

Superior Gluteal Artery Injury in Percutaneous Superior Ramus Stabilization

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Disclosures: A. Suresh: None. C. Falgons: None. S.J. Warner: 1; Globus Medical, Inc, Bonebridge, Stryker. 9; AAOS, OTA, AONA. P.J. Kellam: None. M.L. Chip Routt, Jr: 2; AONA, Johnson & Johnson, Stryker, Zimmer. J.G. Eastman: 1; Globus medical, Osteocentric, Stryker.

ABSTRACT INTRODUCTION:

A common component of pelvic ring injuries and acetabular fractures include involvement of the superior pubic ramus. Reduction and stabilization is performed through open approaches or percutaneously with either an antegrade or a retrograde technique. Prior studies have documented the proximity of the superior gluteal artery to percutaneous pathways for iliosacral and transiliac transsacral screws. We are not currently aware of any study investigating the relationship of the superior gluteal artery to the ramus screw insertion pathway. The purpose of this study is to report the incidence of superior gluteal artery with antegrade percutaneous instrumentation of the superior pubic ramus osseous fixation pathway.

METHODS:

A 10-year retrospective chart review of all patients with pelvic ring injuries at our Level 1 Trauma center was performed. Patients were identified in our prospectively collected trauma database with utilizing the CPT codes 27217, 27226, 27227, 27228, and G0413/G0414. All patients over the age of 18 years with an intramedullary implant in the superior pubic ramus osseous fixation pathway as part of their pelvic ring or acetabular fixation construct were included. Pertinent patient variables were recorded including injury diagnosis, patient demographics, size of implants utilized, and surgical technique used. Through a thorough review of the medical chart and associated imaging, any injury to the superior gluteal artery was noted including operative notes, interventional radiology notes, progress and follow up appointments, any mention of superior gluteal artery injury including pseudoaneurysm and embolization was noted. All patients and imaging was verified by a fellowship-trained orthopaedic traumatologist.

RESULTS SECTION:

A total of 1,056 were identified with 511 patients having percutaneous instrumentation of the superior pubic ramus osseous fixation pathway. 3 of 511 (.59%) patients sustained a superior gluteal artery injury. The first patient was an 18 year old African American female who was involved in an auto pedestrian accident and had a BMI of 15.62 kg/m². The second was a 45 year old African American male involved in a motor vehicle collision with a BMI of 25.12 kg/m². The third was a 29 year old Caucasian female involved in a motorcycle accident with a BMI of 31.00 kg/m². Of the three confirmed patients, there were no significant similarities in terms of patient demographics considering age, gender, race, surgeon, or type of injury.

DISCUSSION: Percutaneous fixation of the superior pubic ramus is a commonly used technique for stabilizing pelvic ring injuries and the anterior column component of certain acetabular fracture patterns. Due to the percutaneous technique of implant insertion, advantages include a smaller incision, decreased soft tissue and clot disruption, less estimated blood loss, and is thought to have less complications compared to other traditional open approaches. As with any surgical intervention, the findings of this study demonstrate that antegrade superior ramus screw placement does carry a very small but potentially clinically meaningful risk of superior gluteal artery injury. We found that out of 511 patients who had percutaneous intramedullary screw placement into the superior pubic ramus osseous fixation pathway, three sustained a superior gluteal artery injury, putting the overall incidence at 0.59%. While this rate is notably small, the slight potential of this complication is clinically significant as there can be significant hemorrhage and the need for further care including emergent embolization. Most previous research on superior gluteal artery injuries have focused on the iliosacral or transiliac-transsacral screws, however this study demonstrates that surgeons should also consider the risk with antegrade superior ramus screw placement. Anatomically, the superior gluteal artery exits the pelvis through the greater sciatic foramen above the piriformis and traverses between the gluteus medius and minimus with varying muscular branches. The typical start site for an antegrade superior ramus screw is near the base of the gluteus medius pillar. There are several different techniques of percutaneous superior pubic ramus screw insertion. Even when utilizing the presumed soft tissue friendly initial Kirschner wire and cannulated drill technique as previously described, there is a potential to injure any surrounding soft tissue. Any initial errant placement of the wire into a more posterior or caudal location could place the SGA at risk. Additionally, there is a wide range of superior ramus osseous morphology that exists. Patients with a more curvilinear OFP may have the appropriate start site in a more caudal and posterior location. Even though the wire or drill is in the correct osseous location for that patient, it is by definition closer to the SGA and the inherent risk is increased. Further, similar to prior studies on SGA injury with iliosacral and transsacral screw placement, there is variability in SGA branching that could place the SGA at risk even with correct surgical technique.

In this study none of the three cases of superior gluteal artery injury shared any obvious demographic or injury specific similarities, suggesting that the recorded factors such as BMI, age, or mechanism of injury may be less important compared to the actual technical aspects of screw placement. This emphasizes the importance of careful preoperative planning, precise technique, and awareness of the vascular structures that could be at risk. Additionally, while routine postoperative checks are in place, having awareness of this possibility can lead to prompt treatment and correction.

SIGNIFICANCE/CLINICAL RELEVANCE: While rare, superior gluteal artery injury is still a possibility in percutaneous intramedullary stabilization utilizing the superior ramus osseous fixation pathway. Despite the low incidence rate, it is still important for surgeons to understand that this type of injury is possible. Careful surgical technique may minimize the incidence of injury. Further imaging and cadaveric studies may be useful to further define the relationship between the superior gluteal artery injury and the soft tissue path associated with the superior ramus screw insertion.