■ FORUM DISCUSSION

What would you do?

CHALLENGES IN HIP SURGERY

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A moderator and panel of five experts led an interactive session in discussing five challenging and interesting patient case presentations involving surgery of the hip. The hip pathologies reviewed included failed open reduction internal fixation of subcapital femoral neck fracture, bilateral hip disease, evaluation of pain after metal-on-metal hip arthroplasty, avascular necrosis, aseptic loosening secondary to osteolysis and polyethylene wear, and management of ceramic femoral head fracture.

Case 1

A 79-year-old female patient with a body mass index (BMI) of 22 kg/m² presents with failed open reduction internal fixation (ORIF) of a femoral neck fracture (Fig. 1). She has disabling pain in her right hip, loss of function, a severe limp, a leg length difference, and a restricted range of motion.

The panelists were in agreement that the treatment of choice for this patient would be conversion to total hip arthroplasty (THA) rather than re-fixation of the fracture. Infection is a major concern. To rule out infection prior to surgery, the experts recommend obtaining a laboratory profile including complete blood count (CBC) with differential, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP). If levels are high, the hip is aspirated. If results are within normal limits, proceed with THA. If infection is suspected the hardware may be removed first, either tissue cultures or frozen sections obtained intra-operatively, the patient treated with an appropriate course of antibiotics, and THA delayed until the infection has been eradicated. Patients and their families should be counseled that the outcome for conversion to THA after ORIF may be less optimal than in routine primary THA, with slower recovery and perhaps more likelihood that the patient will ambulate with a limp. Dr Ranawat advised that perhaps 20% of patients over age 75 have a positive Romberg's test, which indicates a loss of balance and is the reason they fall and break their hips. Additionally, these patients are at a higher risk for falling again after undergoing THA, and dislocating the hip or fracturing the femur. Dr Cameron's center

has a clinic for falls where they promote Tai Chi to help elderly patients improve their balance. The arthroplasty procedure will require careful pre-operative planning to assess bone quality, and the correct armamentarium available to remove hardware and perform the reconstruction. If the patient has developed post-traumatic arthritis or avascular necrosis after undergoing ORIF, dislocate the hip first before removing hardware to prevent fracture. The panelists recommended a metal-on-polyethylene bearing but had mixed opinions regarding fixation and component selection. Some opted for an all-polyethylene cup while others preferred a non-cemented device (Fig. 2).

Case 2

A 66-year-old female patient with a BMI of 33 kg/m² presents with severe bilateral hip pain, a limp, and a slight leg length difference. She has been diagnosed with osteoarthritis. She has a flexion deformity of about 30° and a restricted range of motion. Radiographs show a protrusio deformity on the right (Fig. 3).

While most of the panelists recommended performing bilateral THA as staged procedures, Dr Ranawat stated that if the patient is in good health, understands the procedure and risks, is not heavy and wants both sides done, he would not hesitate to do both hips at once. Some tips to facilitate the more difficult dislocation on the right given the protrusio deformity include removal of periacetabular osteophytes, and *in situ* or 'napkin ring' resection of the femoral neck. Panelists recommend grafting to fill the medial acetabular wall deficit, with Dr Cameron advocating to keep the patient off weight-bearing for about six weeks

Fig. 1

A 79-year-old female patient presented with disabling right hip pain and loss of function. A radiograph of her pelvis shows failed open reduction internal fixation of a subcapital femoral fracture.

Fig. 3

A 66-year-old female patient presented with severe bilateral hip pain and limited function. Her preoperative radiograph shows a leg length difference of 1.3 cm and endstage degenerative disease of both hip joints.

Fig. 2

An immediate post-operative radiograph shows treatment of cementless right total hip arthroplasty with a hemispheric cup fixed with screws, a tapered stem, and a metal-on-polyethylene articulation with 32mm head.

Fig. 4

A post-operative radiograph reveals both hips have been treated with primary cementless THA, staged six weeks apart, using short tapered stems, large heads and ultraporous cups. Leg length difference has been remedied.

post-operatively. Dr Paprosky advised that while ultraporous cups are not used routinely in primary scenarios, they are indicated in this case because of the complexity and distorted anatomy present. When performing staged procedures, it is important to counsel the patient that leg lengths will be unequal during the interim period (Fig. 4).

