Routine Fracture Fixation for a Resurfacing Hip Periprosthetic Fracture; **a case report.**

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Abstract

Case: We present a case of a 56-year-old male who sustained a basal cervical periprosthetic fracture around a well-fixed Metal-on-Metal Hip Resurfacing Arthroplasty (MoMHRA). **Although several fixation methods have been described, there appears to be no consensus about the optimal fixation method for fractures around MoMHRAs.**

**T**his fracture could be regarded as a Vancouver type-B1 or -C periprosthetic fracture, **so** we successfully treated our patient in a standard way with a Dynamic Hip screw (DHS) and one cannulated hip screw.

Conclusion: **W**e describe DHS fixation as a **successful** treatment option for periprosthetic hip fractures around well-fixed MoMHRA.

Introduction

Periprosthetic fracture treatment around a Metal-on-Metal Hip Resurfacing Arthroplasty (MoMHRA) can be challenging, especially when retaining the prosthesis. Fracture treatment in MoMHRA should not be different compared to the periprosthetic fracture treatment around conventional hip arthroplasty. Fracture location, implant stability and bone quality, as described in the Vancouver classification, should guide the treatment choice [1]. Therefore we consider that in case of a basal cervical hip fracture around a well-fixed femoral hip resurfacing component, simple fixation should be sufficient.

**T**o our knowledge, we report the first case of a successfully treated periprosthetic fracture around a MoMHRA which was 6 years in situ with a Dynamic Hip Screw (DHS, DePuy Synthes, Oberdorf, Switzerland) in combination with a Cannulated Hip Screw fixation (CHS, AO Surgery, Davos, Switzerland).

Statement of Informed Consent

The patient signed informed consent and agreed for the use of the data for publication.

Case **description**

A healthy, non-smoking 56-year-old male with a BMI of 30.7 and bilateral MoMHRAs (BHR, Smith & Nephew, Memphis, Tenn) sustained a basal cervical periprosthetic fracture of the right hip (figures 1 & 2) after a fall of a stepladder. Both prosthes**e**s **had been** placed in another hospital via a posterolateral approach in 2006 (left side) and 2012 (right side) because of end stage osteoarthritis due to hip developmental dysplasia. Prior to the current fracture, the patient functioned well with both MoMHRAs.

He was transferred to our orthopedic trauma ward from a community hospital for treatment of the periprosthetic fracture. **He had also** sustained extra-articular and comminuted distal radial fracture on the right side.

Since the periprosthetic fracture was distal to the prosthesis, with a stable implant and no signs or symptoms of metal ion problems, we chose simple fracture fixation. The surgery was performed within 24 hours after injury. As such, **we did** not perform a MRI nor determine metal levels in serum, as this would cause a significant delay performing the surgery and could compromise the vascularity of the femoral head. The distal radial fracture was treated conservatively in a cast.

Surgical procedure

The procedure was performed under general anesthetics and fluoroscopic guidance. A closed reduction was performed with traction and slight internal rotation on the traction table. An incision was made on the lateral side of the hip just distal to the tip of the greater trochanter and parallel to the femur. The fascia of the iliotibial tract was incised, the posterior fascia of the vastus lateralis muscle was incised and 2 Hohmann retractors were used to elevate the vastus lateralis muscle and expose the femur. The 135° DHS angle guide was placed on the lateral side of the femur and under fluoroscopic guidance a 2.5mm K-wire was placed just below the peg of the prosthesis and just over the calcar into the femoral head. Care was taken to **retain** enough space for the diameter of the DHS screw tip. Placement of the lag screw was more caudal than normal and could result in rotational instability, therefore we inserted a 2.5mm K-wire just above the peg of the prosthesis, parallel to the first K-wire and placed a cannulated (anti-rotational) hip screw (CHS). The tips of both K-wires could not be seen due to projection of the prosthesis. Subsequently, measurement of the screw lengths (90mm for the CHS and 95mm for the DHS lag screw), tapping and drilling to an adequate depth was performed carefully in order not to touch the stem of the prosthesis or weaken the calcar. After confirming the position with fluoroscopy, a 6.5mm short threaded 90mm cannulated screw with a washer was placed over the second K-wire. A four-hole plate was assembled over the DHS lag screw and fixed onto the femur with 4 bi-cortical screws. After confirming the position of the reduced fracture, plate and screws with fluoroscopy the fascia and subcutaneous tissue were closed with absorbable sutures and the skin with staples. No complications occurred during and after surgery. The post-operative x-ray showed an anatomical position of the fracture and no complications in the DHS and CHS placement (figure 3). The patient was discharged home on the third post-operative day on crutches with touch toe weight bearing for six weeks.

