

# Pantaloon Hip Spica Cast and Constrained Liner for the Treatment of Early Total Hip Dislocation in a Young Patient With Sickle Cell Disease

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**S**ickle cell disease often leads to osteonecrosis of the femoral head and subsequent degenerative arthritis of the hip. Pain and ambulatory limitations prompt orthopedic surgeons to consider total hip arthroplasty (THA). In these patients, THA can be challenging secondary to distorted anatomy, prior surgeries, and significant soft-tissue contractures.

The case reported here illustrates early prosthetic dislocation after THA in a young patient with sickle cell disease successfully treated with open reduction, conversion to a constrained liner, and 8 weeks in a pantaloon hip spica cast. The authors have obtained the patient's written informed consent for print and electronic publication of the case report.

## CASE REPORT

A 16-year-old wheelchair-bound boy with sickle hemoglobin C disease was referred for evaluation of a painful right hip. The patient had a history of bilateral femoral head osteonecrosis, which for the past 6 years had been a source of pain. He had undergone right valgus-producing proximal femoral osteotomy 5 years before presentation with subsequent hardware removal, and left valgus-producing proximal femoral osteotomy 2 years before presentation. Pain relief came after both procedures, but the right hip pain recurred. In addition, the right hip dislocated superolaterally, leaving the patient nonambulatory and wheelchair-bound for the preceding 2 years. The superolaterally dislocated hip and wheelchair-bound functional

status caused right hip flexion and adduction contractures. The left hip remained relatively asymptomatic. The patient sought independent, pain-free ambulation.

The patient was 5 feet 3 inches tall and weighed 130 pounds. Range of motion (ROM) testing revealed a flexion contracture of 40° with maximum flexion to 100°. An adduction contracture of approximately 30° was also present. No significant internal or external rotation was possible. The right lower extremity was clinically noted to be 3 cm shorter than the left. An anteroposterior pelvis radiograph is shown in Figure 1. Preoperative radiographs showed dislocation of the femoral head, a false acetabulum, and flattening of the femoral head. The risks and benefits of total hip arthroplasty (THA) were discussed with the patient and his family, and they agreed to proceed.

THA was undertaken using a posterolateral approach with the patient in the lateral decubitus position. A complete capsulectomy was performed to facilitate exposure. Metal-on-metal bearings using a 44-mm acetabular cup (Pinnacle-Bantam, DePuy, Warsaw, Ind) and an S-ROM (Sivash-Range of Motion; DePuy, Warsaw, Ind) modular femoral component with a 28-mm femoral head were placed. Metal-on-metal was selected to provide the largest head size for the 44-mm cup. The acetabular component

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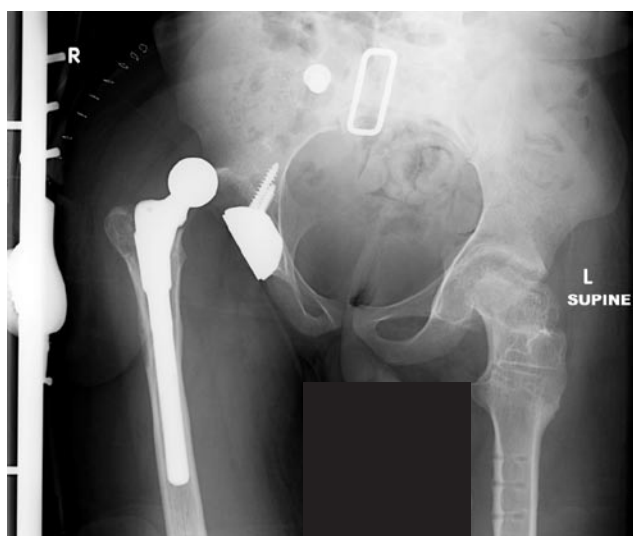
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**Figure 1.** Preoperative anteroposterior pelvis before right hip arthroplasty.



