

Sonication of retrieved implants improves sensitivity in the diagnosis of periprosthetic joint infection, Bellova, et. al. *BMC Musculoskelet Disord*, 20, 623 (2019)

Level of Evidence: 3

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Total ankle arthroplasty/replacement (TAR) is an increasingly prevalent treatment for end-stage ankle arthritis. As with any total joint replacement, a major concern is deep periprosthetic joint infection (PJI). When dealing with these cases, tissue culturing has been the gold standard for detection of the causative pathogens, though this approach is characterized by a high rate of false negatives. Sonication of explants is a tool which has been shown to disrupt biofilms, thus yielding a greater number of microorganisms available for culture. This increase in organisms allows for the administration of more specific antibiotic therapy. The goal of this study was to determine the sensitivity and specificity of sonicate fluid culture (SFC) compared with periprosthetic tissue culture (PTC), using the European Bone and Joint Infection Society (EBJIS) criteria as reference standard.

This retrospective study reviewed data of explanted/retrieved joint prostheses from March 2017 to April 2018. During this period, 257 implants were submitted for sonication. Inclusion criteria included availability of sonicate fluid culture. Exclusion criteria included lack of corresponding tissue culture samples (at least 1 necessary for inclusion) and retrieval of any hardware other than prostheses or prostheses components. Retrieved data included demographic data, surgery performed (type and date), clinical information (presence of sinus tract or pus), microbiological findings and histopathological findings. Based on criteria definition, these cases were divided into PJI or aseptic failure. Microbiological data reviewed included: intraoperative tissue sampling of tissue most suspicious for infection, sonication fluid from explants, and synovial fluid culture of preoperative joint aspiration. Periprosthetic membrane histopathological examination was also performed.

Of the total 257 implants submitted for sonicate fluid analysis, 145 and 112 cases were defined as infected and aseptic, respectively. Between the PJI and aseptic failure groups, the demographics were not significantly different. Among the 145 cases defined as PJI, 100 were accurately detected by SFC, with 45 being missed. Among the 112 cases defined as aseptic failures, 101 were accurately detected as negative, with eleven falsely positive. This accounted for a sensitivity of 69% and specificity of 90.2% for the SFC. In comparison, traditional PTC was found to have a sensitivity of 62.8% and specificity of 92.9%, with the difference between SFC and PTC sensitivity being statistically significant. When used in conjunction, the combined sensitivity and specificity of SFC and PTC was 76.6% and 83.3%, respectively.

Diagnosis of PJI is often challenging due to the existence of a biofilm around the implants. The theory behind sonication of explanted hardware is that the process of applying low-frequency ultrasound allows for the dislodging of pathogens from the surface of the implant while still preserving their viability for culturing. This presented study suggests the potential benefit of utilizing this technique for increasing the accuracy of PJI organism characterization. The authors concluded that SFC has better sensitivity than traditional PTC based on the EBJIS criteria, though this was not shown to be the case when using the International Consensus Meeting on Periprosthetic Joint Infection (ICM) criteria. The sensitivity between the two methods was also found to be similar based on both reference standards. Based on these findings, as well as the understanding of the difficulties associated with these cases, it is reasonable to recommend sonication if explantation of the components is performed and the sonication test is available to the provider. Sonication fluid culture is simply an additional data point which can be used, and in these difficult cases of PJI where a patient's limb is potentially at risk, every additional data point matters.



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