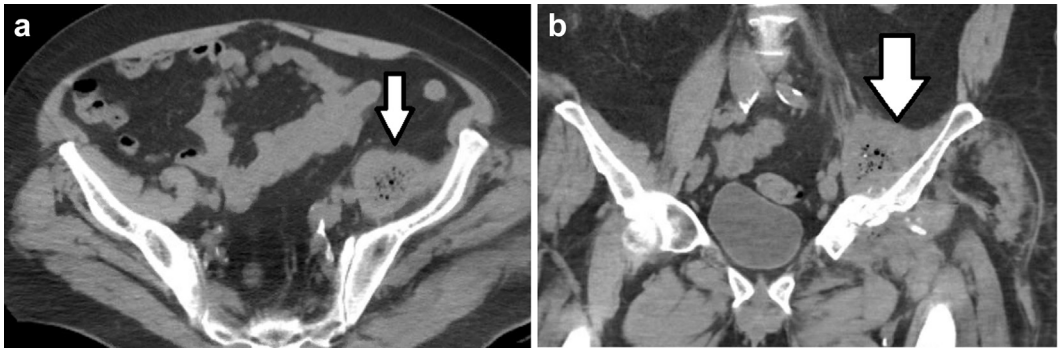

Figure 4. CT scan axial (a) and coronal (b) images showing psoas abscess after removal of cement spacer (arrow pointing to psoas abscess).

and removed and the open cavity extended up to the intercostal border and down to the pelvis. This area was thoroughly debrided and irrigated extensively, drains were placed, and the incision closed. The right hip was entered via a standard posterolateral approach and there was found to be a very large collection of pus; there was no evidence of metallosis. An extensive synovectomy and debridement was performed and the well-fixed components were explanted with the use of an extended trochanteric osteotomy. An antibiotic-laden cement spacer prosthesis was placed in the hip joint (Fig. 6a) and antibiotic beads were placed in the wound. She received IV antibiotics upon discharge from the hospital for approximately 10 weeks, then oral antibiotics for 1 month. She was off antibiotics for 2 months during which time she had an attempted reaspiration of the psoas (no fluid present) and an aspiration of the right hip, both having no growth. Repeat CT scan showed resolution of the psoas abscess with some residual thickening of the muscle (Fig. 7). The right hip was reimplanted after all cultures were negative and labs normalized (Fig. 6b). During the revision surgery, there was scar tissue but no infection noted. A revision subtrochanteric osteotomy was required to remove the cement spacer, then revision components including a distally engaging uncemented stem, porous acetabular component, and polyethylene liner were used. The osteotomy was repaired with cerclage cables. All intraoperative cultures and frozen section pathology were negative. She was continued on IV antibiotics until OR cultures were negative times 3 days, then oral antibiotics for a total of 1 week postoperatively. She has been followed for 2 years to date and remains infection free. She has resumed all normal activities and is ambulating without assistive devices.

Figure 5. Case 2: CT scan axial and coronal images showing psoas abscess prior to open I&D (arrow pointing to psoas abscess).

Discussion

The psoas muscles originate from the transverse processes and lateral aspects of the vertebral bodies from T12-L5. The iliacus muscle joins the psoas and inserts by a common tendon at the lesser trochanter. The iliopsoas bursa is the largest synovial bursa in the body and lies between this tendon and the anterior hip capsule. This bursa has been shown to communicate with the native hip joint in 14% of the population, and can also interact with the pseudocapsule formed after THA [3,4]. Psoas abscess, defined as pus within the psoas muscle, can be classified as either primary or secondary. Primary psoas abscess has no identifiable cause, though it is thought to be from hematogenous spread. The most common organism isolated from a primary psoas abscess is *S aureus*, in 90% of the cases [1]. Secondary psoas abscess is caused by contiguous spread from local infection, commonly digestive, urological, and osteoarticular. The organism is typically related to the source of the infection [2]. In both of the cases we present it appears that the psoas abscess seeded the hip joint based on the presenting symptoms. Case 1 was likely a secondary psoas abscess from an unidentified gastrointestinal source given the primary organism of *B fragilis*. *Bacteroides* is part of the normal flora in the gastrointestinal tract [8] but is uncommonly implicated in joint infections in either native or prosthetic joints [8,11]. Case 2 was likely a primary psoas abscess that seeded the hip joint secondarily. She improved initially with aspiration of the psoas abscess and antibiotics, but developed fever while on antibiotics leading to the diagnosis of a PJI.