Follow up

At 6 weeks follow up the patient reported no pain in his operated right hip. For the next 6 weeks **he** was encouraged to increase weight bearing until full weight. Further follow up at 3, 6 and 12 months showed a good clinical recovery. The patient was able to fully weight bear on the right leg without using any walking aids and does not experience any pain. The Harris Hip Score at 6 months postoperatively was 96 points and at 12 months it was 100. X-rays were taken at 6 weeks and 12 months post-operatively and showed full consolidation of the fracture and no signs of complications (Figures 4, 5, 6 & 7).

In order to evaluate possible metal ion problems, we measured serum chromium and cobalt levels postoperatively. At 4 weeks and 3 months post-operatively the chromium levels were 84.2 nmol/L and 88.5 nmol/L respectively and the cobalt levels were 57.7 nmol/L and 83.7 nmol/L respectively. These values were slightly increased compared to normal, but our patient showed no local or systemic complaints related to possible metal ion problems.

Discussion

**As far as we know,** this case is the first to describe successful treatment of a periprosthetic fracture around a well-fixed MoMHRA with a Dynamic Hip Screw. **The MoMHRA was introduced as a prosthesis for the young and active patient, however the use of MoMHRAs has declined since the international recall of the DePuy Orthopaedics’ Articular Surface Replacement (ASR™) hip system in 2010 and other MoMHRAs [2]**. **Femoral neck fracture rate in MoMHRA patients has been reported as 1.31% in the first year after surgery [3]. The female sex, high body mass index (BMI) and osteoporosis have all been associated with an increased risk of fracture [4]. Surgical factors such as femoral neck notching and a suboptimal placement of the femoral component may contribute to this mode of failure as well [5, 6].**

**Since** many MoMHRAs are still in situ and, due to ageing of these patients, surgeons **are likely to** encounter more periprosthetic fractures in the near future **[7]. T**hese periprosthetic fractures can provide an opportunity to revise the MoMHRA and prevent possible bearing issues and revision problem in the future. [8]. **A complete revision as well as a partial revision with retention of the acetabular component and using dual mobility components are often treatment options for periprosthetic fractures around MoMHRA. At the base for this choice of treatment is the recall of many HRA because of their high failure rate, metal wear and adverse reactions to metal debris (ARMD) [2]. However these revisions come with new (dis-)advantages and unknown long term outcomes [9]. In addition, when dealing with a well-fixed and well-functioning implant in a satisfied patient, retention of the prosthesis should be considered.**

**Although the Vancouver classification is based on stemmed total hip prosthesis, this classification could be used and guide us to simple fracture fixation. When translating the Vancouver classification to a resurfacing prosthesis, our case would be described as a type B1 or C fracture [1]. Since both types B1 or C fracture can be treated in isolation to the prosthesis, implant retention is the preferred option. Most mid and basal cervical fractures and intertrochanteric fractures around MoMHRA appear to have been treated with cannulated hips screws only [10-14]. Two case reports describe a LCP femoral plate as treatment option with good clinical results [15, 16]. A third reported treatment option is intramedullary nailing for intertrochanteric and subtrochanteric femoral fractures around the MoMHRA [17].**

However, in our hospital the standard treatment protocol of a basal cervical hip fracture is a DHS or 3 cannulated hip screws [18]. Brennan et al discourage**d** the use of an implant similar to a DHS and emphasizes the risk of damaging the cement mantle underneath the femoral component when using this device since the diameter of the distal threaded screw end is 13 mm and of a CHS is only 6.5 or 7.3 mm [10]. Most important is to avoid the stem and cement mantle with the screws. In our case the target area between the stem and the inner surface of the BHR prosthesis was large enough for the screw tip of the DHS. In addition, the lateral aspect of the fracture of our patient resulted in our choice for the more stable DHS, as is described in literature for more comminuted fractures leading to less implant related complications and slightly better outcomes [19, 20].

With this case report we want to present a successfully treated periprosthetic fracture around a well-functioning MoMHRA with a DHS. We believe that this commonly used fracture fixation method for trochanteric fractures can be added as treatment option for periprosthetic fractures around well-fixed MoMHRAs.

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Figure legends

Figure 1: Anteroposterior radiograph. A basal cervical periprosthetic fracture of the right hip is shown.

Figure 2: Axial view of the basal cervical periprosthetic fracture of the right hip.

Figure 3: Direct postoperative Anteroposterior radiograph of the right hip with a reduced fracture and fixation with a Dynamic Hip Screw ((DHS, DePuy Synthes, Oberdorf, Switzerland) in combination with a Cannulated Hip Screw fixation (CHS, AO Surgery, Davos, Switzerland).

Figure 4: Anteroposterior radiograph. After 6 weeks no signs of failure and consolidation of the fracture.

Figure 5: Axial view 6 weeks postoperatively. No signs of failure and consolidation of the fracture.

Figure 6: Anteroposterior radiograph. After 12 months a fully consolidation is showed with no failure of the osteosynthesis or prosthesis.

Figure 7: Axial view 12 months post-operatively. Full consolidation and no signs of failure of osteosynthesis or prosthesis.