Cutibacterium acnes is an intracellular and intra-articular commensal of the human shoulder joint

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\textbf{Background:} Cutibacterium acnes (\textit{C acnes}) is a mysterious member of the shoulder microbiome and is associated with chronic postoperative complications and low-grade infections. Nevertheless, it is unclear whether it represents a contaminant or whether it accounts for true infections. Because it can persist intracellularly in macrophages at several body sites, it might in fact be an intra-articular commensal of the shoulder joint.

\textbf{Methods:} In 23 consecutive, otherwise healthy patients (17 male, 6 female; 58 years) who had no previous injections, multiple specimens were taken from the intra-articular tissue during first-time arthroscopic and open shoulder surgery. The samples were investigated by cultivation, genetic phylotyping, and immunohistochemistry using \textit{C acnes}–specific antibodies and confocal laser scanning microscopy.

\textbf{Results:} In 10 patients (43.5%), cultures were \textit{C acnes}–positive. Phylotype IA1 dominated the subcutaneous samples (71%), whereas type II dominated the deep tissue samples (57%). Sixteen of 23 patients (69.6%) were \textit{C acnes}–positive by immunohistochemistry; in total, 25 of 40 samples were positive (62.5%). Overall, 56.3% of glenohumeral immunohistochemical samples, 62.5% of subacromial samples, and 75% of acromioclavicular (AC) joint samples were positive. In 62.5% of the tested patients, \textit{C acnes} was detected immunohistochemically to reside intracellularly within stromal cells and macrophages.

\textbf{Discussion:} These data indicate that \textit{C acnes} is a commensal of the human shoulder joint, where it persists within macrophages and stromal cells. Compared with culture-based methods, immunohistochemical staining can increase \textit{C acnes} detection. Phylotype II seems to be most prevalent in the deep shoulder tissue. The high detection rate of \textit{C acnes} in osteoarthritic AC joints might link its intra-articular presence to the initiation of osteoarthritis.

\textbf{Level of evidence:} Level III; Cross-Sectional Design; Epidemiology Study

\textbf{Keywords:} Cutibacterium acnes; \textit{C acnes}; infection; shoulder surgery; intracellular; commensal

To our knowledge, Levy et al were the first to hypothesize that \textit{C acnes} might be an underestimated pathogen causing shoulder osteoarthritis.\textsuperscript{42}