2-1-2006

Use of an Ilizarov apparatus to perform closed reduction of a chronic proximal dislocation following total hip arthroplasty: A case report

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Use of an Ilizarov Apparatus to Perform Closed Reduction of a Chronic Proximal Dislocation Following Total Hip Arthroplasty

A Case Report

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Dislocation remains a major early perioperative complication of total hip arthroplasty, with a prevalence of 3.9% within the first six months as reported in a review of 58,521 patients in the Medicare population[1]. While the literature abounds with options for the treatment of recurrent dislocation after total hip arthroplasty, we are not aware of any report on the treatment of chronic proximal dislocation after total hip arthroplasty. We report the case of a patient in whom this complication was successfully treated with gradual closed reduction with use of an Ilizarov distraction technique. The patient was informed that data concerning this case would be submitted for publication.

Case Report

A forty-six-year-old man was involved in a motor-vehicle accident in 1997 and sustained a right posterior wall acetabular fracture with peroneal nerve palsy that was treated with open reduction and internal fixation. Degenerative joint disease subsequently developed, and the patient underwent right total hip arthroplasty. Postoperatively, the hip dislocated multiple times and revision total hip arthroplasty was recommended by the original treating physician. The revision procedure was postponed on a number of occasions, and the patient was then lost to follow-up.

The patient presented to our facility six years later for evaluation of chronic proximal dislocation at the site of the right total hip arthroplasty. The initial radiographic evaluation revealed the right total hip replacement to be dislocated posteriorly, resulting in 10 cm of shortening (Fig. 1). Other than the peroneal nerve palsy, motor and sensory function were intact in the involved extremity. The patient had chronic pain in the buttock and a severe Trendelenburg gait, and he walked with use of a crutch and a 7.5-cm shoe-lift. The pain was worse with weight-bearing but was also moderate to severe with sitting.

The treatment options that were discussed with the patient included resection arthroplasty, revision surgery with residual limb-length discrepancy, and soft-tissue lengthening with use of an external fixator, possibly followed by revision surgery. After discussion of the risks and benefits of each option, the patient opted for the lengthening procedure.

The patient was taken to the operating room, where a spanning Ilizarov device was placed over the right hip (Fig. 2). The patient was placed in the lateral decubitus position to allow complete access to the pelvis. The anterior superior iliac spine and the posterior superior iliac spine were palpated to ensure safe passage of transosseous tensioned wires. Transosseous wires were placed in an anterior-to-posterior direction within the ilium. The starting point for the wires was

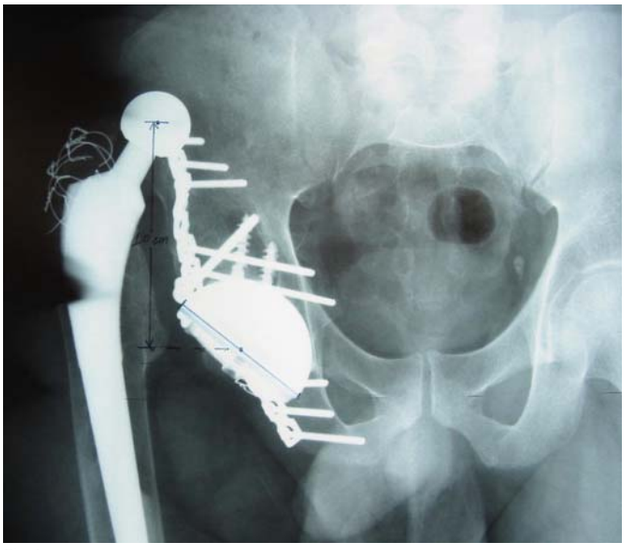

Fig. 1

Anteroposterior radiograph demonstrating 10 cm of shortening.

just proximal to the anterior superior iliac spine. The wires were driven between the tables of the ilium with a wire-driver. Once the posterolateral cortex of the iliac wing was pierced with the wire, the wire was advanced manually by gentle tapping. Care was taken to ensure that the trajectory of the wire was lateral to the posterior inferior iliac spine. This technique was adapted from observations made at the Kurgan Institute, Russia, by one of the authors (J.R.H.). Since these tensioned wires were oriented at 90° to the distraction force, they were very resistant to loosening. The wire fixation was reinforced by half-pins that were placed along the iliac crest and in the anterior inferior iliac spine. The use of hydroxyapatite-coated half-pins added to their resistance to loosening. Tapered, blunt-tipped half-pins were used to facilitate their placement between the tables of the iliac wing. The cortex of the iliac crest was predrilled through a stab incision. The path of the half-pins was not predrilled, to ensure that the cortices of the ilium remained intact. The half-pins were then placed into the pilot hole in the crest and were gently driven into the ilium for approximately 5 mm with use of a mallet. At this point, we turned the half-pins without applying axial pressure in order to draw them between the tables of the ilium. Fixation in the femur was accomplished with three half-pins that were placed as far distally on the femur as possible to avoid contamination of the prosthesis from a possible pin-track infection. Furthermore, distal pin placement avoided the creation of a stress-riser in the diaphyseal bone adjacent to the femoral stem.

