Biopsy vs. MRI as the standard diagnostic tool for osteomyelitis in the diabetic patient, a retrospective analysis.

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BACKGROUND

• Osteomyelitis (OM) is a serious infection which is often difficult to diagnose and treat. It occurs as a consequence of hematogenous dissemination of bacteria, invasion from contiguous focus of infection or skin breakdown in patients with vascular insufficiency3.

• OM affects about two out of every 10,000 people. Staphylococcus aureus causes between 70% and 80% of osteomyelitis cases. Other frequent causes include Pseudomonas and Escherichia coli. Some infections involve multiple infectious agents4.

• The most common presenting signs and symptoms include pain, fever and chills. Laboratory values demonstrate an elevated sedimentation rate, C-reactive protein and leukocytosis. However, part of the difficulty in diagnosis lies in that osteomyelitis may present without systemic symptoms or abnormal laboratory values5.

• The current “gold standard” for diagnosis remains biopsy of the affected bone.

• Clinical diagnosis may be performed with the ‘probe to bone test’ which has an 87% sensitivity for diagnosis of OM and a negative predictive value of 98%6.

• Current treatments require both debridement of necrotic bone and prolonged administration of antibiotics for a minimum of 6-8 weeks. Certain oral therapies may be as effective as standard parenteral antibiotic therapy for chronic suppression of OM.

STUDY PURPOSE

• Current research has questioned the reliability of bone biopsy remaining as the gold standard for osteomyelitis.4

• Research has also begun to question the true definition of ‘bone biopsy’ as either being histopathological or microbiological5.

• Microbiological biopsy can have many false negatives due to current antibiotic administration, as well as false positives due to contamination6.

• MRI remains the best diagnostic imaging study for OM with a sensitivity ranging from 82-100% and specificity 75-95%. Additionally MRI provides useful information including extent of infection, associated abnormalities and surgical planning7,8.

• This study was designed to compare side-by-side data between diagnostic bone biopsy and our MRI findings.

RESULTS

• There were a total of 55 positive interpretations MRI’s of the ankle and foot for osteomyelitis during the two year period. Of these 55 studies only 23 had correlative bone biopsies.

• A total of 23 patients met the criteria for our study. There were 13 males and 10 female patients. The age ranges were from 39-76.

• Of the 23 positive interpretations on MRI for osteomyelitis 18 had correlative positive bone biopsy results while the 5 remaining patients had negative biopsies. The positive predictive value of MRI for osteomyelitis in our included criteria was 78.3%.

MATERIALS AND METHODS

• Inclusion criteria was any patient with high suspicion for osteomyelitis of the foot or ankle over a two year period (Jan 01, 2011 – Dec 31,2012) with both a bone biopsy and a positive MRI performed at our institution.

• Bone biopsies which were included consisted of both histological and microbiological specimens. They were obtained via surgical debridement or bedside biopsy utilizing a Jamshidi bone marrow biopsy kit.

• biopsy results were obtained from the St. Barnabas Hospital electronic medical record system (EMR).

• All MRI scans were performed at St Barnabas Hospital using our Siemens Magnetom Symphony (maestro class) 1.5 T. The sequences obtained were T1 Axial, T1 Sagittal, T2 Axial FS, T2 Axial, Stir Coronal and Proton Density sequences in all three planes.

• Contrast was not used in these patients secondary to hospital protocol and high patient population of renal disease.

• MRI diagnosis consisted of high marrow signal in bone on fluid sensitive sequences with correlative low T1 signal to increase specificity (when applicable).

• Diagnosing osteomyelitis in a diabetic patient can be very challenging given that they may have extensive marrow edema and even enhancement due to neuropathic arthropathy. The presence of soft tissue abscess or ulcers is used heavily at our institution to help lead to a correct diagnosis. This in addition to a strong clinical history enables a correct diagnosis of osteomyelitis to be made.

• Statistical analysis was performed to compare positive and negative findings between 1) MRI 2) Histological biopsy 3) Microbiological biopsy.

CONCLUSIONS

• Despite our small sample size we have tried to prove that MRI in the appropriate clinical setting may be relied on and can lead to fewer invasive bone biopsies. This can allow for prompt treatment and possibly fewer complications by reducing exposure to invasive procedures.

• Bone biopsy however should remain in the overall clinical diagnostic plan including laboratory values for osteomyelitis particularly in patients who have contraindications to MRI.

• Given our small sample size, further research is needed to evaluate if radiological imaging can possibly negate the need for invasive biopsy techniques when referring physicians are concerned about osteomyelitis.

REFERENCES


