HK26: What is the Optimal Duration for Holding Cultures in Patients who have prosthetic joint infections?

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Response/Recommendation: We recommend holding of cultures for a duration of 14 days. If fungal or mycobacterial prosthetic joint infection (PJI) is suspected, samples should be inoculated on special media and held for four to six weeks.

Level of Evidence: Strong

Delegate Vote:

Rationale:

Prosthetic joint infection (PJI) is a devastating complication and one of the leading causes of failure in patients undergoing total joint arthroplasty (TJA)[1]. Concurrently, the economic burden of PJI in the United States is projected to reach an all-time high of $1.85 billion per year by 2030[2]. Furthermore, as the annual volume of primary and revision TJA procedures continues to rise, the overall prevalence of PJI is also expected to increase[3].

The most important consideration in the management of patients who have an established diagnosis of PJI is the prompt and accurate identification of the infecting organism[4]. This allows for the administration of targeted antibiotic therapy, which has been shown to markedly increase the odds of treatment success[5]. Although there have been promising reports on the utility of newer diagnostic techniques for microbial identification, conventional culture remains the modality of choice for pathogen isolation in patients diagnosed with PJI[6]. In a recent meta-analysis, culture was found to have a pooled sensitivity and specificity of 70 and 97%, respectively, in the diagnosis of PJI[7]. However, it is important to recognize that there is data to suggest that the rate of culture-negative infection in this patient population is on the rise[8]. In one study, Bejon et al. found that bacterial culture was negative in 45% of patients undergoing two-stage exchange arthroplasty[9]. As such, given that the administration of antimicrobial therapy has been shown to reduce the rate of positive cultures, physicians must obtain a detailed history in order to ensure that patients are not receiving antibiotics before performing arthrocentesis[10].

In an effort to maximize diagnostic yield, several studies in the orthopaedic literature have examined the efficacy of different culture techniques that have been popularized in recent years[11,12]. As a result, there is now a growing body of evidence to support the implementation of strategies that have been shown to increase the rate of culture positivity, such as obtaining a minimum of three intraoperative samples and the use of blood culture bottles[13–16]. In cases of PJI suspected to be caused by fungal and mycobacterial pathogens, it is well-established that samples should be inoculated on special media and held for four to six weeks[17]. Conversely, although a number of prior investigations have evaluated the impact of extending incubation times on the overall culture positivity rate in patients who have PJI, the optimal duration for holding aerobic and anaerobic cultures in this setting remains a contentious issue[18–21].

While it was previously believed that an incubation time of three to five days was sufficient to capture the majority of infecting organisms, we now know that this may lead to a relatively high rate of false-negative culture results in this patient population[22]. In a study of 711 PJI patients, Kheir et al. showed that the culture positivity rate increased from 42 to 95% when prolonging the incubation time from three to eight days, respectively[23]. Similarly, Schafer et al. found that holding cultures for 13 days resulted in a 100% culture positivity rate in patients who have an established diagnosis of PJI[24]. Moreover, in another study, Tarabichi et al. demonstrated that routine holding of cultures for 14 days was necessary in order to capture cases of PJI caused by atypical pathogens[25]. Furthermore, in view of recent data suggesting that a minimum duration of 10.2 days is required in order to isolate *Cutibacterium acnes*, it is evident that prolonging incubation time to 14 days is paramount to maximizing the sensitivity of culture for slow-growing organisms that are not uncommon in this setting[23,26].

Despite its well-established limitations, culture remains the preferred option for the isolation of infecting pathogens in patients diagnosed with PJI. Although it was previously believed that holding cultures for three to five days is sufficient, there is now substantial evidence to suggest that a prolonged incubation time is necessary in order to maximize diagnostic yield and reduce the overall false negative rate of culture. Based on recent literature, we recommend routine holding of aerobic and anaerobic cultures for 14 days. In cases of suspected fungal or mycobacterial infection, samples should be inoculated on special media and held for four to six weeks.

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