

Sonication Has the Potential to Improve Culture Yield in Patients with Clinical Infection

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Purpose: The number of patients with orthopaedic infections is rising with increased number of surgeries performed. Most infections involving orthopaedic implants result in the formation of a biofilm on the implant; organisms living in the biofilm are difficult to collect for laboratory analysis because they are adhered to the implant. Sonication dislodges bacteria from metal surfaces using low-frequency ultrasound, allowing for better culture yield. While arthroplasty explants are routinely sonicated, the sonication results of trauma explants are not known.

Methods: In an IRB-accepted retrospective review, all patients who had surgical explantation of an orthopaedic trauma device (plates, screws, nails) from August 2010 to July 2013 were included in the study. External fixators and other implants that intentionally extended through the skin were excluded. A detailed review of the electronic medical record was performed to note the indication for explantation as well as preoperative clinical and laboratory features to diagnose infection. Postoperative results of tissue culture and sonicate fluid were studied. Infected patients without routine cultures were excluded. Patients with intraoperative features of infection were also considered "infected." Clinical evidence of infection was considered the "gold standard."

Results: A total of 146 orthopaedic trauma-related devices (plates = 60, screws = 48, nails = 29, nail screws = 6, other = 3) explanted in the study period were sonicated. 32 of 146 (22%) were from clinically infected patients. 30 of these (94%) had a positive culture and 2 (6%) had a negative culture. In one clinically infected patient with a negative culture, sonication was able to detect presence of a specific organism in low yield. In another patient, with a positive culture, sonication was able to detect an additional organism. Overall, if explanted orthopaedic devices in patients with known clinical infection were to be subjected to sonication only and not cultured, a positive microbiological yield with sonication would be 29/32 (91%) (including counts less than 20 colony forming units) as opposed to 30/32 (94%), a difference not statistically significant (Table 1). Sonication had a high sensitivity 29/32 (91%; 95% confidence interval [CI]: 75%-98%) but low specificity 72/114 (63%; 95% CI: 54%-72%) for clinical infection (Table 2). Some patients without infection did not get routine cultures; however, among those who were cultured, sensitivity and specificity of culture to detect infection were 94% and 88%, respectively

Sonication	Culture		Total
	Positive	Negative	
Positive	28	1	29
Negative	2	1	3
Total	30	2	32

Table 1. Culture Versus Sonication Results in Clinically Infected Patients (N = 32)

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off label" use). For full information, refer to page 600.

Sonication	Clinical Infection		Total
	Positive	Negative	
Positive	29	42	71
Negative	3	72	75
Trauma	32	114	146

Table 2. Clinical Infection Versus Sonication Results in All Patients (N = 146)

Conclusion: In clinically suspected cases with infection, combined sonication and culture appears to increase the ability to detect biofilm forming organisms. Appropriate antibiotic therapy specific to those organisms can then be initiated. Further studies with larger sample size would be beneficial.