

Symptomatic Hip Impingement Due to Exostosis Associated With Supra-Acetabular Pelvic External Fixator Pin

Patrick C. Schottel, MD, Christopher S. Smith, MD, and David L. Helfet, MD

Abstract

Expedient stabilization of unstable pelvic fractures has been shown to significantly reduce morbidity and mortality in the polytrauma patient. Application of a pelvic external fixator is one of the methods used to provide effective pelvic stability. However, pelvic external fixators are not without drawbacks. While pin tract infections and pin loosening are frequent complications, we describe a unique complication consisting of the formation of a symptomatic exostosis at the supra-acetabular pin site in a 35-year-old male with a pelvic fracture. To our knowledge this is the first description of hip impingement due to reactive bone formation secondary to a supra-acetabular pelvic external fixation pin. The impinging bone was completely excised utilizing the anterior approach to the hip. A 40° improvement in the patient's hip flexion range of motion was noted after exostosis excision.

Expedient stabilization of unstable pelvic fractures has been shown to significantly reduce morbidity and mortality in the polytrauma patient.¹⁻⁴ This improved patient survival is believed to be primarily due to a reduction in the intrapelvic volume, stabilization of the pelvic hematoma, and the resulting tamponade effect on any posterior venous plexus bleeding.⁵⁻⁷ Pelvic stabilization also allows for earlier mobilization and decreased pulmonary complications.³

Different methods exist to provide pelvic stability for unstable pelvic fractures. Pelvic binders, skeletal traction, open reduction, and internal fixation, as well as external fixation are examples of such methods. The choice of using a particular stabilization technique is based on the fracture pattern, patient condition, concomitant injuries, and surgeon preference. External pelvic fixation has been shown to be especially beneficial, because it allows early patient mobilization, provides unimpeded access to the abdomen or other wounds, and can be applied in a relatively expeditious manner.⁸⁻¹³ Various pin locations and bar configurations have been described.^{11,13-18} Anteroinferior pelvic external fixators using pins within the

dense supra-acetabular bone has been shown to form the most biomechanically stable construct.¹⁹ Thus, definitive pelvic external fixation employing supra-acetabular pins are becoming more common.

However supra-acetabular pins are not without their drawbacks. While pin tract infections are a frequent complication of all definitive pelvic external fixators, in this case, we describe a unique complication of anteroinferior fixators: formation of an exostosis at the site of a supra-acetabular pin. To our knowledge, this is the first description of symptomatic hip impingement due to reactive bone formation secondary to a supra-acetabular pelvic external fixation pin.

The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A 35-year-old male presented to an outside hospital after suffering a 3 m fall from a ladder. The patient did not report a head injury or loss of consciousness. On initial radiographic evaluation the patient was noted to have a proximal humerus fracture-dislocation as well as minimally displaced bilateral superior and inferior pubic rami fractures. In addition, a right-sided transforaminal sacral fracture was noted on computed tomography (CT). The treating surgeon considered the patient's pelvis unstable, and the patient subsequently underwent pelvic stabilization with a right-sided percutaneously placed 8.0 mm sacroiliac (SI) screw and an anteroinferior pelvic external fixator using a 6.0 mm hydroxyapatite (HA) coated supra-acetabular pin bilaterally (**Figure 1A**). The patient reportedly had an uneventful postoperative course and was discharged 10 days after admission. The anterior pelvic external fixator was removed after 8 weeks without complications.

Fourteen months following the initial placement of the pelvic external fixator, the patient underwent excision of a right-sided exostosis emanating from the anterior inferior iliac spine (AIIS). The patient reportedly was experiencing significant anterior hip pain and limited hip flexion that did not improve with nonoperative management. Therefore, an anterior approach to the hip was performed using an approximately 3.0 cm incision. Per the outside hospital operative report, the im-