Identifying the presence of a psoas abscess in conjunction with a PJI remains something of a challenge. Advanced imaging of the abdomen is required to identify this process, though this is not recommended in the consensus guidelines for treating PJI [12]. In our reported cases, initial appropriate abdominal imaging failed to show significant abscess. Case 1 had the abscess identified

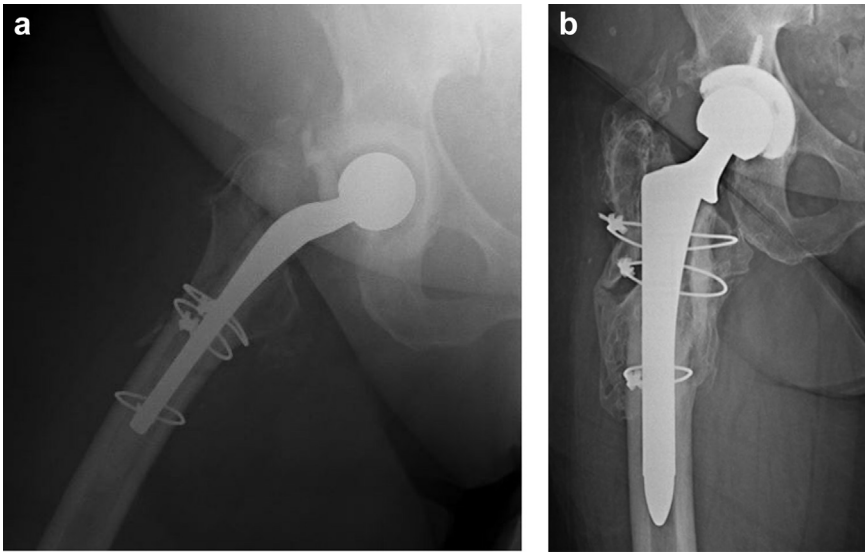

Figure 6. Case 2: (a) Radiograph after explant and cement spacer insertion. (b) Final revision components (1 year postoperative).

intraoperatively with the first debridement though serial imaging failed to show a discrete abscess; he had a psoas fluid collection noted prior to the initial revision THA for ALTR. Upon exploration of his abdomen he was found to have a large abscess. Case 2 noted an enlargement of the psoas but no abscess was identified on imaging. She also had a large abscess identified intraoperatively.

To our knowledge, this is the first report of psoas abscess with concomitant PJI in patients with a history of MoM THA. Recent studies have implicated MoM hips as having a higher rate of infection than other bearing surfaces [13-15]. The mechanism of the increased rate of infection is unknown, but some hypotheses are a change in the periprosthetic environment or a change in the immunologic response due to the presence of corrosion and metallic debris [14,15]. The presence of ALTR has also been suggested as a possible trigger for infection [16]. Current monitoring protocols recommend periodic monitoring of serum cobalt and chromium levels, though there is some discussion of the acceptable threshold for these levels [17,18]. Case 1 was status post revision for adverse reaction to metallic debris 18 months earlier with extremely high serum cobalt and chromium levels. These had dropped substantially (<10 ppb) though they were still somewhat elevated prior to onset of infection. Case 2 had mildly elevated serum cobalt and chromium levels and no clinical evidence of adverse reaction to metallic debris at the time of revision.

Summary

Reviewing the published literature (Table 2) highlights the need to treat patients with concomitant psoas abscess and THA aggressively since these difficult to treat infections are associated with significant morbidity [4,5]. This reflects our experience in that both patients required open debridement of the psoas in addition to debridement and explantation of the affected hip. Multiple debridements may be required over the course of treatment. Consultation with an infectious disease team is also vital and an extended course of organism-specific antibiotics will likely be required. Both our experience and the literature seem to suggest that a combined hip and retroperitoneal approach is indicated in order to have the best chance decreasing morbidity and the need for multiple surgeries. With aggressive treatment, combined surgical approach, and prosthesis removal, reimplantation of the hip prosthesis should be possible based on our experience and literature review of a small number of reported cases. Due to the presence of an MoM hip arthroplasty it is possible that a change in the local periprosthetic environment or immunologic response may make simultaneous psoas abscess and prosthetic hip infection more likely. An increased clinical index of suspicion may be required, particularly in patients with a deteriorating clinical course despite appropriate treatment.

