Rapid Sequence MRI versus CT Capsular Width Sign for Detection of Occult Femoral Neck Fractures Associated with Femoral Shaft Fractures

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Purpose: Ipsilateral occult femoral neck fractures (IFNFs) are an injury associated with high-energy femoral shaft fractures. The current "gold standard" for diagnosing IFNF is MRI with both the highest sensitivity and specificity. In 2020 the CT capsular sign was proposed as another modality to detect these fractures. The CT capsular sign involves measuring the hip capsule distention on an axial CT cut when viewed in a soft tissue window. A difference between the contralateral hip capsule and the injured side of 1 mm or greater was deemed positive for an association with IFNF. The aim of this study was to compare the efficacy of CT capsular width sign with a proven modality of rapid sequence MRI developed at UT Houston in diagnosing IFNF.

Methods: The electronic medical records were queried for patients with CPT codes 27506, 27235, and 27236. Of these patients, those aged greater than 18 years, with both a CT scan and MRI, were included. Patients with bilateral femoral shaft fractures or ipsilateral acetabulum/pelvis pathology were excluded. There were 217 patients who met all inclusion/exclusion criteria. Of those 217 patients, there were 21 patients with MRI positive for IFNF. The CT capsular sign was measured using the technique outlined by Park et al, the "side-to-side difference of capsular distension, which was the distance between the anterior capsular border and the tangential line drawn from the intertrochanteric crest—where the anterior hip capsule was attached—to the femoral head." A difference of greater than 1 mm is considered positive.

Results: Of the 21 MRI-positive for IFNF, only 7 had a positive CT capsular sign (33%). 14 patients had a falsely negative CT capsular sign (66.7%). Two patients with false negative signs had a capsule on the uninjured extremity at least 1 mm greater than on the injured extremity. In 1 patient, the MRI also identified subtle, occult inferior and superior pubic rami fractures.

Conclusion: When compared to rapid sequence MRI, the CT capsular sign demonstrated a high rate of false negatives. This leads to the concern that this sign is not a reliable method to diagnose IFNF, and may not be not be useful in isolation to guide operative treatment.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.