



Substantial cultures of *Propionibacterium* can be found in apparently aseptic shoulders revised three years or more after the index arthroplasty

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Background: Revisions of apparently “aseptic” shoulder arthroplasties are not infrequently culture positive for *Propionibacterium*, organisms that may be introduced at the time of the index surgery when the dermal sebaceous glands are transected. This report seeks to answer the question, Do surgeons performing revision shoulder arthroplasty years after the index procedure need to be concerned about the persistence of *Propionibacterium*?

Methods: We reviewed the medical records of 148 revision arthroplasties performed between July 2008 and June 2013 to find those revisions performed at least 3 years after the index procedure and at which intraoperative cultures were strongly positive for *Propionibacterium*.

Results: We identified 14 cases of revision surgery performed 8 ± 4 years after the original arthroplasty for which deep cultures were strongly positive for *Propionibacterium*. A total of 109 specimens were obtained, 84 of which were positive. All 14 patients were male.

Conclusion: Shoulder arthroplasties revised for the mechanical problems of loosening or stiffness can be substantially culture positive for *Propionibacterium*, even if the revision is performed many years after the index procedure. Therefore, even in shoulder arthroplasties revised for mechanical problems years after the index procedures, surgeons should consider submitting multiple deep specimens for specific *Propionibacterium* culture. In the presence of persistent *Propionibacterium*, surgeons should consider the need for directed surgical and medical treatment in their management of a failed arthroplasty.

Level of evidence: Level IV, Case Series, Treatment Study.

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Keywords: Shoulder arthroplasty; revision; *Propionibacterium*

This prospective study was approved by our Human Subjects Review Committee (#46192).

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Periprosthetic infections have been reported in up to 3% of shoulder arthroplasties.^{30,31} Many of these are diagnosed within months of the index procedure with clinical and laboratory signs of infection.^{30,31} However, it has recently been recognized that revisions of apparently “aseptic” shoulder arthroplasties are frequently culture positive for

organisms such as *Propionibacterium*.^{5,11,14,15,19,24,30,31} There is evidence that these organisms are introduced at the time of the index surgery when the dermal sebaceous glands are transected.²²

The question now to be answered is, Do surgeons performing revision shoulder arthroplasty years after the index procedure need to be concerned about the presence of *Propionibacterium*? This study sought evidence that substantial cultures of *Propionibacterium* can be recovered from deep specimens harvested at revision shoulder arthroplasty surgery performed years after the index shoulder arthroplasty.

Materials and methods

Between July 2008 and June 2013, we performed 148 revision arthroplasties on shoulders presenting with stiffness or component loosening without clinical suspicion of infection, that is, no wound erythema or drainage and normal white blood cell count, sedimentation rate, and C-reactive protein values. In each of these cases, we submitted multiple deep tissue and prosthesis explant specimens for culture; specimens were cultured in broth and on aerobic and anaerobic media and were observed for a minimum of 3 weeks.^{7,24} We retrospectively reviewed these 148 cases to identify those revised 3 years or more after the index arthroplasty and that had multiple positive cultures for *Propionibacterium*.

Results

Fourteen patients met our inclusion criteria; all were male. The average age of the patients at the time of revision surgery was 64 ± 8 years (range, 47-79 years). The index surgery was a total shoulder in 10, a reverse total shoulder in 1, and a humeral hemiarthroplasty in 3. The revisions were performed for stiffness or component loosening without clinical evidence of infection at an average of 8 ± 4 years (range, 3-14 years) after the index procedure. Ten patients had osteolysis, 6 humeral components were loose, and 9 of the 10 glenoid components were loose (Fig. 1). An average of 8 ± 3 cultures (range, 3-12) were submitted for each revision procedure. Of the 109 cultures, 79% (84) were positive for *Propionibacterium*; 18% (20) were positive for coagulase-negative staphylococcus. The number of cultures positive for *Propionibacterium* was correlated with the number of specimens submitted for culture ($R^2 = .73$) (Fig. 2). At 1 week, 53% of the cultures were positive; 74% were positive at 2 weeks, and 79% were positive at 3 weeks (Fig. 3).

Discussion

This is the first report of a substantial number of cases of revision arthroplasty performed years after the index procedure that were strongly positive for *Propionibacterium*.



Figure 1 Radiograph of a male patient with humeral and glenoid osteolysis and component loosening who had positive cultures for *Propionibacterium*.

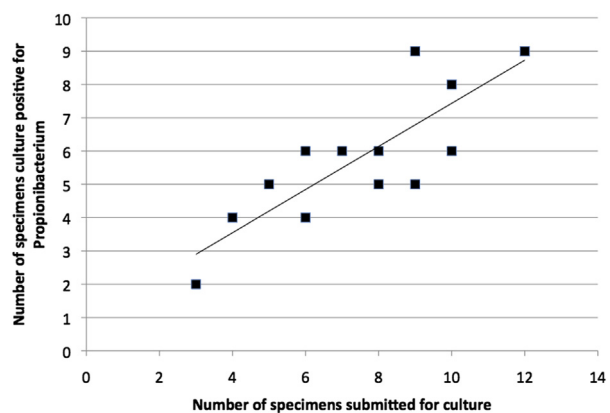


Figure 2 The relationship of the number of cultures positive for *Propionibacterium* to the number of specimens submitted for culture.

These cases are particularly remarkable in that the revisions were performed for mechanical rather than for inflammatory symptoms. Whereas there have been prior reports of *Propionibacterium* being cultured from deep specimens harvested at the time of revision shoulder arthroplasty,^{1,3,4,8-10,12-18,21,27,28,30-33} our series is important because of the long time between the index procedure and the revision at which positive culture specimens were obtained, which averaged 8 ± 4 years. Although some authors

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