

**Femoral Neck Stress Fractures: Clinical Course and MRI Risk Factors for Progression***Clarence Steele, MD; Grant Cochran, MD; Christopher Renninger, MD;**Bradley Keith Deafenbaugh; Kevin M. Kuhn, MD**Navy Medical Center San Diego, San Diego, California, USA*

**Purpose:** Femoral neck stress fractures (FNSFs) are an uncommon overuse injury usually seen in military recruits and endurance athletes with potentially devastating consequences if not diagnosed and treated at an early stage. MRI has been established as the most sensitive study for diagnosis and surgical indications have been recommended based on MRI features. The goal of this study is to retrospectively review the clinical course of FNSFs using an MRI-based protocol. We sought to identify any radiographic or clinical risk factors for disease progression leading to operative management.

**Methods:** We identified all MRI scans used for FNSF screening from 2002 to 2015. Inclusion criteria included all nondisplaced FNSFs. Demographic data, radiographic data, symptom duration, fracture progression, surgical intervention, return to run time, and return to duty rate and time were recorded. Each MRI scan was evaluated for edema, fracture lines percentage, and hip effusion. Surgical indications were a compression-sided stress fracture involving >50% of the neck width or progression on serial MRI.

**Results:** 798 MRI scans were performed to screen for FNSF and 327 stress fractures were diagnosed meeting inclusion criteria. No patients sustained a displaced fracture after being diagnosed with an FNSF. Initial MRI showed edema with fracture line in 72% and isolated edema in 28%. The fracture line involved an average of 25% of the femoral neck width. 49 patients (15%) were indicated for surgery based on the first MRI. Interval MRI was performed in 73% of patients at an average of 6 weeks. No progression was seen in any patient whose initial MRI showed focal edema without fracture line (25%). There was progression of fracture requiring surgery in 27 remaining patients (9.7%). Those who had a hip effusion on initial MRI had 20 times (relative risk [RR] 20.3; 95% confidence interval [CI], 7.4-56.0;  $P < 0.0001$ ) the risk of progression to surgical fixation compared to those without a hip effusion.

**Conclusion:** The majority of FNSFs can be managed with strict weight-bearing restrictions and a gradual return to activity without risk of completion and displacement. There is a cohort of patients with minimal edema and no fracture line on the initial MRI who have reliable improvement with nonoperative treatment. Approximately 10% of patients with fracture lines will have progression of the fracture requiring surgical fixation. The presence of an effusion on the first MRI is strongly predictive of progression.