

# An unusual *Staphylococcus saccharolyticus* spondylodiscitis post vertebroplasty, a case report

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## Case report

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## Abstract

**Background:** *Staphylococcus saccharolyticus* is a rarely encountered coagulase-negative slowly grower and strictly anaerobic staphylococcus from the skin. It is usually considered as a contaminant, but some rare reports describe deep-seated infections. Virulence factors remain poorly known although genomic analysis highlight pathogenic potential.

**Case presentation:** we report a case of *Staphylococcus saccharolyticus* spondylodiscitis that followed kyphoplasty, a procedure associated with a low rate of sometimes severe infectious complication (0.46%) and we reviewed the literature. This case specifically stresses the risk of *S. saccharolyticus* health-care associated infection in patients of poor condition.

**Conclusion:** infection to *S. saccharolyticus* is difficult to diagnose due to microbiological characteristics of this bacterium, requires timely treatment and improved infection control procedure should be encouraged for patients with poor condition.

## Background:

*Staphylococcus saccharolyticus* (formerly *Peptococcus saccharolyticus*) is a rarely encountered coagulase-negative staphylococcus and the only anaerobic species of the genus *Staphylococcus* [1]. While it is usually considered as a non-pathogenic microorganism of the human skin flora with no particular known tropism to generate specific infections, occasional reports suggest a pathogenic potential through miscellaneous rare deep-seated infections [2–5]. Little is known on its virulence factors, pathogenesis and determinants of infection. Recently, genome sequencing analysis has shown that *S. saccharolyticus* carries hyaluronidase activity (similar to that of *Staphylococcus aureus*), toxins of the phenol-soluble modulins family and several quorum sensing systems that may provide a tissue-invasive potential [6].

Infectious complications after vertebroplasty/kyphoplasty are rare but potentially serious complications that can be life-threatening or affecting the patient's functional prognosis, (0.46%) and usually result from direct inoculation from skin flora such as *Staphylococcus aureus*, *S. epidermidis*, *Cutibacterium acnes*, etc. [7, 8]. Here, we report the third case of spondylodiscitis due to *S. saccharolyticus*, and the first one that followed a surgical procedure like kyphoplasty that specifically stresses the risk of *S. saccharolyticus* health-care associated infection [2, 3].

## Case Presentation:

A 57-year-old man with a history of alcoholism and heavy smoking was admitted for disabling back pain. Four months earlier, a fall induced two vertebral fractures (T10, T11) treated by kyphoplasty under CT-scan guidance. Because the back pain persisted two weeks after the procedure, he received a zygapophyseal joint steroid injection under CT-guidance. Three days later C-reactive protein level was 12.5 mg/l, hyperleukocytosis was moderate (13 G/L including 10G/L neutrophils) and the patient had no fever. Magnetic Resonance Imaging was consistent with infectious spondylodiscitis (Fig. 1a). A *Staphylococcus saccharolyticus* isolate was recovered after 90 hours of incubation from one single vial of a first series of three blood culture (BC) sets. The same microorganism was recovered from two additional BC series collected five and ten days later, after respectively 83 and 100 hours of incubation. These findings fulfilled the criteria for a definite diagnosis of spondylodiscitis while the patient had neither catheter nor spine device. Using disk diffusion assay, the isolate was multi-drug susceptible including to penicillin and cefoxitin. The patient was treated with 2 g of amoxicillin three times a day for a total duration of 4 weeks after consultation with the infectious disease team. Pain and inflammatory syndrome both gradually regressed and MRI performed month 12 showed decrease of hyperintensity (Fig. 1b). No clear source of the bacteria was identified. It was presumably from skin and the bacteria was likely introduced in the surgical site during the kyphoplasty procedure. We could identify neither any defect in the surgical skin preparation and infection control procedures nor any particular event during the kyphoplasty procedure.

## Discussion:

*S. saccharolyticus* is a little known coagulase-negative staphylococcus [1]. While it is usually considered as a skin contaminant, it is able to cause e.g., endocarditis, bone infection or pyomyositis, some of them with poor outcome (Table 1) [2–5, 9–13]. In addition to the tissue-invasive factors that have been unraveled, the dependence on anaerobic conditions is considered to inherently favor the ability to invade human tissue while biofilm production may contribute to colonize medical devices [6]. Further research is needed to better understand *S. saccharolyticus* virulence and the risk of infection. In this regard, reports should also better consider patient comorbidities as host condition may play a role. So far, only 3 out of the 9 reported cases detailed host risk factors (Table 1).