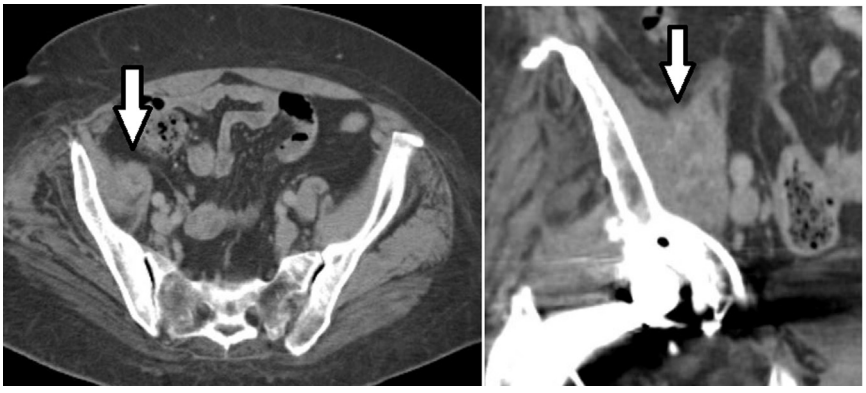

Figure 7. Case 2: CT scan axial and coronal images showing resolution of psoas abscess prior to reimplantation (arrow pointing to the area of thickened psoas).

Table 2
Summary of all 12 cases currently published.

Case	Age/sex	Past surgical history	Presentation	Type of drainage procedure	Organism	Follow-up time (mo)	Outcome
Buttaro et al	65/M	L THA 11 y prior for AVN	Pyrexia, low back pain, left hip pain, fluctuant mass, worsening over 6 mo	Open and explant × 1 and percutaneous × 1	*Escherichia coli*	12	Girdlestone
Plaza et al	46/F	L THA 10 y prior with revision for instability	Low back and left hip pain × 2 mo, functional limitation	Percutaneous × 1, open I&D with explant and spacer	None isolated	24	Reimplant
Querton et al	77/M	R THA for fracture 3 y prior	Fever × 3 d, erythema, swelling right hip, low back pain, difficulty walking	Percutaneous × 1, open I&D with explant and spacer	Group C Strep	18	Reimplant
De Nardo et al	67/F	L THA 1.5 y prior	Left hip pain and stiffness	Ultrasound guided × 1, open I&D × 2	*Mycobacterium tuberculosis*	15	Retained prosthesis
Dhinsa et al	81/M	R THA 6 y prior	Lethargy, right groin pain, fever × 2 wk	Open I&D × 1, ultrasound guided × 1	*Staphylococcus aureus*	24	Retained prosthesis
Volpin et al	68/F	L THA 20 y prior, R THA 8 y prior	Bilateral groin pain × 6 mo, fever, weight loss, night sweats	Bilateral open I&D × 2 with explant and spacer	*Streptococcus anginosus*	60	Reimplant
Gunaratne et al	68/M	R THA 22 y prior, L THA 14 y prior	General malaise, weight loss × 2 m	Percutaneous × 1, open I&D × 3 with explant with spacer bilaterally	*S aureus*	6	Bilateral reimplant
Lawrenz et al	64/F	R THA 6 y prior	Acutely ill, febrile	Percutaneous × 1, open I&D × 3, explant	*S aureus*; super infection with *Serratia marcescens* and *Enterococcus faecalis*	7	Girdlestone
	73/M	B THA 4 y prior	Left hip pain × 6 wk	Percutaneous × 2, open I&D × 7, B explant with spacer	*Propionibacterium acnes*, *Candida parapsilosis*	23	Bilateral reimplant
	63/M	R THA 7 y prior	Right hip pain × 4 wk	Open I&D × 2, explant with spacer	*P acnes*	16	Reimplant
	64/F	R THA revised × 5 for instability	Low back pain × several months, fever × 1 wk	Percutaneous × 1, open I&D × 1	Coag negative *Staphylococcus*	42	Retained prosthesis
	87/M	B THA 15 y prior	Bilateral hip pain, confusion, flu-like symptoms	Open I&D × 4	*Bacteroides fragilis*	21	Retained prosthesis

R, right; L, left; B, bilateral; M, male; F, female; AVN, avascular necrosis; THA, total hip arthroplasty; I&D, incision and drainage.

