X-Bolt unforeseen placement complication: case report

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ABSTRACT

With the introduction of the World Hip Trauma Evaluation Four clinical trial, fixation of pertrochanteric neck of femur fractures is becoming a hot topic. In this trial, the novel X-Bolt expanding bolt implant is being compared with the current gold standard of a sliding hip screw. We present a previously undescribed complication when inserting the bolt into the femoral head, where the expandable wings penetrate the femoral neck due to misplacement of the bone crusher or the X-Bolt prosthesis. This unforeseen complication required the introduction of several additional corrective intraoperative steps.

KEYWORDS

X-bolt

Accepted 5 June 2017

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Introduction

Neck of femur fractures represent a significant workload to the NHS, with an incidence of 65,000 fractures a year.¹ Extracapsular neck of femur fractures are traditionally managed using a dynamic hip screw. The World Hip Trauma Evaluation Four (WHiTE 4; Oxford Clinical Trials Research Unit) study is evaluating the dynamic hip screw against a new implant, the X-Bolt. As with any surgery, complications may be encountered, some of which may not have been previously described. It is imperative that the operating surgeon is aware of potential sequelae of operative procedures, from the perspectives of informed consent and risk reduction. The ability to rectify such complications expeditiously is crucial. We present a complication encountered intraoperatively when inserting an X-Bolt.

Case history

A 91-year-old patient with a background history of advanced Alzheimer's dementia who was living in a nursing home had a fall from a chair. Before the injury the patient was independently mobile. Diagnostic plain film imaging revealed a non-displaced two part basicervical neck of femur fracture (Fig 1). Operative management was scheduled for the following day's trauma list; the patient was randomised as part of the WHiTE 4 trial and was allocated to receive an X-Bolt prosthesis.

In theatre, the patient was positioned supine on the traction table. An image intensifier showed that the fracture remained undisplaced, so no fracture reduction was

necessary. Following the manufacturer's instructions, a guidewire was placed into the centre of the femoral head both in anteroposterior and lateral planes and checked using the image intensifier (Figs 2 and 3). Triple reaming was performed over the guidewire, again checked with image intensification. The triple reamer and the guidewire were removed to allow insertion of the bone crusher into the femoral head, which was checked with anteroposterior imaging only. It was noted that the bone crusher passed into the femoral head in one continuous motion with no major resistance. Thereafter the X-Bolt prosthesis was inserted.

The X-Bolt was deployed with satisfactory imaging in the anteroposterior plane (Fig 4). On lateral imaging, however, we noted that the 'wings' of the X-Bolt had breached the posterior cortex of the femoral head (Fig 5). The X-Bolt was sitting posteriorly in the femoral head, not in the track that had been triple reamed. Our supposition was that the bone crusher or the X-Bolt had established a new tract through osteoporotic bone and had displaced the fracture when introduced. This complication would not have been possible with a dynamic hip screw as the guidewire remains in place in the triple-reamed track until after insertion of the cannulated screw over which it is passed.

When the X-Bolt was removed, misalignment of the fracture was noted. This misalignment was reduced prior to reinsertion of the guidewire. Image intensification showed that the wire sat in the triple-reamed cavity. The wire was removed, noting the angle at which it had been present. The bone crusher was reused at the same trajectory, with checks using image intensification in the anteroposterior and lateral planes. This was followed by reinsertion of the X-Bolt

Figure 1 Admission radiograph showing right basicervical neck of femur fracture.

Figure 3 Theatre fluoroscopy image showing guidewire placement in lateral plane.

Figure 2 Theatre fluoroscopy image showing guidewire placement in anteroposterior plane.

Figure 4 Theatre fluoroscopy image showing X-Bolt deployed in anteroposterior plane.

prosthesis in the same plane as the bone crusher with further check imaging (anteroposterior and lateral). The prosthesis was then deployed. Satisfactory final check imaging was obtained.

Discussion

Neck of femur fractures represent fragility fractures in osteoporotic bone.² The sliding hip screw risks screw cut-

out in such patients. This may necessitate the need for revision surgery, which increases hospital demand and financial burden. In an attempt to prevent screw cut-out, the X-Bolt prosthesis has been designed with the intention of giving

Figure 5 Theatre fluoroscopy image showing X-Bolt deployed in lateral plane with breach of femoral neck cortex.

superior fixation in the femoral head relative to the dynamic hip screw.³ This hypothesis is currently being evaluated as part of the WHiTE 4 clinical trial.

The X-Bolt prosthesis has been manufactured with an expanding bolt consisting of four wings each at 90 degrees to one another, thus giving more purchase within the femoral head. In the context of osteoporotic bone, this offers inherent increased fixation within poor quality bone stock.⁴ While the X-Bolt is currently being trialled relative to the dynamic hip screw, there remains limited clinical data to support the underpinning theory behind the implant.

This case demonstrates a novel complication of this device. The authors suggest that, in an attempt to prevent such a complication, check imaging should be performed at each interval step of procedure, both in the anteroposterior and lateral planes. Therefore after removal of the guidewire, on insertion of the bone crusher, imaging should be performed in both anteroposterior and lateral planes. This imaging should be repeated when inserting the X-Bolt prosthesis before deploying the expandable wings. It is understood, however, that this exposes the patient to increased radiation.

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