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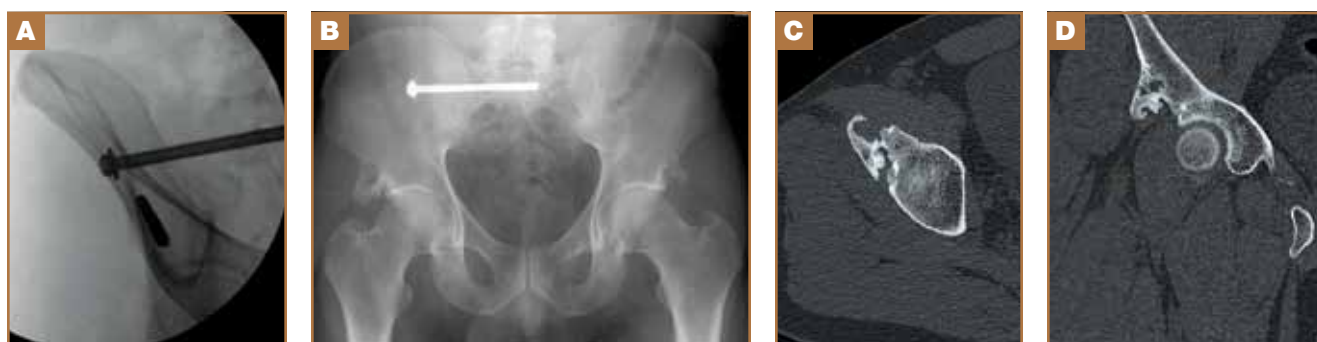


Figure 1. An intraoperative fluoroscopic image from the index procedure demonstrating placement of a right-sided AIIS Schanz pin (A). AP pelvic radiograph 26 months after pelvic stabilization with an anteroinferior external fixator and right-sided posterior SI screw fixation (B). Axial CT image of right AIIS exostosis (C). Coronal CT image of right AIIS exostosis (D).

pinging bone was identified and excised using an osteotome.

Subsequently, the patient presented to our institution 26 months after the initial injury and approximately 12 months following removal of the right-sided AIIS exostotic bone. At that time, the patient claimed that he had a palpable painful mass in his right hip in the vicinity of the prior supra-acetabular pin and previous exostosis. The patient reported reduced hip flexion and pain with activities including sitting, climbing stairs, and standing from a seated position. On examination, the patient demonstrated a coxalgic gait. He had full hip extension but flexion was limited to 90° due to a mechanical block. Hip internal and external rotation in a prone position was symmetric and painless. He demonstrated no other significant physical examination findings. Pelvic radiographs and CT of the right hip demonstrated a large exostosis emanating from the AIIS (Figures 1B, 1C).

Given the radiographic and physical exam findings, a re-excision of the impinging AIIS exostosis and manipulation of the right hip was performed after obtaining informed consent. Utilizing the anterior approach to the hip, an 8.0 cm incision was made and the exostosis was readily identified and excised with the use of an osteotome and rongeur after reflection of the direct head of the rectus femoris muscle (Figure 2A). The hip was taken through a full range of motion and no further impinging bone was manually appreciated. The direct head of the rectus femoris was reattached to the AIIS via bone tunnels and final fluoroscopy demonstrated thorough debridement of the supra-acetabular bone (Figure 2B). Intraoperatively, the patient demonstrated hip flexion to approximately 130°. Postoperatively, the patient was prescribed daily extended-release indomethacin and his weight bearing was restricted to 20 kg on the operative extremity for the first 2 weeks. Follow-up postoperative radiographs at approximately 11 months demonstrated no recurrence of the exostotic bone (Figure 2C).

Discussion

The overall complication rate of anterior pelvic external fixation has been reported to be as high as 47-62%.^{20,21} The most common complication is pin site infection, followed by pin loosening and loss of reduction.^{2,5,8,9,12,13,20-23} However, the ma-

jority of these reported complications are described in studies employing anterosuperior pelvic external fixators using iliac crest pins and not anteroinferior fixation with supra-acetabular pins as is the case with our patient. This subtle difference reveals that supra-acetabular pins have unique potential complications related to their specific anatomic location of insertion, including increased lateral femoral cutaneous nerve (LFCN) vulnerability, possible hip joint pin penetration, and formation of potentially impinging exostoses.

Bellabarba and colleagues²⁴ published one of the few studies documenting the complications of anteroinferior pelvic external fixation. They found an overall complication rate of 36% (5/14) including 3 superficial pin site infections, one deeper pin site abscess formation and irritation of the LFCN in one patient. In another study, Mason and colleagues,²¹ reported one supra-acetabular pin penetrating the hip joint requiring revision of 2 total cases. Neither of these series described any complications related to the development of an exostosis.

Gardner and colleagues,¹⁵ in a technique paper describing proper supra-acetabular pin placement reported no deep infections or loss of fixation for anteroinferior pelvic external fixators in 25 patients. However, the authors did report observing a “small” focus of heterotopic bone in several patients at the AIIS. None of these patients reportedly required excision of the extraneous bone or experienced symptoms of hip impingement.