References

[1] Buttaro M, Gonzalez Della Valle A, Piccaluga F. Psoas abscess associated with infected total hip arthroplasty. J Arthroplasty 2002;17(2):230.

[2] Querton L, Tintillier M, Chaput A, Cuvelier C, Pochet JM. Group C streptococcal psoas abscess associated with a homolateral hip joint prosthesis infection: a case report. Acta Clin Belg 2009;64(4):361.

[3] Gunaratne GD, Khan RJ, Tan C, Golledge C. Bilateral prosthetic hip joint infections associated with a psoas abscess. A case report. J Orthop Case Rep 2016;6(3):3.

[4] Dauchy FA, Dupon M, Dutronc H, et al. Association between psoas abscess and prosthetic hip infection: a case-control study. Acta Orthop 2009;80(2):198.

[5] Lawrenz JM, Mesko NW, Higuera CA, Molloy RM, Simpfendorfer C, Babic M. Treatment challenges of prosthetic hip infection with associated iliacus muscle abscess: report of 5 cases and literature review. J Bone Jt Infect 2017;2(3):127.

[6] Volpin A, Kini SG, Berizzi A. Psoas muscle pyogenic abscess in association with infected hip arthroplasty: a rare case of simultaneous bilateral presentation. BMJ Case Rep 2015;2015. https://doi.org/10.1136/bcr-2015-209711.

[7] De Nardo P, Corpolongo A, Conte A, Gentilotti E, Narciso P. Total hip replacement infected with *Mycobacterium tuberculosis* complicated by Addison disease and psoas muscle abscess: a case report. J Med Case Rep 2012;6:3.

[8] Wexler HM. Bacteroides: the good, the bad, and the nitty-gritty. Clin Microbiol Rev 2007;20(4):593.

[9] Dhinsa BS, Abdul-Jabar HB, Rajkumar S, Kochhar T. A rare case of primary psoas abscess causing hip pain in a patient with hip replacement. Acta Orthop Traumatol Turc 2014;48(5):598.

[10] Plaza R, Soriano A, Tomas X, Gallart X, Garcia S. Psoas abscess associated with infected total hip arthroplasty: a case report. Hip Int 2006;16(3):234.

[11] Shah N, Osmon D, Tande AJ, et al. Clinical and microbiological characteristics of Bacteroides prosthetic joint infections. J Bone Jt Infect 2017;2(3):122.

[12] Parvizi J, Gehrke T, Chen AF. Proceedings of the International Consensus on Periprosthetic Joint Infection. Bone Joint J 2013;95-B(11):1450.

[13] Grammatopoulos G, Munemoto M, Inagaki Y, Tanaka Y, Athanasou NA. The diagnosis of infection in metal-on-metal hip arthroplasties. J Arthroplasty 2016;31(11):2569.

[14] Wyles CC, Van Demark 3rd RE, Sierra RJ, Trousdale RT. High rate of infection after aseptic revision of failed metal-on-metal total hip arthroplasty. Clin Orthop Relat Res 2014;472(2):509.

[15] Prieto HA, Berbari EF, Sierra RJ. Acute delayed infection: increased risk in failed metal on metal total hip arthroplasty. J Arthroplasty 2014;29(9):1808.

[16] Hosman AH, van der Mei HC, Bulstra SK, Busscher HJ, Neut D. Effects of metal-on-metal wear on the host immune system and infection in hip arthroplasty. Acta Orthop 2010;81(5):526.

[17] Chang EY, McAnally JL, Van Horne JR, et al. Relationship of plasma metal ions and clinical and imaging findings in patients with ASR XL metal-on-metal total hip replacements. J Bone Joint Surg Am 2013;95(22):2015.

[18] Carlson BC, Bryan AJ, Carrillo-Villamizar NT, Sierra RJ. The utility of metal ion trends in predicting revision in metal-on-metal total hip arthroplasty. J Arthroplasty 2017;32(9S):S214.