The Use of the Piriformis Fossa Radiographic Landmark to Predict In-Out-In Placement of the Posterosuperior Femoral Neck Screw

Alexandra Cancio-Bello, Nicolas Phillip Kuttner, Krystin Hidden[1], Timothy Maxwell Hoggard, Brandon J Yuan[1], John David Adams
[1]Mayo Clinic

INTRODUCTION: Despite being a common treatment of femoral neck fractures (FNF), cannulated screw fixation (CSF) is associated with a high incidence of cortical breach leading to the “in-out-in” (IOI) posterosuperior screw, with a recent clinical study demonstrating an incidence of 58% using postoperative CT scans. A subsequent small cadaveric study demonstrated that placement of the posterosuperior screw caudal to the radiographic landmark of the piriformis fossa (PF) may prevent IOI screw placement. The purpose of the study was to determine if the use of the radiographic landmark of the PF can be used to predict IOI placement diagnosed on post-operative CT scan.

METHODS: Three fellowship trained orthopedic trauma surgeons blindly and independently evaluated intraoperative AP fluoroscopic images of 104 patients treated with CSF of a FNF at a level I trauma center. Inclusion criteria included patients who were treated with CSF of a FNF and had a post-operative CT scan. Patients with fluoroscopic views demonstrating cortical breach, inadequate fluoroscopic views, or screws too central within the femoral neck (>1 screw diameter from the cortex) were excluded. Each surgeon reviewed AP fluoroscopic views and assigned patients to two groups: above the piriformis fossa (APF) and below the piriformis fossa (BPF). After grouping into APF or BPF, the incidence of IOI screw placement as previously identified on post-operative CT scan was compared. APF screws were considered to predict IOI placement, and BPF screws were considered safe. Accuracy, sensitivity, specificity, and interobserver reliability for the PF landmark prediction of posterosuperior IOI screws were assessed.

RESULTS:

A total of 73 patients were evaluated. In comparison to the CT results, the overall accuracy of responses was 90% (range 88-93%). In using the relation of the screw to the PF to predict IOI placement, the average sensitivity was 90% (range 84-93%) and specificity was 90% (range 83-93%). There was statistically almost perfect agreement among surgeons (κ = 0.83, range 0.75 to 0.91).

DISCUSSION AND CONCLUSION: The relationship of a screw relative to the radiographic margin of the PF on fluoroscopy to predict IOI placement appears to be highly sensitive and specific when compared to the gold standard of CT. Clinical studies using a technique that incorporates the use of the PF landmark are warranted to determine if IOI placement can be prevented by placing the posterosuperior screw caudal to the PF.