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CORR Insights

CORR Insights®: Synovial Cytokines and the MSIS Criteria Are Not Useful for Determining Infection Resolution After Periprosthetic Joint Infection Explantation

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Where Are We Now?

Identifying persistent infection in patients with hip or knee arthroplasty infection who are undergoing treatment with two-stage exchange is often difficult [1, 7]. Providers currently use clinical and follow up systemic inflammatory markers as a surrogate for periprosthetic joint infection (PJI) eradication. Satisfactory wound healing after resection arthroplasty (Stage 1) is often used as a clinical surrogate. A decrease in an elevated systemic C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) have also been advocated as being predictive of PJI eradication [3]. But in a study by Kusuma and colleagues [4], the ESR remained persistently elevated in 54% and CRP in 21% of patients with TKA infection despite documented eradication of infection based on preestablished microbiologic and histopathologic criteria. The lack of a decrease in systemic inflammatory markers is often due to noninfectious etiologies or to a normal variation rather than the persistence of PJI. This often leads to unnecessary extension of antimicrobial therapy or additional surgical débridements. Nuclear scans often remain positive for up to 1 year after treatment and are not useful in documenting sepsis arrest. Due to the limitations of systemic inflammatory markers and imaging studies, many investigators have advocated repeat diagnostic joint aspiration for cell count and culture prior to reimplantation surgery. The sensitivity of culture in this setting is very low and is often associated with a high contamination rate [5].

In the current study by Frangiamore et al., the investigators compared synovial fluid cytokines levels prior to explantation (Stage 1) and prior to reimplantation (Stage 2). Two

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markers, interleukin (IL)1β and IL-6 showed the greatest decrease in levels between stages. All tested synovial fluid markers including (IL)1β and IL-6 and the Musculoskeletal Infection Society criteria applied prior to reimplantation were associated with a low accuracy in predicting persistent PJI.

Where Do We Need To Go?

Assessing sepsis arrest as a predictor for failure prior to reimplantation surgery (Stage 2) addresses only one piece of this puzzle. The microbiology of confirmed failures prior to reimplantation in patients treated with two stage exchange is often due to a different organism as often failures are due to reinfection rather than a relapse with the same organism. Reinfection is likely acquired at the time of resection or shortly after as surgical therapy is a risk for reinfection. Failure of medical and surgical therapy for PJI is often the result of lack of adequate bone and soft tissue healing, and the presence of important comorbidities. It seems to me that future approaches will call for a more comprehensive approach to assessing the local wound environment, healing potential and relevant comorbidities Likewise, it seems important to develop rapid diagnostic microbiologic techniques that can be performed at the time of reimplantation surgery. Unfortunately, such tools are not now in wide use [2, 6].

How Do We Get There?

Application of novel clinical metagenomic techniques to specimens obtained at the time of initial surgery (Stage 1) and the time of reimplantation (Stage 2) may offer the ability to identify the exact ecology of the wound and to document persistence of infection or the risk of development of a new infection [9]. One hopes that rapid microbiologic diagnostics performed during the time of reimplantation such as polymerase chain reaction technology and standardized objective approach of frozen histopathology specimens will aid orthopaedic surgeons in making better real-time decisions at the time of final reimplantation. These developments along with formal assessments of bone and wound healing potential will lead to the development of clinical predication models and ultimately be used to define surgical strategies prior to and during reimplantation including the use of smart prosthetic joints [8]. These implants are imbedded with micro sensors that might detect early infection well before the development of clinical signs and symptoms.

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