Short Stem Option for Total Hip Arthroplasty With Retained Hardware

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Abstract: The presence of retained femoral hardware, usually as a consequence of prior orthopedic trauma, has been classically presented as something that must be removed prior to total hip arthroplasty. However, hardware removal is not without risks, including pain, creation of stress risers, and refracture. The authors report a patient with a retained retrograde femoral nail who underwent total hip arthroplasty with a short, neck-preserving femoral stem used to avoid the need for hardware removal. Clinical results at short-term follow-up have been excellent. In the setting of retained hardware, the use of short stems may be a viable treatment option for a well-selected subgroup of patients who require total hip arthroplasty and when the surgeon cannot use standard implants.

The presence of retained femoral hardware used to treat previous orthopedic trauma may present a unique challenge to orthopedic surgeons during primary or revision total hip arthroplasty (THA).1 Hardware removal frequently necessitates more soft tissue disruption and increased bleeding and operative times and may create stress risers, which increase the risk of peri-prosthetic fracture.1 Several implant options exist for primary or revision THA in the setting of prior hardware. One option is for hardware retention combined with total hip resurfacing, which is typically recognized as a potential treatment option only for select young and active patients in whom long-term polyethylene wear is a concern,2,3 but may not be an option in the patient reported in the current study. Another option is removal of the hardware and placement of a long-stem implant. With this option, removal of a femoral nail may be difficult before THA, particularly if it is an early-generation, nonreamed nail that has become incarcerated. Furthermore, removal of the proximal locking screw may create a stress riser, which necessitates the use of long-stem implants and decreases surgeon implant choice.4 Concerns about thigh pain and proximal stress shielding with long-stem implants have been the impetus for using shorter femoral stems, which load the femoral neck and proximal femur to achieve a more physiologic load distribution. However, the use of short stems that load the femoral neck and proximal femur with minimal distal canal involvement has not been commonly reported.

The authors report a patient with a retained retrograde femoral nail who was treated with a short femoral stem that loads the femoral neck and proximal femur, which was accomplished without removal of the femoral nail.

Case Report
A 47-year-old woman who had previously undergone several orthopedic procedures after a motor vehicle accident 7 years previously presented requiring a THA. Apart from other nonorthopedic injuries, the patient sustained a right closed midshaft femoral fracture that was treated using a retrograde femoral nail and subsequently achieved union. The patient had recently experienced an insidious onset of groin pain that worsened with ambulation and was not amenable to conservative therapy with nonnarcotic analgesics, injections, or activity modification. Markers for infection

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(erythrocyte sedimentation rate and C-reactive protein) were negative. The patient elected to have a stemmed hip arthroplasty and did not wish to have her previous hardware removed. She was counseled about the option of using a short-stem implant that may have made the procedure possible without removing the femoral nail and was informed that if the intraoperative tests showed the femoral nail to be located too proximally, then it would need to be removed and a longer-stemmed prosthesis would need to be used after nail removal to bypass the proximal interlocking screw holes, which could have created a stress riser.

The patient was brought to the operating room, and the hip was approached anterolaterally. The femoral neck was cut and a short, neck-sparing femoral stem with a distal tip that ended just proximal to the femoral nail was implanted (MiniHip; Corin, Tampa, Florida). The femoral component is a neck-sparing design with a plasma spray titanium surface onto which a coating of hydroxyapatite is overlain. Corida). The femoral component (MiniHip; Corin, Tampa, Florida) is a neck-sparing design with a plasma spray titanium surface onto which a coating of hydroxyapatite is overlain. Correct stem position and length were confirmed with trial components (Figure 1).

During broaching, a small hoop stress fracture was noted in the proximal femur and was stabilized with 2 cerclage wires before impacting and seating the implant. The hip was reduced without difficulty and demonstrated excellent range of motion and stability intraoperatively.

The patient subsequently had an uneventful postoperative hospital stay and was discharged on postoperative day 2 due to her rapid progression in physical therapy. At her 2-year follow-up, the patient was doing well clinically and radiographically. She reported no pain with ambulation or limping and was able to ambulate with no assistive devices. At most recent follow-up, her Harris Hip score was 92 points and her UCLA activity score was 8 points. Assessment of global outcomes with the Short Form 36 demonstrated a score of 57 points for both the physical and mental components, where a score of 50 represents the average score for the general population in the United States. On radiographs, the components were in good alignment with no evidence of stem subsidence, varus angulation, or loosening (Figure 2).

**DISCUSSION**

Early reports of THA in the setting of retained hardware stressed the importance of hardware removal. However, because the use of short femoral stems has become increasingly popular among orthopedic surgeons, this rule may not apply currently.

The theoretical benefits of these short-stem designs include the ease of performing a THA with minimally invasive approaches and their usefulness for patients with extraarticular deformities and retained hardware. Unlike total hip resurfacing, these stems also increase the spectrum of bearing choices available to surgeons, with both polyethylene and ceramic liner options and cobalt-chrome or ceramic femoral heads as options. In a subset of patients who have had femoral resurfacings, this stem option allows surgeons to use a bone-preserving stem.

The major benefit of this approach is the avoidance of a more extensive surgery that includes hardware removal. In a review of indications for femoral hardware removal in a trauma population (30,943 patients with 4886 hardware removals), Lovald et al noted that 15% of the instances that required removal were for conditions that required joint arthroplasty. Although hardware removal is routinely performed in certain situations (eg, ankle or patellar fractures), the procedure is not without substantial risks at the hips, particularly with large implants. The difficulties associated with removal of femoral nails have been well documented. Incarcerated femoral nails may be especially difficult to remove; even with no bone ingrowth, nail removal may risk refracture at the original injury site, a new iatrogenic fracture, or soft tissue damage around the incision site during extraction.

In a study of 164 asymptomatic patients who elected to have their femoral nail removed, Gosling et al observed that 20% of patients reported pain and discomfort following nail removal. One
potential drawback of this approach may be the risk of creating a stress riser at the junction between the distal tip of the femoral stem and the proximal end of the retrograde femoral nail; however, the current authors have observed no reactive cortical changes in this patient.

When assessing a patient with retained hardware who requires a THA, evaluating the amount of proximal bone stock is critical for long-term implant durability and clinical success. For patients who have poor bone quality, it may be advisable to remove any interfering hardware and use a stem that relies primarily on diaphyseal fixation. Patients should also be made aware of the risks associated with hardware removal. However, the current authors believe that the classic teaching point of removing hardware prior to THA has changed with the advent of newer implant designs. In a well-selected subset of patients, the use of short stems may be a viable alternative for primary or revision THA.

REFERENCES