Case 3

This male patient initially presented in 2000 at 24 years of age and BMI of 45 kg/m² with a previous osteotomy complaining of left hip pain, difficult ambulation, loss of motion and no relief with anti-inflammatories. He was employed as a moderate manual laborer and walked with a

limp in spite of equal leg lengths. Laboratory profiles were obtained and within normal limits. He underwent single-stage removal of hardware and cementless THA with a 14 mm × 175 mm porous plasma sprayed tapered stem and an M²a-Taper modular metal-on-metal cup (Biomet, Warsaw, Indiana) with 28 mm head. He did very well initially but came back ten years later complaining of groin pain and intermittent squeaking and grinding in his hip (Fig. 5). He was still working and ambulating unlimited distances without support.

The panelists recommend aspiration and obtaining metal ion levels as well as cross-sectional imaging, either ultrasound or metal artifact reduction sequence (MARS) MRI.

Fig. 5

At ten years post-operative conversion from an osteotomy to left cementless total hip arthroplasty with a tapered stem and modular metal-on-metal cup articulated with a 28mm head, the patient, now age 34 years, presented with moderate pain in the right hip, and intermittent squeaking and locking.

Fig. 7

A 72-year-old patient was referred by her surgeon for evaluation of a painful right hip two years after undergoing primary cementless total hip arthroplasty with a metal-on-metal articulation that was subsequently recalled.

Fig. 6

A post-operative radiograph reveals treatment of acetabular revision using an ultraporous cup fixed with screws and a 36 mm biolox delta head with option taper adaptor articulated with a highly cross-linked polyethylene liner.

Lab results revealed CBC: 7.2 (normal <10), ESR: 4 and CRP: 6.7, all within normal limits and negative for infection. The aspiration results were yellow and cloudy; unable to perform manual differential due to debris, few red bloods cells and all cultures negative. Dr Della Valle advised that a manual count of red blood cells is needed if the presence of metallic debris is suspected. An automated count will give false results since the machine cannot differentiate dead from live cells and will sometimes count the metallic debris as white cells. Dr. Ranawat said that yellow, cloudy fluid with a metal-on-metal bearing, even with

minimal symptoms, indicates an adverse reaction as the yellow colour is produced by necrotic tissue along with loss of sensation. Metal ion testing in this patient revealed chromium 12000 µg/L (reporting limit: 0.5), cobalt 4700 µg/L (reporting limit: 1.0), nickel: 10 µg/L (reporting limit: 1.0), and titanium: 25 µg/L (reporting limit: 2.0) – all elevated. MARS MRI revealed soft-tissue edema and concern for disruption of the gluteal tendon. Because the M²a-Taper device only accepts a metal insert, liner exchange was not an option. At the time of revision surgery, pseudotumor, an abundance of debris and disruption of the gluteal tendon were encountered. The cup was well fixed and was removed with cutting tools. Options suggested for addressing the deficiency of the abductor mechanism included constrained liner, large head, dual mobility articulation, and, as was done, a gluteus maximus transfer (Fig. 6).

Case 4

A 72-year-old female patient with BMI of 25 kg/m² presents two years after undergoing right metal-on-metal THA at another center with a monoblock acetabular device that has been recalled (ASR; DePuy, Warsaw, Indiana) (Fig. 7). She reports having pain since the operation, in the groin and buttock at all times. She is employed in light labor, has no history of infection and is a non-smoker. She walks with a slight limp, has equal leg lengths, no fixed deformity and a satisfactory range of motion.

The panelists advise that even when knowing the device is a metal-on-metal, the approach to evaluating the patient should begin with the same steps as with any painful THA; that is to rule out the extrinsic and some of the intrinsic causes of hip pain. Are the implants loose? Is it infected? Obtain a laboratory profile, aspiration and cultures.

Fig. 8

A post-operative radiograph reveals treatment consisting of acetabular revision with an ultraporous shell and a 44 mm tripolar bearing used out of concern for instability.