Table 1  
Summary of cases of infections caused by *S. saccharolyticus*

Year (ref)	Location	Age/Sex	Diagnosis	Risk factors	Comment on clinical presentation	Biology	Microbiological diagnosis	Antimicrobial susceptibility
1990 (8)	USA	61/M	Endocarditis	No predisposing valvular heart disease	Low grade fever at onset; moderate-sized mitral valve vegetation	Anemia; thrombocytosis; ESR elevation	BC; all bottles positive at day 10	Susceptible to PE, OX, VA, GE, Cl, CL; resistant to ME
1996 (10)	USA	57/W	Prosthetic mitral valve endocarditis	NA	Fever; large masses at prosthetic valve level	Anemia; hyperleukocytosis	BC; all anaerobic vials positive at day 1; aerobic vials positive at day 11	Susceptible to VA, CL, CH; resistant to all $\beta$ -lactamin agents (including OX, CES, ME, TET)
2009 (13)	USA	NA	Prosthetic valve endocarditis	NA	NA	NA	Mitral valve; anaerobic culture; at day NA	NA
1990 (11)	China	21/M	Pneumonia	NA	Blood-stained sputum; multiple spherical focal lesions in the lung (CT scan)	Anemia; hyperleukocytosis	NA	Susceptible to LE, MO; NA for other antibiotics
2015 (12)	China	26/W	Bone marrow infection	NA	High-grade fever; headache at onset; lymph nodes	Anemia; hyperleukocytosis; ESR and CRP strong elevation	Lung biopsy; positive anaerobic culture at day 10?	Susceptible to VA, LE, PE, CL; resistant to ME;
2001 (5)	France	58/M	Spondylodiscitis	No endocarditis; no underlying disease but poor oral hygiene	Thoracic posterior pains for 2 months; fever; weight loss; NSAIDs/corticosteroids treatment	At admission, hyperleukocytosis; ESR and CRP elevation	BC and bone marrow; positive anaerobic cultures at day 3	Susceptible to VA, TEI, RI, ER, PR, TET, OF, CL; Resistant to ME; No $\beta$ -lactamase production; no mecA gene
2009 (6)	USA	38/M	Spondylodiscitis	NA	Radicular symptoms treated unsuccessfully by microdiscectomy	Elevation of inflammatory parameters	Negative aerobic cultures; negative acid-fast bacilli	NA
2017 (9)	NZ	48/M	Pyomyositis, spermatic cord infection	Type II diabetes; hyperlipidemia	Fever	Neutrophilia; CRP large increase; CPK normal	Multiple muscle biopsies; anaerobic positive culture at 24 hours; coinfection <i>S. capitis</i> and <i>S. saccharolyticus</i>	Susceptible to FL; Resistant to PE
2017 (our case)	France	57/M	Spondylodiscitis	Heavy smoking; alcoholism; unhealthy underweight	Vertebral fractures (treated by kyphoplasty and zygapophyseal joint steroid injection); no fever; unremarkable clinical examination	Hyperleukocytosis; CRP moderate increase	Aerobic cultures negative at day 7	Susceptible to PE; CEF, MA, RI, TET, FO, OF; no $\beta$ -lactamase production

M, man; W, woman; ESR, erythrocyte sedimentation rate; BC, blood culture; NA, non-available; AM, amoxicillin; AZ, azithromycin; CEFA, cefazolin; CEF, cefoxitin cephalosporin; CH, chloramphenicol; Cl, ciprofloxacin; CL, clindamycin; ER, erythromycin; FL, flucloxacillin; FO, fosfomycin; GE, gentamicin; IM, imipenem; LE, l macrolides; ME, metronidazole; MO, moxifloxacin; NAF, nafcillin; OF, ofloxacin; OX, oxacillin; PE, penicillin; PR, pristinamycin; RI, rifampicin; TEI, teicoplanin; TE timidazole; VA, vancomycin.

To date, only three case of spondylodiscitis have been reported (including our case), of which 1 has been related to a surgical procedure and multiple levels diskographies [3], the current case occurred after kyphoplasty, while the third case [2] retrieved no information on surgical procedure.

Although vertebroplasty is a minimally invasive procedure, the possibility of postoperative infection should not be ignored. It requires major salvage surgery and may lead to residual disability and even death in several cases. In addition to standard skin preparation and the administration of prophylactic antibiotics,

surgeons should preoperatively consider immune status, urinary tract infection or other infection source within 6 months, and history of pulmonary tuberculosis to prevent infection post vertebroplasty (14)

It is unclear why *S. saccharolyticus* is specifically associated with spondylodiscitis. This either reflects a specific bacterial niche that remain to be evidenced or represents a publication bias because Brüggemann et al. studied 8 strains recovered from hip and shoulder prosthetic infection but the authors provided no information on the clinical cases [6].

This case highlights several important considerations on *S. saccharolyticus* infection and the pitfalls associated with the diagnostic aspects.

Both symptomatology and biological syndrome may be moderate or absent in the early stage of infection [4]. In our case, fever was absent and the inflammatory biologic syndrome was mild. Possible reasons could be the proximity of a corticosteroid injection, and effective empirical treatment that was timely administered. *S. saccharolyticus* is, in addition of being anaerobic, a slowly grower which may be misinterpreted as a contamination (long BC time-to-positivity, isolated –anaerobic – positive bottle) [1, 9]. This may also lead to under diagnosis, when cultures are not incubated at least 5 days, a regular situation with analyses other than BC.