Vaidya and colleagues²⁵ recently published the clinical outcomes and complications of unstable pelvic injuries using anterior subcutaneous internal fixation. This unique construct consists of a subcutaneously placed bar connecting polyaxial supra-acetabular pedicle screws. They observed the development of heterotopic bone in 35% (32/91) of their patients located predominately in the vicinity of the AIIS surrounding the screw heads. There was no specific mention of this bone causing hip impingement or requiring excision. It should be noted, however, that the supra-acetabular pedicle screws were not removed until 3 to 6 months postoperatively.

No study to date has reported the incidence and severity of heterotopic bone or exostoses for anteroinferior pelvic external fixators. Based on the aforementioned papers we believe that this may be an underreported phenomenon and no publica-

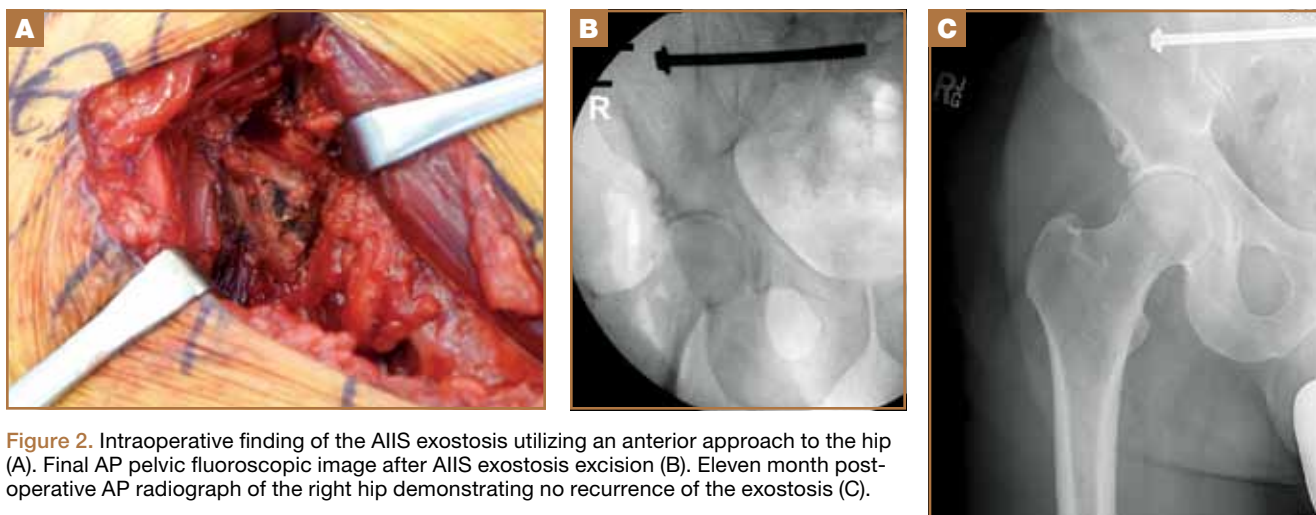


Figure 2. Intraoperative finding of the AIIS exostosis utilizing an anterior approach to the hip (A). Final AP pelvic fluoroscopic image after AIIS exostosis excision (B). Eleven month post-operative AP radiograph of the right hip demonstrating no recurrence of the exostosis (C).

tions to date have described an exostosis causing symptomatic hip impingement.

Whether the use of HA coated pins contributed to the development of the exostosis is unknown. To our knowledge there are no reports associating increased heterotopic bone formation and HA coated external fixator pins. Unfortunately, the majority of publications, including a recent systematic review by Saithna, investigating HA coated pins in external fixators did not specifically mention complications related to heterotopic bone formation.²⁶ A larger case series of patients treated with definitive anteroinferior pelvic external fixation specifically looking at heterotopic bone and exostosis formation is needed to quantify the significance of this problem and determine whether the HA coating plays a significant role.

Conclusion

Heterotopic bone and the formation of an AIIS exostosis as a result of supra-acetabular pins in anteroinferior pelvic external fixators is a rarely reported but increasingly recognized complication. While typically asymptomatic, this extraneous bone has the potential to cause painful hip impingement. When present, we recommend a direct anterior open approach for unimpeded visualization and complete excision. Strong consideration is recommended for postoperative heterotopic ossification prophylaxis following surgical excision. Further work is needed to define the incidence as well as the role of HA coated pins in inducing this exuberant bone formation.

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This paper will be judged for the Resident Writer's Award.
