

Reinfection or Persistence of Periprosthetic Joint Infection? Next Generation Sequencing Reveals New Findings

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Introduction: Surgical management of PJI remains challenging with patients failing treatment despite our best efforts. An important question is whether these later failures reflect reinfection or the persistence of infection. Proponents of reinfection believe hosts are vulnerable to developing infection and new organisms emerge. The alternative hypothesis is that later failure is a result of an organism that was present but had not been given the chance to become a pathogen or was under antibiotic pressure and then turned into a pathogen. This multicenter study explores the second theory. Utilizing next-generation sequencing (NGS), we hypothesize that failures are often the result of an organism present at the time of initial surgery.

Methods: This prospective study involving 15 institutions collected samples from 635 revision total hip (n=310) and knee (n=325) arthroplasties. Synovial fluid, tissue and swabs were obtained intraoperatively for NGS analysis. Patients were classified per 2018 Consensus definition of PJI. Treatment failure was defined as reoperation for infection that yielded positive cultures during minimum 1-year follow-up. Concordance of the infecting pathogen cultured at failure with NGS analysis at initial revision was determined.

Results: Among the total cohort, 203 revisions were considered infected and 432 were aseptic (based on ICM-criteria). Of the infected cases, 157 were NGS-positive and 46 NGS-negative. Twenty-nine ICM-positive patients (29/157; 18.5%) failed by reoperation with an organism confirmed on culture. In 23 of these (23/29; 79.3%), the organism at failure was present on NGS at initial revision. The remaining 6 cases detected discordant organisms between initial NGS and culture at failure. Of the 432 ICM-negative patients, NGS identified microbes in 48.1% (208/432) of “aseptic” revisions, and 17 of these failed. Thirteen of the 17 failures (76.5%) were due to an organism previously detected by NGS at initial revision.

Conclusions: Our collaborative findings suggest that most failures (~79.3%) by infection recurrence could be attributed to an organism previously detected by NGS at index revision surgery.