Can surgeons differentiate between painful shoulders that grow Cutibacterium acnes and infection benefitting from treatment?

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Published in:
Shoulder and Elbow

DOI:
10.1177/1758573220979905

Publication date:
2021

Shoulder & Elbow

LETTER TO THE EDITOR

Shoulder & Elbow
2021, Vol. 13(2) 149–150

DOI: 10.1177/1758573220979905
journals.sagepub.com/home/sel
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Can surgeons differentiate between painful shoulders that grow *Cutibacterium acnes* and infection benefitting from treatment?

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Pruijn et al. concluded that (1) synovial interleukin(IL)-6, calprotectin and a combination of IL-6, IL-2 and TNF-α have a high sensitivity and specificity for detecting *Cutibacterium acnes (C. acnes)* in patients undergoing revision of shoulder arthroplasty and (2) that in per-operative setting, the highest sensitivity and specificity are shown in arthroscopically obtained tissue cultures prior to revision surgery.[1] This statement is made with confidence in spite of the lack of a consensus definition of prosthetic infection, and no reference standard for the diagnosis. Among published studies, there is varied consideration of symptoms and signs and positive tissue cultures.

In the absence of a consensus reference standard for *C. acnes* infection, how can we distinguish infection from colonization? How do we know that *C. acnes* is not a benign commensal? *C. acnes* is part of the native shoulder microbiome and the presence of *C. acnes* in cultures may therefore not indicate infection.[2,3] *C. acnes* does not cause systemic sepsis, bone erosion, prosthetic loosening, and purulent abscess. It seems possible that positive cultures for *C. acnes* might sometimes be a justification for revision of a technically adequate, but painful shoulder arthroplasty.

There seem to be several unanswered questions: (1) What is the relationship between culture of *C. Acnes* and shoulder symptoms? (2) Does testing for *C. Acnes* in the setting of a painful arthroplasty with no other signs of infection offer greater potential benefits than potential harms? (3) Does surgery to address *C. Acnes* grown from culture of a shoulder arthroplasty lead to better short and long-term outcomes compared to no treatment or simulated surgery?

Persistent pain is the most common cause of dissatisfaction after arthroplasty.[4] There is increasing evidence that persistent limiting pain is related to mental and social health.[5] Does our focus on *C. acnes* distract the patient and the surgeon from attending to these important aspects of human illness?

The diagnosis of *C. acnes* infection based on tests of blood or synovial fluid may also cause a nocebo effect. In other words, symptoms of patients may become worse because of the idea that their shoulder is infected, which reinforces feelings of worry and despair. One analogy is the psychological, financial, and iatrogenic harm that comes from types of cancer with a benign natural history such as with ductal carcinoma in situ of the breast and many thyroid, kidney, and prostate cancers.[6]

Revision of a well-fixed shoulder arthroplasty is a difficult procedure with notable actual and potential harms. It seems important to wonder about the relative benefit of revision arthroplasty for *C. acnes* compared to the natural history of no treatment. We don't have a good understanding of the natural history and we need to account for the placebo effect.[7]

C. acnes infection, colonization and commensalism are three different conditions. We need clear definitions with reference standards for these terms. Moreover, we are not convinced that *C. acnes* causes problematic infections and, perhaps more importantly, there is a strong need for guidelines for patients with unexplained troublesome pain in the common scenario of a technically adequate shoulder arthroplasty. Given the potential harms of testing for *C. acnes*, we suggest tests, cultures, and surgery to be restricted to patients with

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obvious and concerning signs of fever, erythema, purulence, sepsis, osteolysis, or loosening consistent with infection. Surgery for unclear problems after arthroplasty should be considered to have more potential harms than potential benefits until evidence has proved otherwise.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Guarantor

MB.

Contributorship

RS, JD, DR and MB wrote and edited the manuscript and approved the final version.

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