The 5 hour Bone Biopsy

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Purpose:
Bone biopsy is considered the gold standard for diagnosis of osteomyelitis (1,2). The standard histology procedure for evaluating an intra-operative bone specimen requires decalcifying the bone sample for up to 3-4 days. Therapeutic decisions such as duration of antibiotic therapy, level of amputation, course of treatment and timing of wound closure are often made based on the bone biopsy results (1). We propose a technique that will allow 5 hour histology analysis of intra-operative osseous samples with equivalent diagnostic results. This technique has the potential to cut down on hospital stay, patient satisfaction and improved treatment times.

Methods
An IRB approval was obtained for animal and human testing of this technique. This technique was utilized on Ten bovine femur bone samples and presented to a pathologist for analysis. The study then transitioned to human trials. Qualifying subjects were those who were already consented for surgical debridement of known osteomyelitis. There was no exclusion criteria, but each candidate was additionally consented for faster one day technique. Two Podiatric Surgeons were consented for performing this procedure and consenting patients for this study.

8 proximal margins were processed for this study. Each proximal margin obtained would be divided into 2 equal portions, one portion to be sent for standard decalcification technique and the second to be sent for the faster one day technique. A blinded pathologist would then read each sample and state if the sample was adequate for analysis, and whether the bone displayed osteomyelitis or no osteomyelitis.

Results
The rapid frozen section technique has yielded preparation time of approximately 5 hours vs. the approximate 3-4 days standard technique in both animal and human testing. (10/10) 100% of animal samples were deemed adequate for analysis by the pathologist. (8/8) 100% of human proximal margin bone were processed by this new technique and assessed as adequate for histopathology analysis. 6 proximal margins were negative for osteomyelitis and 2 were positive. 100% correlation between our new technique and the standard decalcification technique in diagnosing osteomyelitis.

Discussion:
Through pre-formatting the bone in the pathology lab, adjusting to relatively inexpensive tungsten carbide blades, pre-chilling the microtome to -35°C and decalcifying for a small amount of time we were able to achieve approximately 5 hour bone biopsy results with equal reliability. Animal testing for microscopic quality, human testing for microscopic quality and human testing for disease prediction have all validated this technique with 100% accuracy. This technique potentially may lead to decreased patient hospital stay with prompt antibiotic treatment. PubMed search was performed and no other study to date have described this faster one day technique. Accurately diagnosing osteomyelitis can be challenging, definite osteomyelitis requires both histological findings of osteomyelitis as well as clinical, laboratory and imaging findings (3,4). Current evidence still in favor of bone biopsy as the as the best available diagnostic technique, therefore decreasing the length of time it takes for bone biopsy results with the faster one day technique has the potential to improve the level of care patients receive.

References:

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