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Do All Femoral Neck Stress Fractures with Effusion on MRI Require Surgical Fixation?

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We commend Steele et al. on their publication. In their article, the authors recommend considering early prophylactic surgical intervention in patients with high-grade femoral neck stress injuries (FNSIs) with a macroscopic fracture line measuring less than 50% of the femoral neck width and an ipsilateral hip effusion at the time of initial screening MRI. We question this recommendation on the basis of contemporary research with a very similar military cohort [1].

Based on the results presented by Steele and colleagues, the presence of a hip effusion on MRI serves as a risk factor for fracture progression, resulting in the authors' recommendation for considering prophylactic surgical fixation when this finding is noted in association with a macroscopic fracture. However, the authors do not objectively define what constitutes a hip effusion on MRI, which, in our opinion, constitutes a major limitation of the study. Defining a hip effusion, or quantifying the volume of fluid present on MRI, is of paramount importance if it is to be considered a consistent and reproducible risk factor for fracture progression, as the authors imply. Defining an effusion volume or size cutoff that portends poor prognosis is of particular importance, in our opinion, considering that most, if not all, FNSIs present with some degree of excess joint fluid relative to the amount of hip joint fluid in age-matched

sedentary individuals. Furthermore, it is unclear why a hip effusion would only adversely affect progression of FNSIs with a macroscopic fracture and not those with isolated edema on MRI. This is especially true considering that isolated edema represents microtrabecular injury that can certainly progress to a macroscopic fracture.

We agree that serial clinical and radiographic evaluation of these injuries is important. However, interpretation of serial MRIs for FNSIs is challenging. Therefore, a thorough understanding of the normal healing process of FNSIs and how this healing appears on follow-up MRIs is critical. In our experience, progression of the fracture line by MRI without a concomitant description of the degree of bone marrow edema by MRI and of the radiographic appearance of the stress injury may result in an inaccurate assessment. The macroscopic fracture, or “dreaded black line” equivalent as evaluated on MRI, represents healing callus. In its early stage, this callus is immature, surrounded by abundant marrow edema, and prone to completion or progression without appropriate treatment. On serial imaging, and with appropriate conservative management, however, this macroscopic fracture represents mature callus, which can be confirmed by the presence of a thickened, sclerotic-appearing callus on radiographs. In our experience, this mature callus is less prone to progression, even if the macroscopic fracture line has increased in size from the initial MRI. Admittedly, distinguishing between immature and mature callus can be difficult. However, the severity and extent of adjacent bone marrow edema can serve as a helpful guide, with decreased adjacent marrow edema suggesting callus maturation regardless of the appearance of the fracture line. Unfortunately, the severity and extent of adjacent bone marrow edema were not reported in the present study, which represents a limitation in the assessment of FNSI progression that could be evaluated in future research.

FNSI progression from isolated bone marrow edema to a macroscopic fracture and progression of fracture line size have been observed in our practice. However, with appropriate conservative management, very few FNSIs with a macroscopic fracture line measuring less than 50% of the femoral neck width ever progressed to a higher grade stress injury. These findings were previously reported by Rohena-Quinquilla et al. [1] and defined as grade III FNSIs. In that large cohort study, none of the 41 grade III FNSIs progressed or required operative intervention, despite all having some degree of excess hip joint fluid. Furthermore, 66.7% of all patients with grade III FNSIs were able to complete Army Basic Training with appropriate nonoperative management. From the findings presented by Rohena-Quinquilla and colleagues, we believe FNSI progression is primarily related to patient noncompliance or delay in diagnosis, as opposed to ancillary imaging findings such as joint effusion, periosteal edema, or soft tissue edema.

We congratulate the authors for their contributions to this topic. While we have questioned the utility and definition of effusion as a risk factor, we would like to highlight that the authors noted no FNSIs with

macroscopic fracture isolated to the tension side of the femoral neck, which is consistent with the findings presented in recent studies using MRI for the diagnosis of FNSIs [1,2]. Despite being consistently listed as an operative indication, isolated tension-sided FNSIs are rare or nonexistent in the literature and, similar to the authors' opinion, we believe the majority of tension-sided FNSIs identified on MRI are in fact the sequelae of femoroacetabular impingement syndrome.

With respect to the compression-sided FNSI algorithm presented in the present study, our previous research and anecdotal experience calls into question the frequency of operative intervention required for grade III FNSIs as reported by Steele and colleagues. It is our opinion that when grade III FNSIs are appropriately diagnosed and managed, inherent mechanical stability allows for conservative, nonoperative management to be safely considered. Thus, recommending prophylactic fixation for grade III FNSIs based on the subjective parameter of a hip effusion by MRI raises substantial concerns, given that prophylactic fixation is invariably not benign and could affect military retention and disability ratings.

References

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