Review the radiographs for signs of loosening and to assess component positioning. In this case, radiographs revealed satisfactory cup positioning but presence of osteolysis. Even if radiographs were negative for osteolysis, dual mobility liners are not an option with the ASR because of sizing incompatibility. Lab results were negative for infection – WBC: 6.5 (normal 4.0-10.5), ESR: 19 (normal 0-30), and CRP: <2 (normal 0.0-9.0). Serum ion levels are elevated – chromium: 11.8 µg/L (normal <1.4) and cobalt: 26.2 µg/L (normal <1.8). Some panelists thought obtaining metal ion levels and an MRI study was unnecessary since it was already clear to them that the cup had to come out. However, Dr Ranawat felt an MRI should be obtained, which Dr Lombardi did not obtain in this case but wished he had, since it may have revealed as he discovered at time of revision that the posterior capsular structures were not attached. There was considerable corrosion at the head/neck junction, mild metallosis, no significant fluid collection, posterior soft-tissue repair not healed, and the components were well fixed. The panelists agreed with the use of an ultraporous device with adjunct screw fixation and a non-constrained tripolar articulation (Fig. 8). Dr Jones raised concern about impingement. The panelists emphasised the importance of evaluating carefully for full range of motion at the time of operation, flexing the hip all the way up, abducting and internally rotating the extremity to ensure that impingement does not occur and lead to early failure. Dr Ranawat raised two concerns: 1) if a tripolar is placed in too abnormal an abduction angle or with too much combined anteversion, it will have a tendency to lock in, and the head of the tripolar articulates with the metal of the socket; and 2) there is a new disease being discussed in regard to the trunnion – that is, ‘trunnionosis’. If the trunnion is damaged, it will be damaged further if a larger head is placed on it because of the off-center load on the

Fig. 9

Seven years after undergoing primary cementless left total hip arthroplasty with a tapered titanium stem, porous hemispheric acetabular component, and 28 mm alumina ceramic head articulated with standard polyethylene, the patient, now age 38 years, presents with mild pain, squeaking and grinding noises occurring with motion in his left hip. He reports noticing an audible pop in his left hip when rising from a chair at work the day before.

trunnion. Therefore, when the trunnion is damaged a small head and a constrained or tripolar construct are better than a large head.

Case 5

A male patient first presented in 1989 at the age of 28 with BMI of 28 kg/m² and severe right hip pain, popping and cracking located in the groin, buttock and anterior thigh. He was employed as a moderate manual laborer. He had undergone bilateral core decompressions three years earlier for avascular necrosis and was on Prednisone for systemic lupus erythematosus. He was treated with primary cementless THA using an 11 mm × 160 mm tapered stem and a HexLoc (Biomet) porous plasma sprayed titanium cup with hydroxyapatite (HA) coating articulated with a 28 mm ion-bombarded titanium head. The HexLoc design had a sub-optimal locking mechanism, and combined with inferior polyethylene, yielded poor results. The patient returned three years later (1992) with similar symptoms on the left side. For this THA a similar stem was used, but the cup used was a RingLoc (Biomet), which has an improved ring locking mechanism. It was articulated with a 28 mm alumina ceramic head. Seven years post-operative to the RTHA (1996) the patient returned with complaints of pain in the groin on the right side. He walks with a limp but no assistive device. Radiographs reveal significant periacetabular osteolysis. Because of the poor locking mechanism and extent of osteolysis, the cup was revised to a RingLoc shell with multiple screws, a polyethylene liner, and a 28 mm alumina ceramic head. Seven years post-operative to the LTHA (1999) the patient returned with squeaking in the left hip (Fig. 9). He was rising from a chair at work and

Fig. 10

At 16 years post-operative to right acetabular revision with a porous hemispheric cup and a 28 mm alumina ceramic head articulated with standard polyethylene and 12 years post-operative to left polyethylene liner and head exchange to a 28 mm cobalt chromium device for treatment of fractured alumina ceramic head, the patient presents with mild right hip pain in the groin and buttock. The left hip is asymptomatic.

heard a pop. He was ambulating with two crutches. Radiographs reveal fracture of the alumina ceramic head.

The panelists were in agreement that the fractured head had to be taken out quickly in order to avoid damage to the

trunnion. If the trunnion was damaged, the stem would require removal as well. The recommended articulation for the revision was metal-on-polyethylene, which is what was done, exchanging the liner only and leaving the well-fixed shell. Dr Cameron felt that the soft tissues were not washed enough. Dr Ranawat stated that washing is not sufficient to remove the ceramic particles; the surrounding tissues must be excised.

The patient returned 16 years after the right hip cup revision and 12 years after the left (2012), with complaints of pain in the right hip but no pain in the left side (Fig. 10). Radiographs reveal wear and osteolysis in both hips.

The panel recommends revising both hips in staged fashion; however, the patient is adamant that he does not wish to undergo revision on the left. Therefore, the right side has been revised and the left side is being closely monitored.

Supplementary material

A full transcript of this discussion is available with the electronic version of this paper at www.boneand-joint.bjj.org.uk.

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