The Impact of Specimen Transport Time on Synovial Fluid Culture is Minimal

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INTRODUCTION: There has been ongoing concern in the field of arthroplasty that synovial fluid transport delays may reduce the likelihood of pathogen growth in laboratory culture. However, synovial fluid samples collected in the office, and sometimes in a hospital setting, often require transport to a third-party central or specialty laboratory, causing delays in the initiation of culture incubation. The purpose of this study is to evaluate the impact of transportation delay on 1) The culture positive rate of submitted synovial fluid samples and 2) the observed organism proportions of culture positive synovial fluid samples.

METHODS:

A retrospective review of one clinical laboratory's testing results from 2015-2021 was conducted. A total of 147,246 synovial fluid samples from knee and hip arthroplasties, from 2,932 different US institutions, were submitted for laboratory testing including synovial fluid culture (blood culture bottles). Transport time was calculated as days from the sample aspiration date to synovial fluid testing date, and this study included samples with a transport time of 1 to 6 days. The overall culture positivity and the proportion of major organism genera was evaluated as a function of transportation time.

RESULTS: The laboratory received 72.2% (N=106,346) of samples within 1 day after aspiration. The number of samples received from days 2 to 6 after aspiration decreased in an exponential trend to a low of 0.4% (N=636) of samples being received on day 6 after aspiration. Samples with 2 to 3 days of transport had a marginally higher mean rate of culture positivity than day 1 samples with an overall difference of 1.5% (14.3% vs. 12.8%; $p<0.0001$). Samples with a transport time of 5 or 6 days had a mean culture positivity that was not different than that observed among day 1 samples (12.6% vs. 12.8%; $p=0.75$). Analysis of the top 7 organism genera as a function of transport days revealed minimal proportional changes over 6 days (Figure 1).

DISCUSSION AND CONCLUSION: Synovial fluid culture exhibited reasonably consistent positivity and organism profiles for at least 1 to 6 days of transport time to the destination laboratory, with differences that appear to have minimal clinical importance. While the authors of this study advocate for short transport times as a best practice to expedite diagnosis, it appears that concern regarding the degradation of culture results due to synovial fluid transportation are unwarranted.

Figure 1