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CORR Insights

CORR Insights®: False-positive Cultures After Native Knee Aspiration: True or False

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Where Are We Now?

Clinicians often debate the best ways to confirm a joint infection. The consequences of a delayed or missed infection diagnosis are substantial. Timeliness of diagnosis in patients with prosthetic knee joints may be the difference between treatment with a single operation and a staged revision, or on rare occasions, an above-the-knee amputation [2]. In an attempt to clarify the diagnostic process, the Musculoskeletal Infection Society recently developed a consensus statement [3] addressing the definition and diagnosis of a periprosthetic joint infection (PJI). The criteria to confirm a joint infection include: Two positive cultures (on two separate samples) are a major criteria and one positive culture qualifies as a minor criteria. Other minor criteria include ESR and CRP blood tests.

The current study by Jennings and colleagues also brings us one step closer to appropriately interpreting culture data in patients without arthroplasties in whom the diagnosis of pyarthrosis is being entertained. The authors contend that prior to their study, culture reports of nonvirulent organisms such as normal skin flora were often dismissed as false-positive results. Though the consequences can vary, a delay in diagnosis and treatment of a native joint infection could lead to preventable joint destruction.

Jennings and colleagues set out to study false-positive culture results by aspirating a series of knees with no clinical signs of infection using needles containing stylets to minimize the risk of harvesting skin plugs, which could contaminate knee aspiration resulting in false positive culture results [6]. They took extensive steps to minimize the risk of inadvertent contamination that has been observed in other studies on the topic [1, 8, 9, 11]. Specifically, they performed the experiment in the operating room, with a full surgical skin preparation, body-exhaust suits, and sterile technique. This laborious process gives credence to their findings of no false-positive cultures.

To some degree, the diagnosis of infection has been made easier in recent years. Alpha-defensin testing [4, 5, 7, 10] offers a high degree of sensitivity and specificity. Although this test currently does not provide immediate results, a same-day process currently is available in Europe (and is making its way through regulatory channels in the United States). Even so, for purposes of tailoring antimicrobial therapy, accurate cultures are critical and are likely to remain so for

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the foreseeable future, so the work of Jennings and colleagues is quite important.

Where Do We Need To Go?

We still need more research on surgical site infection (SSI) prevention and infection treatment, particularly intraoperative best practices and postoperative arthroplasty care. Is there a best practice for determining when to use a silver impregnated or other specialty dressing? When and how often should we change dressings? Should consideration be given for perioperative methicillin-resistant *Staphylococcus aureus* coverage to reduce SSIs? Identifying the common culprit and bacterial source leading to SSIs would help identify where there is a critical sterility break lies in the surgical process.

Instrument processing, prepping, and draping needs an expansive and detailed analysis for potential areas of contamination. For example, we may discover that a large proportion of prepackaged implants are not truly sterile on all surfaces. The box may be sterile, but do its contents remain sterile as the box is opened and the implants handled in the operating room?

Traffic in the operating room has been shown to increase the rates of dander, a source for bacteria [12]. How often do we witness someone not fully gowned or gloved reaching over the back table in the operating room? How often do members of the surgical team reach over the tables to don gloves and how often are various items peeled open and flipped onto the sterile field by operating room assistants or by the surgical scrub prior to the start of the case? The quick arm and hand movement likely sprays the field with body dander, which may lead to a SSI. Finally, how often do members of the anesthesia team peek their heads over the drapes gently retracting the drape with their bare hands?

How Do We Get There?

None of the practical, real-world scenarios listed above have been investigated to date because, I surmise, the logistics would be daunting. Approaching them calls for translational medicine, which consists of three pillars: (1) The laboratory scientist, (2) the clinician, and (3) the broader medical community, which includes the drivers of medical advancements such as nonprofit foundations, government-funded universities, and corporations providing medical services, devices, or medications with (all supported by in-house research and development teams). By combining disciplines, resources, and expertise within these pillars, translational medicine can foster and promote better methods of prevention, diagnosis, and therapies faster and more successfully than either one pillar could achieve individually. The interaction among the three pillars is always multidirectional, with each side transferring current or recent technological or scientific advancements into improved medical or surgical paradigms. This is in direct contrast to traditional academic centers with laboratories and professors working independently (the word "silo" comes to mind) within their own disciplines with scant communication between other scientists.

We must transition our research efforts from improving the ways we diagnose and treat infections to prevention. In an attempt to combat potential contamination of tools and implants on the surgical tables, I no longer permit the opening of surgical wound dressings or closing sutures at the beginning of all arthroplasty procedures. Instead, we open the suture materials only at the end of any surgical procedure. By adopting this new protocol, the suture material is less exposed to airborne or other source contaminants in the operating room.

If researchers could identify where breaks in sterility most commonly lead to infections, then we would have a

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much better chance of treating infections through preventive measures. Though identifying the sterility breaks by using periodic culture swabs for the critical components in the operating room has its limitations, this approach could lead to a DNA finger-printing match with previous infections, ultimately leading to improved surgical processes.

The list of sterility breaks is nearly endless, and improving the surgical process necessitates a collaborative translational medicine project including universities and medical institutions with the translational medicine resources that would allow us to tackle these important topics.

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