The favorable evolution after appropriate antibiotics treatment is not a regular option. The rare reported infections (9 to our knowledge) have often been fatal (3 out of the 7 available outcomes, (Table 1). Timely treatment may be critical. Comorbidities favoring opportunistic organisms to cause infection are unevenly reported: prosthetic heart valves (10,13), poor oral hygiene (2), type II diabetes (5), to which we can add important tobacco use, alcoholism and cachexia in this patient

Last but not least, infection control procedures designed to prevent infection following vertebroplasty procedure may require some advance to improve infection prevention in patients with poorer condition.

## Conclusion

The incidence of spondylodiscitis by *S. saccharolyticus* is reportedly low, but clinicians must not fail the diagnosis. We advise that any *S. saccharolyticus* culture in the context of fever and/or orthopedic pain should be cautiously reviewed before being considered as a contaminant. Prompt diagnosis and treatment is essential for an improved outcome of this severe infection and overall efforts should be made in infection control during vertebroplasty.

## Declarations

### Ethics approval and consent to participate

Written consent was obtained from the patient. No ethics committee was necessary for this case report.

**Consent for publication:** Written consent was obtained from the patient for publication of this case report. A copy of the written is available for review by Editor in Chief of this journal.

**Availability of data and materials:** Not applicable. Please contact authors for data requests

**Competing interests:** The authors declare that they have no competing interests

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**Authors' contribution:** MCT was in charge of the case review and preparation of the manuscript. CR, BL, conceived the work, provided clinic expert opinion and helped to draft the manuscript. KR, NA and RR provided clinic expert opinion and revised the manuscript. All authors read and approved the manuscript.

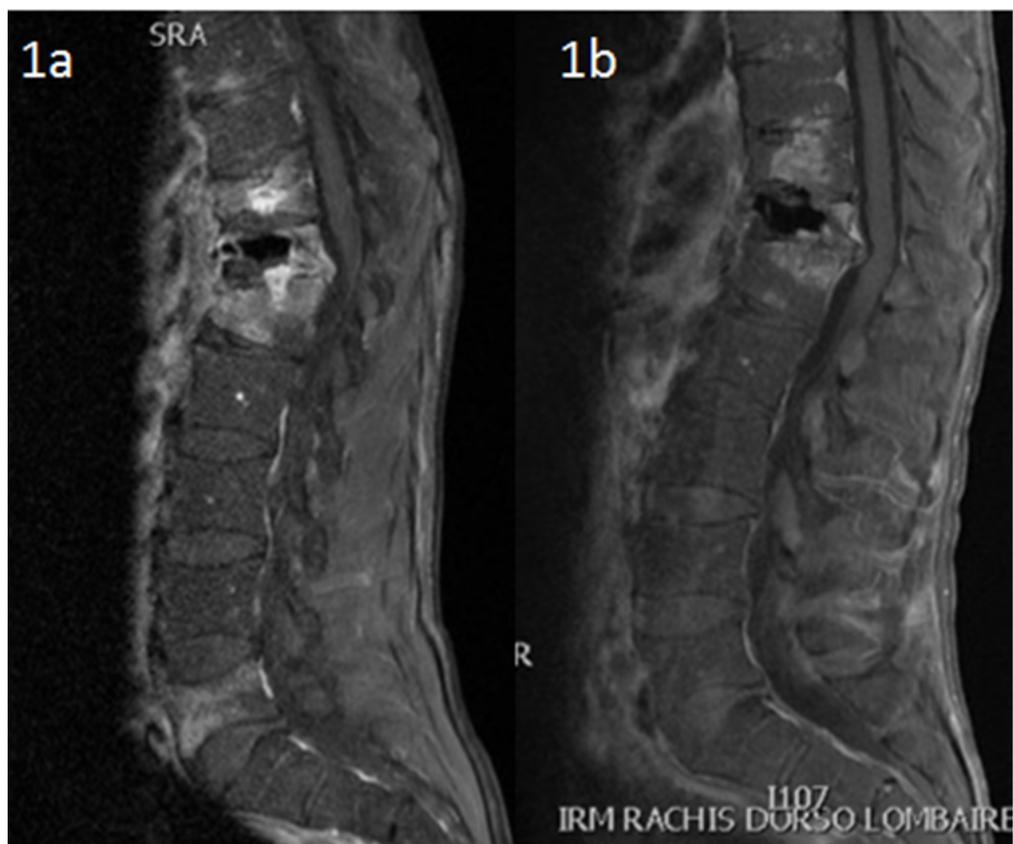
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## Figures



**Figure 1**  
T2 weighted sagittal Magnetic Resonance Imaging. (1a) : Hyperintensity T11-T12-L1 vertebrae, para-vertebral soft tissue and T12-L1 disc consistent with infectious spondylodiscitis. (1b) : One year later: decrease of the signal.