Fig. 2

Postoperative appearance of the Ilizarov device, placed with the patient in the lateral decubitus position, with transosseous wires proximally and half-pins distally.

The patient was started on a lengthening regimen at a rate of 4 mm per day on the first postoperative day. The patient was managed with enoxaparin postoperatively and was transferred to a rehabilitation unit on the second postoperative day to continue lengthening.

Two complications occurred during the lengthening process. Approximately three weeks after the placement of the Ilizarov frame, the patient presented to the emergency room complaining of shortness of breath and pleuritic chest pain. He was diagnosed with a pulmonary embolism and was admitted for treatment. Duplex Doppler imaging of both lower extremities failed to reveal any evidence of deep-vein thrombosis. Heparin therapy was started, and a vena cava filter was placed. Additional thromboprophylaxis was provided with a coumadin protocol and, after six days, the patient was transferred back to the rehabilitation unit. Two weeks later, the patient was seen in clinic and it was noted that the frame had angulated at the proximal joint, causing one of the half-rings to impinge on the soft tissues of the right buttock. The patient was taken to the operating room. With the patient under anesthesia, the frame was derotated and diagonal supports and "cross-links" were added to the hip-spanning frame to counteract the torsional forces on the long vertical struts of the apparatus. Intraoperative radiographs that were made after revision of the frame showed the head of the femoral component to be at the level of the superior edge of the acetabular component. Postoperatively, the frame was lengthened at a rate of 4 mm per day for seven days. At this point, six weeks after the initial surgical procedure, radiographs showed the head of the femoral component to be reduced in the acetabulum. The patient was taken to the operating room the following day. The Ilizarov apparatus was removed, and the patient wore an abduction brace for three days. The patient was then managed with a hip pantaloon spica cast that ended proximal to the knee joint to facilitate walking.

The hip pantaloon spica case was maintained for eight weeks, after which time the patient was allowed to bear weight as tolerated and physical therapy was begun. The patient returned for follow-up two years later. He was able to walk without assistive devices and had a mild limp due to the residual peroneal nerve palsy from the initial injury. Radiographs made at that time showed that the total hip replacement remained reduced (Fig. 3). In spite of a trochanteric nonunion, he had had a minimal Trendelenburg sign and could resist gravity in side-lying abduction.

Discussion

The use of external fixation for lengthening before total hip arthroplasty in patients with developmental dyspla-

Fig. 3

Radiograph, made two years after removal of the brace, demonstrating maintenance of reduction of the total hip implant and equal limb lengths.

sia of the hip has been described[2,3]. However, we found no reports describing the use of external fixation to reduce a chronic dislocation after total hip arthroplasty. In the case of our patient, the components were well aligned and well fixed and therefore avoiding component revision was a priority. A rapid rate of distraction (4 mm per day) was used because we were returning the neurovascular structures to their normal anatomic length. However, concern should remain as neurologic compromise can still occur, especially toward the end of the lengthening period, because of long-standing scarring of the nerves and adjacent soft tissues. The patient should be educated with regard to the signs of neural irritation. If such signs develop, the distraction should be slowed or even temporarily halted.

We believe that the use of the anterior-to-posterior transosseous wires in the ilium are important to the success of forceful distraction across the hip. On the basis of our experience in similar cases, we believe that fixation with half-pins alone is associated with rapid loosening. In cases such as the one described in the present report, in which large forces must be generated to overcome scarring and soft-tissue contracture, the tensioned wires oriented at 90° to the force vector are essential. Obviously, experience with the use of transosseous wires and knowledge of the anatomy are crucial to the safe employment of this technique.

While complications such as pulmonary embolism and pin-track infection can occur in association with the use of this method, the very difficult case described in the present report was treated successfully. A much higher level of function was restored, equal limb lengths were restored, and an open procedure was avoided. We believe that gradual distraction with an external fixator is a viable option for the treatment of chronic dislocation following total hip arthroplasty. ■

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The authors did not receive grants or outside funding in support of their research for or preparation of this manuscript. They did not receive payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity. No commercial entity paid or directed, or agreed to pay or direct, any benefits to any research fund, foundation, educational institution, or other charitable or nonprofit organization with which the authors are affiliated or associated.

doi:10.2106/JBJS.E.00529

References

1. Phillips CB, Barrett JA, Losina E, Mahomed NN, Lingard EA, Guadagnoli E, Baron JA, Harris WH, Poss R, Katz JN. Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement. J Bone Joint Surg Am. 2003;85:20-6.

2. Symeonides PP, Pournaras J, Petsatodes G, Christoforides J, Hatzokos I, Pantazis E. Total hip arthroplasty in neglected congenital dislocation of the hip. Clin Orthop Relat Res. 1997;341:55-61.

3. Lai KA, Shen WJ, Huang LW, Chen MY. Cementless total hip arthroplasty and limb-length equalization in patients with unilateral Crowe type-IV hip dislocation. J Bone Joint Surg Am. 2005;87:339-45.