Next Generation Sequencing Test for Diagnosing Periprosthetic Joint Infection Is Not Affected by Premature Therapeutic Antibiotic Administration

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INTRODUCTION:

Premature administration of antibiotics prior to the collection of diagnostic samples for periprosthetic joint infection (PJI) can adversely affect the accuracy of conventional tests, particularly culture results. As cultures can often yield false negatives due to antibiotic interference, there is a pressing need for more reliable diagnostic methods. Next generation sequencing (NGS) has shown promising results when cultures failed to detect the infecting organism. This study evaluates the impact of premature antibiotic use on the results of various diagnostic tests; serum erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), synovial WBC count and PMN%, synovial culture, and NGS in diagnosing PJI.

METHODS:

A retrospective analysis of 132 patients who underwent revision hip or knee arthroplasty due to MSIS confirmed PJI. All patients underwent synovial NGS testing for detecting the infecting organism in addition to serum ESR and CRP, synovial WBC and PMN% and synovial cultures. Among the patients, 46% received antibiotic therapy before the diagnostic workup, while the rest did not. The patients were categorized into two groups depending on whether or not they received antibiotics, and the sensitivity of the mentioned diagnostic tests were compared. RESULTS:

Patients in the antibiotic group had lower median in serum ESR (87 vs 62 mm/hr; p = 0.007), CRP (17.8 vs 11.2 mg/L; p=0.0042) synovial WBC (48,252 vs 8,788; p=0.002) and PMN% (95% vs 84.2%; p=0.004). Administration of antibiotics negatively impacted the sensitivity of all the diagnostic tests ESR (75.2% vs 91.5% [relative risk (RR) for false-negative results, 2.4; p = 0.04]), CRP (65.4% vs 82.5% [RR, 2.1; p = 0.03]), synovial WBC (70.2% vs 94.4% [RR, 5.2; p = 0.001]), PMN% (75.8% vs 93.5% [RR, 3.4; p = 0.01]). The rate of negative cultures were higher in the antibiotics group at 36.0% compared to the no-antibiotics group at 18.3% (p = 0.029). NGS was overall significantly more sensitive than cultures 96.2% vs. 73.5% [RR, 5.3; p = 0.001]. Administration of antibiotics did not impact the NGS results 95.1% in the antibiotic group vs 97.2%.

DISCUSSION AND CONCLUSION:

Premature administration of antibiotics can compromise the accuracy of conventional diagnostic tests for PJI, often resulting in a higher rate of false-negative results. Despite this challenge, NGS maintains its diagnostic reliability, even when antibiotics are administered prior to testing. Our findings indicate that NGS offers a robust alternative for diagnosing periprosthetic joint infections, ensuring dependable results. Moreover, we strongly urge the orthopedic community against the premature administration of antibiotics prior to diagnostic workups. This practice does not improve the care of these patients and stands to interfere with timely diagnosis.