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CORR Insights

CORR Insights®: Are Frozen Sections and MSIS Criteria Reliable at the Time of Reimplantation of Two-stage Revision Arthroplasty?

Craig J. Della Valle MD

Where Are We Now?

While the diagnosis of periprosthetic joint infection (PJI) can be a challenge, determining whether a patient who has undergone the first stage of a staged revision arthroplasty is ready for reimplantation is an even greater diagnostic task. These patients have recently undergone surgical intervention, have been treated with antibiotics, and typically have an antibiotic-loaded spacer within the joint, all of which may alter the commonly used diagnostic tests we utilize to diagnose PJI, including the history and physical examination, serologic markers, joint aspiration, and cultures. To compound the issue, there have been few scientific articles that have attempted to tackle this challenging diagnostic dilemma.

Prior work from our center [5, 6], for example, suggests that there is no ideal "cut-off" value for the erythrocyte sedimentation rate or C-reactive protein that predicts persistent infection prior to reimplantation. Further, these same laboratory values do not need to be normal prior to safely proceeding with the second stage reimplantation. Although these reports provide some guidance, they still leave important questions unanswered, and it remains difficult for the surgeon to know exactly when to perform the prosthesis reimplantation.

The intraoperative evaluation of frozen sections of periprosthetic tissues, obtained at the time of attempted reimplantation, have been included among the tests that are used at some centers [1, 2]. In the current study, George and colleagues report on 97 patients who were studied during the two-stage treatment of an infected hip or knee and found that intraoperative frozen sections were useful at ruling in—but not ruling out—persistent PJI

This CORR Insights® *is a commentary on the article* "Are Frozen Sections and MSIS Criteria Reliable at the Time of Reimplantation of Two-stage Revision Arthroplasty? *by George and colleagues available at:* DOI: 10.1007/s11999-015-4673-3.

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C. J. Della Valle MD (✉)
Department of Orthopaedic Surgery, Rush University Medical Center, 1725 West Harrison Street, Suite 1063, Chicago, IL 60612, USA
e-mail: craigdv@yahoo.com; cdellavalle@rushortho.com

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(that is, the test had good specificity, but poor sensitivity). Interestingly, a positive frozen section was not a risk factor when looking at subsequent failure for PJI, however, meeting the Musculoskeletal Infection Society criteria for PJI at the time of reimplantation was a risk factor.

The authors of the present study have extensive clinical experience in treating infection. Further, they have at their disposal one of the most talented musculoskeletal pathologists in the world. If intraoperative frozen sections had poor sensitivity in their hands, I believe it is likely most of us would fare much worse.

Where Do We Need To Go?

Generally, we as surgeons (and our patients) need better tests to determine if infection persists prior to embarking upon a second stage reimplantation. Unfortunately, it is pretty clear that the results of a second two-stage exchange are worse than those typically achieved the first time around. Hence, all parties involved clearly want the risk of failure from another infection to be as low as possible.

It is interesting to note, however, that in some of the recently reported clinical series that discuss the treatment of PJI, failures secondary to PJI are often times secondary to an infecting organism that is different than the one originally identified [7]. While it may be that this other organism was there and not recognized initially, I suspect that in the majority of cases, the failures are secondary to a new PJI, and that there are host-related factors that predispose the individual to recurrent failure. Therefore, these may not be failures to eradicate the original infection, but failures to improve the host to fight off a new one.

How Do We Get There?

George and colleagues are to be congratulated for their work. This is a complex and difficult topic. More work, however, is still needed in this area.

Frozen sections are particularly challenging as a diagnostic tool for many reasons, including sampling error (the surgeon has to pick the right tissue to send to the pathologist), as well as diagnostic criteria that are universally accepted. Frozen sections are also subjective by nature and not every orthopaedic surgeon will have an interested and experienced pathologist at their disposal. Further collaboration between orthopaedic surgeons and pathologists could mitigate some of these issues. We have certainly found that meeting with our pathology colleagues to better understand the challenges faced on both sides and to come up with a common language for the reporting of intraoperative results is helpful.

As the authors point out, recent work in the area of "biomarkers" is promising for enhancing our ability to differentiate "cured" from persistently infected [3, 4]. Specific studies addressing the ability of the currently available and other biomarkers to predict persistent infection prior to second stage reimplantation are needed. Further, larger prospective, ideally multicenter studies on the treatment of PJI would also help us to better understand which factors predict when a joint is ready to reimplant and successful treatment in general. Fortunately, we are learning how to work together to tackle some of these tough questions, and the number of multicenter, prospective studies on the diagnosis and treatment of PJI is on the rise. In time, I believe that both diagnostic and treatment protocols will improve to better treat patients afflicted with this devastating complication.

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