Is prolonged 14-days incubation really necessary for accurate diagnosis of implant-associated infection?

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Introduction

Implant-associated infections represent significant burden in ageing population. Accurate detection, identification and susceptibility testing is of utmost importance for successful treatment.

Sonication of explanted foreign material with subsequent sonicate-fluid culture is regarded superior to conventional tissue culture. Nonetheless, optimal culture incubation time remains controversial[1-2]. *Propionibacterium acnes* proves to be especially challenging for detection. Recognizing its infectious or contaminating origin is especially difficult, therefor a standardized method with increased sensitivity is needed.

The aim of our study was to evaluate diagnostic yield of prolonged 14-days incubation versus more conventional 7-days incubation.

Methods

Consecutive sonicate-fluid cultures from a 3.5-years period (02/2013-09/2016) were retrospectively analysed. 100 µL of sonicate-fluid was inoculated on blood agar, chocolate agar, Schaedler agar, thioglycolate broth (TIO), aerobic and anaerobic blood culture bottles (AeBC, AnBC). They were cultured for 14-days and inspected for growth on day 1, 2, 7 and 14. Terminal subculture from TIO, AeBC and AnBC was performed on day 7 for additional 7 days of aerobical and anaerobical cultivation. Time to positivity was recorded. All microorganisms were identificated by MALDI-TOF (Brucker). Microbiological significance was determined based on (i) **isolate quantity**, (ii) **number of positive culture media** and (iii) **growth of same isolate in concomitant conventional tissue cultures**. If at least one of them was presented, it was considered microbiologically significant.

Results

A total of 1007 sonicate-fluid cultures from 778 patients (2-96 years, mean age 62) were analysed. 51.5% (n=519) of cultures were from male patients, 48,5% from women. 81.8% (n=824) were from orthopaedic implants (i.e. prosthetic joints and osteosynthetic material), 11.2% (n=113) from cardiovascular implants (i.e. vascular grafts, heart valves, pacemakers) and 7.0% (n=70) from other foreign material (breast implants, surgical material). In total, 59.5% (n=599) of cul tures were positive. Among them, 69.6% (n=417) were mono-microbial, 22.7% (n=136) bi-microbial and 7.7% (n=46) poly-microbial. 854 bacterial or fungal isolates were identified. The most frequent isolates were coagulase-negative staphylococci (CoNS) 37.1% (n=317), *Staphylococcus aureus* 16.6% (n=142) and *Propionibacterium acnes* 13.7% (n=117). Gram-negative bacteria and other anaerobes except *P. acnes* represented 13.0% (n=111) and 6.3% (n=54) of isolates, respectively. Among positive sonicate-fluid cultures, 95.2% (n=570) were positive within 7 days and 4.8% (n=29) were positive after prolonged 14-days incubation. *P. acnes* is being the predominant isolate in that group with 72.4% (n=21), remaining are otherwise fast growing bacteria 27.6% (n=8).

Table 1: Ratio of *P.acnes* isolates after 7 and 14 days incubation and ratio of diagnostic isolates.

	n	ratio (%)	diagnostic (n)	diagnostic (%)
P.acnes isolates	117	100	67	57,3
positive after 7 days	86	73,5	60	69,8
positive after 14 days	31	26,5	7	22,6

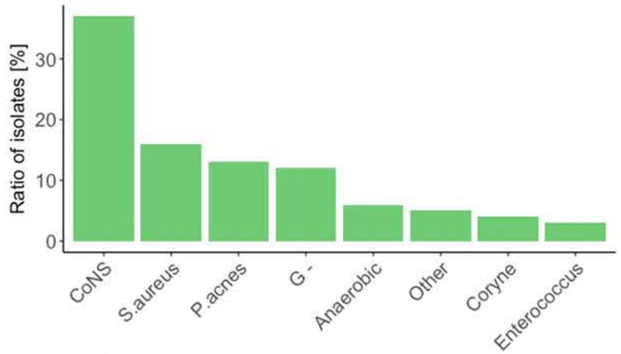

Figure 1: Frequency of identified isolates in sonicate-fluid cultures. CoNS (Coagulase negative *Staphylococcus*), G- (Gram-negative bacteria), Coryne (*Corynebacterium* spp.)

Conclusions

Prolonged 14-days incubation of sonicate-fluid culture for the diagnosis of implant-associated infections offers only minor <5% gain in detection of bacteria with regard to conventional 7-days incubation. Furthermore, majority of isolates after prolonged incubation are non-diagnostic. Caution in an interpretation of significance of P. acnes isolated after 14-days incubation is warranted.

References

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