**Figure 2.** Dislocation, postoperative day 10.



**Figure 3.** Anteroposterior pelvis after revision to custom constrained liner and application of pantaloons hip spica cast.

was placed at the true acetabular position. Intraoperative ROM testing revealed continued flexion and adduction contractures. Complete psoas (at lesser trochanter) and rectus femoris (at anterior inferior iliac spine) releases were performed. An adductor longus release was performed through a separate medial incision. Despite these releases, the patient left the operating room with a 20° flexion contracture and tight adductors. He was therefore placed in an abduction orthosis in an attempt to relax the tight soft tissues and protect the hip from extremes of motion. Postoperative radiographs showed a reduced THA in acceptable position. Ten days after surgery, while in the abduction orthosis, the patient dislocated posteriorly (Figure 2). On dislocation, a significant amount of postoperative pain was eliminated, suggesting soft-tissue tightness as a contributing factor to the pain.

A custom constrained polyethylene liner for the small acetabular cup was ordered, and the patient was left dislo-



**Figure 4.** Two years after right hip revision and 6 months after primary left hip arthroplasty.

cated for comfort. One month after the index procedure, he underwent revision to a constrained liner, additional release of the insertion of the gluteus minimus, and placement of a unilateral pantaloons hip spica cast ending proximal to the knee (Figure 3). Although there was a concern regarding use of a constrained liner only 1 month after the index procedure, it was felt that the anatomical position of the implants and the planned use of a pantaloons hip spica cast would minimize the stresses at the acetabular bone–implant interface and allow osseointegration. The patient remained in the pantaloons hip spica cast for 8 weeks. He was allowed to weight-bear as tolerated in the cast, but his mobility was limited to transfers and household ambulation.

More than 2 years after revision, the patient had no additional adverse events. He underwent contralateral hip replacement without complication and was ambulating without aids. He had no residual flexion or adduction contractures (Figure 4).

## DISCUSSION

The incidence of femoral head osteonecrosis in patients with sickle cell disease ranges from 3% to 41%.<sup>1</sup> In patients with severe disease, vaso-occlusive episodes can begin early in life. The present case involves a patient who developed severe femoral head collapse, hip dislocation, and severe osteoarthritis. THA was believed to be the best surgical option for minimizing or eliminating pain and allowing resumption of ambulation.

Femoral head collapse, hip joint contractures, and marked preoperative stiffness must often be addressed during surgery with significant muscular and soft-tissue releases.<sup>2</sup> A posterolateral approach was used because of surgeon familiarity and extensile options. In this case, preoperative stiffness from a superiorly dislocated hip, combined with intraoperative reestablishment of the true acetabulum, prompted aggressive capsular resection and extensive muscular releases. Although significant releases

were performed, we believe that the underlying cause of the total hip dislocation was persistent postoperative soft-tissue tightness and contractures associated with the chronic preoperative dislocated femoral head. Even after release of the gluteus minimus tendon during the second surgery, the patient had a persistent hip flexion contracture. A unilateral pantaloon hip spica cast was applied in an attempt to stretch the soft tissues contributing to this nonphysiologic force causing posterior instability despite properly positioned components.

Although hip spica casting has been described as a treatment for recurrent hip arthroplasty dislocation associated with soft-tissue laxity,<sup>3-6</sup> we know of only 1 reported case of its use in the treatment of soft-tissue tightness associated with a dislocation.<sup>7</sup> As in that case report, our use of the cast was to allow for the soft tissues to relax after the dislocated hip replacement had been relocated.

Intraoperative options for maintaining reduction were limited given the patient's small acetabular size. A constrained liner was thought to be the best intraoperative option for additional stability. But with improved stability come limited ROM and increased stress at the acetabular bone-implant interface. The constrained Pinnacle/S-ROM components used in this case allowed for only approximately 80° of motion.<sup>8</sup> Because of the 1-month delay in manufacturing the custom constrained liner, it was hoped that bone-implant stability would be achieved. The pantaloon hip spica cast was additionally speculated to minimize the stress at the acetabular bone-implant interface during osseointegration—another reason to apply this cast.

In retrospect, the success in treating the persistent contractures with the pantaloon spica cast probably obviated the need for a constrained liner, but, given that the components are in anatomical position, it is hoped that the longevity of the prosthesis will not be negatively affected by this constraint.

## AUTHORS' DISCLOSURE STATEMENT

Dr. Meehan wishes to note that he has received institutional research support and a speaker honorarium from DePuy Orthopaedics. Dr. Jamali and Dr. Ryan report no actual or potential conflict of interest in relation to this article.

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