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Difficulties, differences and discrepancies of sonication fluid and tissue cultures for microbiological diagnosis of orthopaedic implant-associated infections

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Objective: Sonication of removed implants using low-frequency ultrasound (35-40 kHz) has been shown to improve the microbiological diagnosis of implant related infections especially periposthetic joint ones. The purpose of this work was to underline the difficulties of the sonication method performed for the diagnosis of orthopaedic implant infections and to study the differences and discrepancies with the conventional tissue cutlures respective results.

Methods: From 9/2012-10/2013 we prospectively investigated patients undergoing removal of orthopaedic implant because of prosthetic joint infection (PJI) or aseptic failure (AF). The explanted implants were placed in sterile containers, sonicated and the resulting sonication fluid (SF) was cultured, all according to the Trampuz's method (NEJM 2007). Additionally, five subcultures of every distinct isolate that failed to be identified by the automated system, were performed on blood agar plates, followed by identification and susceptibility testing. The periimplant tissue (PT) specimens (>=5 per patient) were cultured following the usual laboratory practice. The identification and the susceptibility testing were performed by the VITEK 2 and the API system (BIOMERIEUX) when it was necessary. The statistical analysis was realized using the SPSS 16 software package.

Results: We included 98 patients undergoing removal of hip (n=38) and knee (n=44) prosthesis and internal fixation (n=16) implant. In 4 out of 98 patients PT cultures were performed only because their prostheses' size was too big for being placed in the container, so the explanted components were not sonicated. On the other hand the PT culture results were interpreted as contamination in 5 out of 98 patients. 14,3% of the SF recovered isolates unidentified or identified preliminary different to those of the respective PT cultures, were finally identified similar after their subcultures on blood agar plates (difficulties). SF cultures revealed: a) more polymicrobial infections (n=6) than PT cultures (n=2), b) resistance heterogeneity populations of n=6 patients' *Staphylococcus* spp isolates which were not recognized in the PT cultures and c) coagulase negarive staphylococcus more resistant profile of the SF cultures than that of the PT cultures. The sensitivity of the ST cultures was greater than of the respective PT cultures and this difference was statistically significant (p<0,001). Also, Coagulase Negative *Staphylococcus* species level discrepancies (n=12) between the SF and PT cultures were observed.

Conclusion: Despite of the difficulties and the discrepancies observed, the implementation of sonication method to explanted orthopaedic implants reveals greater sencitivity, more mixed infections, heterogeneity population of prosthesis' biofilm *Staphylococcus* species and more resistant strains which were not recognized in the PT cultures. Unrecognized and untreated orthopaedic implant associated infections with resistant strains may explain therapeutic failures. The sonication method may contribute to avoid these therapeutic failures.