When Do Cultures First Turn Positive in Patients with Periprosthetic Joint Infection?

Saad Tarabichi[1], Graham S Goh, Luigi Zanna, Qudratullah Qadiri[2], Colin Baker, Mustafa Citak, Javad Parvizi[1]
[1]Rothman Orthopaedic Institute, [2]Rothman Institute

INTRODUCTION:

Despite its well-established limitations, culture remains the gold standard for microbial identification in periprosthetic joint infection (PJI). However, there are still no benchmarks for the time-to-positivity (TTP) on culture for specific microorganisms. This study aimed to establish normative TTP data for pathogens commonly encountered in PJI.

METHODS:

This retrospective multicenter study reviewed prospectively maintained institutional PJI databases in order to identify patients who underwent hip or knee revision arthroplasty from 2017 to 2021 at two tertiary centers in the United States and Germany. Only patients who met the 2018 International Consensus Meeting (ICM) criteria for PJI were included in the study. TTP on culture media was recorded for each sample taken intraoperatively. Median TTP among different microbial species and different specimen types were compared.

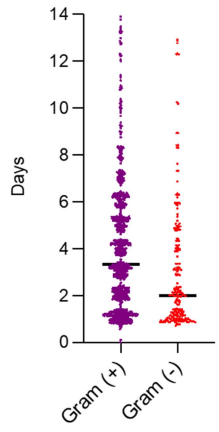
RESULTS:

A total of 526 ICM-positive patients were included. The mean number of positive cultures per patient was 3.9 ± 2.6. Gram-negative organisms (TTP 1.99 days [1.1; 4.1], n=225) grew significantly faster on culture than their gram-positive counterparts (TTP 3.33 days [1.9; 5.8], n=1,774)(p<0.001) (Figure 1). *Methicillin-resistant staphylococcus aureus* (TTP 1.42 days [1.0; 2.8]), n=85) demonstrated the fastest TTP, followed by *gram-negative rods* (TTP 1.92 days [1.0; 3.9], n=163), *methicillin-sensitive staphylococcus aureus* (1.95 days [1.1; 3.3], n=393), *streptococcus spp.* (TTP 2.92 days [1.2; 4.3]), n=230), *staphylococcus epidermidis* (TTP 4.22 days [2.8; 5.5], n=555), *candida species* (TTP 6.13 days [3.6; 11], n=37), and *cutibacterium acnes* (TTP 6.97 days [5.9; 8.2], n=197)(p<0.001) (Figure 2). When evaluating median TTP based on the type of specimen, synovial fluid (TTP 1.97 days [1.1; 3.1], n=109) exhibited the shortest TTP, followed by soft tissue (TTP 3.17 days [1.4; 5.3], n=1,175) and bone (TTP 4.15 days [2.3; 5.9]), n=778)(p<0.001) (Figure 3).

DISCUSSION AND CONCLUSION:

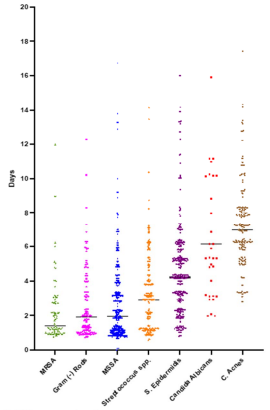
To our knowledge, this is the first study to provide normative data on the TTP of common microorganisms that are known to cause PJI. Nonetheless, additional studies with larger cohorts are needed to validate these benchmarks.

Figure 1. Scatter plot of time-to-positivity by organism gram-stain



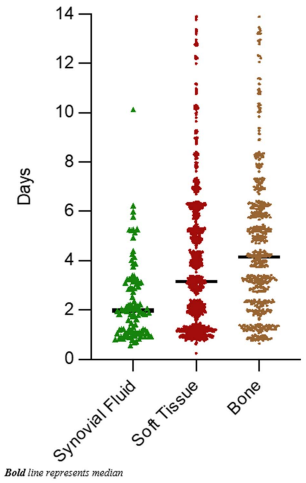
***Bold** line represents median*
Gram (+), gram-positive organisms; Gram (-), gram-negative organisms

Figure 2. Scatter plot of time-to-positivity by microorganism type



***Bold** line represent median.*
MRSA, methicillin-resistant staphylococcus aureus; Gram (-) Rods, gram-negative rods; MSSA, methicillin-sensitive staphylococcus aureus; S. Epi, staphylococcus epidermidis; C. Acnes, cutibacterium acnes

Figure 3. Scatter plot of time-to-positivity by specimen type



***Bold** line represents median*