G70: Is there a role for swab culture of draining fluid from a sinus tract in patients with orthopedic infection?

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Response/Recommendation: No. Swab culture of sinus tract are not reliable, as they are prone to contamination from external sources, which can compromise their diagnostic value and may lead to misdiagnosis. Obtaining deep tissue and dluid culture remains the mainstay of isolating infecting organisms in orthopedic infections.

Level of Evidence: Moderate

Delegate Vote:

Rationale:

A sinus tract, which forms a direct connection between infected bone/joint and the skin, is associated with chronic infections like chronic osteomyelitis and serves as one of the major criteria for diagnosis of periprosthetic joint infection (PJI) [1-4]. The communication between the sinus tract with the skin surface can introduce contamination by external microorganisms, which may not be the actual causative agents of the infection. Although superficial swab cultures taken from the wound or sinus tract can help identify microorganisms, they may not accurately represent deeper tissue infection. This highlights the need for additional diagnostic methods to ensure precise identification and appropriate treatment. It is important to note that while the data discussed here also include information from studies on chronic osteomyelitis, these recommendations are specifically intended for periprosthetic joint infection (PJI).

Superficial swab/sinus tract culture (STC) was initially considered adequate in identifying causative microorganisms in chronic osteomyelitis, but their reliability has been questioned in multiple studies. Perry et al. [5] found that superficial swab cultures correlated approximately 70% with intraoperative cultures, with a higher correlation of about 90% for *Staphylococcus aureus* (*S. aureus*) and monomicrobial infection. In their study STC was more accurate than needle biopsy. In a prospective study of 141 patients with chronic osteomyelitis and a sinus tract, Bernard et al. [6] found that two concordant deep sinus tract cultures with bone contact predicted causative microorganisms in 96% of cases. The accuracy was higher for monomicrobial infections compared to polymicrobial infection (94% vs 79%). Conversely, Patzakis et al. [7] demonstrated that STC failed to match the microorganisms found in bone cultures in nearly half of the cases. Similarly, Ulug et al. [8] observed that only 38% of STC were concordant with bone cultures, suggesting that reliance on STC could lead to misdiagnosis and incorrect treatment. Mackowiak et al. [9] found that only 44% of STC matched microorganisms were identified in intraoperative bone specimens. While *S. aureus* isolated from sinus tracts often correlated with bone cultures, other pathogens did not exhibit the same correlation. Akinyoola et al. [10] reinforced this findings, reporting that while STC had a sensitivity of 60%, a specificity of 45%, and a positive predictive value (PPV) of 72% for detecting *S. aureus*, the overall diagnostic

accuracy of STC was poor, with an overall sensitivity of 51%, specificity of 20%, and PPV of 47%.

In diagnosing PJI, STCs have been evaluated in comparison to deeper intraoperative cultures. Cuñé et al. [11] focused on acute hip and knee PJI, defining acute infection as the onset of symptoms within 15 days postoperatively and diagnosis occurring within the first month after index arthroplasty. Their study reported an 80% concordance rate between superficial swab cultures from wound drainage and deep cultures. Superficial swab cultures demonstrated high sensitivity for detecting *S. aureus* (94%) and Gram-negative bacilli (90%), highlighting their utility for identifying these pathogens in acute PJI. However, the sensitivity for other Gram-positive bacteria was lower (50%), suggesting that superficial swab cultures are less effective in detecting a wider range of pathogens.

On the other hand, Tetreault et al. [12] studied the use of superficial cultures from draining wounds or sinuses in patients with chronic hip and knee PJI and found that these cultures were concordant with deep tissue cultures in only 47% of cases. Additionally, superficial cultures were more likely to yield polymicrobial results. Their study recommended against relying on superficial cultures in patients with draining wounds or sinuses following joint arthroplasty, due to the potential for misleading diagnosis and inappropriate treatment.

Aggarwal et al. [13] compared the diagnostic effectiveness of tissue and superficial swab cultures in identifying PJI during both septic and aseptic revision arthroplasties of hips and knees. Their study revealed that tissue cultures were significantly more reliable, exhibiting superior sensitivity, specificity, and predictive values: 93%, 98%, 93%, and 98%, respectively, compared to 70%, 89%, 68%, and 90% for swab cultures. Additionally, swab cultures were associated with a higher incidence of both false-positive and false-negative results, underscoring their lower accuracy in diagnosing PJI.

In summary, these studies indicate that STC is not sufficiently reliable for accurate microorganism identification in chronic osteomyelitis. While STC can be useful for identifying *S. aureus*, it is generally less accurate for detecting other microorganisms. The diagnostic value is increased if deep sinus tract cultures with bone contact are obtained, and the same microorganism was isolated twice. Similarly, while superficial swab cultures may aid in diagnosing acute PJI, particularly for identifying *S. aureus* and Gram-negative bacilli, their reliability is limited in chronic PJI. Based on the available evidence, clinicians are encouraged to prioritize intraoperative tissue and bone cultures for accurate diagnosis and treatment planning.

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