

Bone Scintigraphy can Predict Postoperative Femoral Head Avascular Necrosis in Children with Hip Trauma and Slipped Capital Femoral Epiphysis

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INTRODUCTION:

Femoral head avascular necrosis (AVN) is a devastating complication that can occur in the setting of trauma to the hip. Bone scintigraphy (BoS) can be used to evaluate femoral head perfusion, but current evidence in support of its use in the pediatric population is lacking. The purpose of this study was to evaluate the utility of BoS to predict AVN following surgical intervention for hip trauma and slipped capital femoral epiphysis (SCFE) in a pediatric population.

METHODS:

We performed a retrospective review of patients who underwent BoS to assess femoral head perfusion 6-12 weeks following treatment of traumatic femoral neck fracture, hip dislocation, or SCFE between 2009 and 2020 at a single pediatric tertiary referral center. Assessment of intraoperative femoral head perfusion was also recorded if performed. Results of BoS and intraoperative assessments were compared to radiographic findings of AVN at final follow up.

RESULTS:

Thirty-four patients (52 hips) (28 M, 6 F; age: 13.0±1.6 years; follow up: 21.0±16.2 months) were included. Radiographic AVN (RAVN) developed in 6 of 52 hips (12%). Seven hips (13%) had an abnormal BoS: 6 hips had absent perfusion and 1 hip had diminished perfusion. All 6 hips with absent perfusion went on to develop RAVN with collapse. The hip with diminished perfusion did not go on to femoral head collapse. No hip with normal BoS developed radiographic evidence of AVN at final follow up. Twenty-two hips (42%) underwent intraoperative perfusion assessment. Seventeen of 22 (77%) were evaluated with femoral head drilling with 3/17 indicating absent perfusion. Fourteen of 22 (64%) were evaluated with intraosseous pressure (IOP) monitoring with 2/14 indicating absent perfusion. Nine of 22 hips (41%) were evaluated with both techniques with concordant absent perfusion in 1/9 hips; this finding of absent perfusion was not noted on BoS and this hip did not develop RAVN. BoS demonstrating absent perfusion had a sensitivity of 100% and a specificity of 98% in predicting RAVN. Evidence of femoral head perfusion at the time of surgery (drilling or IOP) had a sensitivity of 17% and a specificity of 81% in predicting RAVN.

DISCUSSION AND CONCLUSION:

BoS demonstrates high sensitivity and specificity for predicting RAVN and femoral head collapse postoperatively in the setting of trauma and SCFE compared to intraoperative assessments. Clinicians should have increased suspicion for impending femoral head collapse if there is absent perfusion on BoS, even with evidence of preserved femoral head perfusion at the time of surgery.