Utilization of ultrasonic frequencies (Sonication) and Target Enriched Multiplex Polymerase-Chain Reaction (TEM-PCR) in identifying elusive Prosthetic Joint Infections (PJI)

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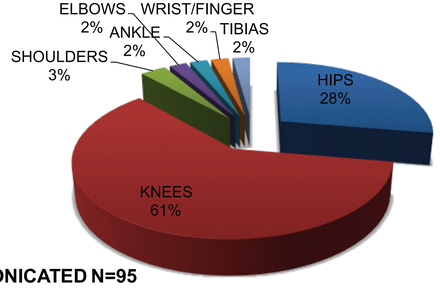
Introduction

PJIs persist as an elusive complication in joint replacements demanding accuracy in identification of organisms for proper management of infections.



EXPLANTS SONICATED N=95

Figure 1

Methods

A retrospective chart review was conducted on 95 patients (Figure 1) admitted with PJIs or infected orthopedic hardware. Data collected included demographics, hardware/joint sonication, tissue samples, and a multiplex molecular testing panel (TEM-PCR) that detects 16 different bacterial targets and 7 drug resistant genes.

Introduction

The combination of 56 knees, 26 hips, 3 tibia nails, 2 ankles, 4 shoulders, 2 elbows, and 2 wrists PJI were reviewed. Mean age of 62 (21-89) and 62% were female.

Measured labs in 56% of patients showed mean ESR 30.26 (0 to >80), CRP 4.36 (<0.1 to 46) and WBC 9.45 (2-22). Sonication was performed in 100% of patients while TEM-PCR and tissue cultures were performed in 76% and 65% of patients, respectively.

Previously undetected organisms from joints fluid were identified in 46% sonications, 44% TEM-PCR, and 31% tissue cultures. Correlation of positive results between sonication and TEM-PCR equaled 35%, negative sonication/positive TEM-PCR 10%, and negative sonication/ positive tissue cultures 20%.

Most common organisms detected with sonication were: Staphylococcus epidermidis (36%), Staphylococcus aureus (17%), and Enterococcus faecalis (11%).

Mean Lab Values

ESR 30.26 (0 to > 80)	CRP 4.36 (<0.1 to 46)	WBC 9.45 (2 to 22)

Figure 2

Common Organisms Identified

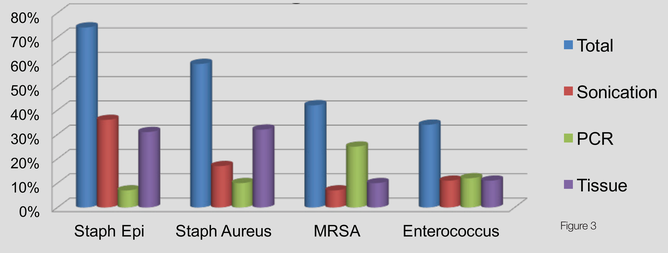


Figure 3

Comparatively, TEM-PCR detected Methicillin-resistant Staphylococcus aureus (MRSA) (25%), Escherichia coli (13%), and Enterococcus faecalis (12%), while tissue cultures produced Staphylococcus aureus (32%), Staphylococcus epidermidis (31%), and Enterococcus faecalis (7%). There was co-detection of 2 or more bacterial targets on TEM-PCR, most common being Staphylococcus epidermidis and Enterococcus faecalis (7%). TEM-PCR was the only method to identify Escherichia coli in 13% of patients. Sonication culture and TEM-PCR combined detected organisms in 51% of patients while sonication and tissue cultures had positive cultures in 45%. Combining all methods detected organisms in 54% of patients.

Conclusions

Sonication and TEM-PCR demonstrated value in identifying elusive organisms as compared to standard methods. Further studies are necessary to assess the practicality of sonication and TEM-PCR for identifying PJIs.

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