A case of *Streptococcus mutans* endocarditis with cardiac surgical indication and complicated by spondylodiscitis after multiple dental procedures without antibiotic prophylaxis

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ABSTRACT

Background: The association between *Streptococcus mutans* infective endocarditis and spondylodiscitis is extremely rare (only one case reported in the literature). Invasive dental procedures are known to increase the risk of infective endocarditis. European Society of Cardiology 2023 guidelines recommend antibiotic prophylaxis only in high-risk patients. However, these new guidelines do not consider the number of dental procedures performed in a short period of time.

Case Presentation: We report the case of a patient affected by *S. mutans* infective endocarditis complicated by lumbar spondylodiscitis as a consequence of the performance of multiple dental procedures without antibiotic prophylaxis; this may be the first case characterized by this association and requiring cardiac surgery.

Conclusion: These infective events occurred despite a proper interpretation of current guidelines about antibiotic prophylaxis but we believe that a case-by-case evaluation is useful to reduce the incidence of these complications. Specifically, it could be that the risk of developing endocarditis depends not only on the patient's risk category but also on the number of dental procedures performed in a short period of time.

Keywords: Endocarditis, spondylodiscitis, surgical aortic valve replacement, antibiotic prophylaxis.

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Background

The association between *Streptococcus mutans* infective endocarditis and spondylodiscitis is extremely rare (only one case reported in the literature). Invasive dental procedures are known to increase the risk of infective endocarditis. European Society of Cardiology (ESC) 2023 guidelines recommend antibiotic prophylaxis only in high-risk patients. However, these new guidelines do not consider the number of dental procedures performed in a short period of time.

Case Presentation

A 76-year-old man entered the emergency department complaining of general malaise, poor appetite, weight loss (of about 5 kg), and lower back pain radiating into the lower limbs (mostly on the right) for about 3 months. This pain, unresponsive to home antalgic therapy (oxycodone, naloxone, and paracetamol) had worsened over time to the point where walking was no longer possible. He was admitted to internal medicine for the performance of diagnostic investigations.

During the objective examination, the patient was alert, oriented, and cooperative; the body temperature was 38.5°C. A new-onset diastolic murmur was found. The patient described lower extremities pain as unbearable and was forced into a gynecological antalgic position. The lower limbs appeared hypotrophic and the patient was unable to lift the right lower limb from the bed surface due to pain. Sensibility was preserved while motor skills were poorly assessable in the lower limbs due to pain symptoms. Patellar osteo-tendon reflexes were preserved. No other pathological signs were observed.

In the months before his hospitalization, the patient had undergone multiple dental extraction procedures required for the oral cavity's clean-up. No antibiotic prophylaxis had been prescribed during the above-mentioned procedures, and the patient had been exclusively treated with anti-inflammatories.

During the blood tests' assessment, we found out a normocytic anemia (Hb 9.9 g/dl), no. 8,760/ mm^3 white blood cells, no. 173,000/ mm^3 platelets, normal values of procalcitonin but an incremented value of C-reactive protein (89 mg/l). When the fever pitch was reached (39°), blood cultures were collected.

The patient had a family history of monoclonal gammopathies (brother deceased from multiple myeloma). The hypothesis of hematologic neoplasia was ruled out by performing immunophenotype on peripheral blood, hematologic examination, computerized tomography scan, and total body positron emission tomography scan.

Clinical evidence, imaging (lumbosacral magnetic resonance imaging (MRI): see Figure 1), and the finding of purulent material on the bone biopsy led us to the diagnosis of spondylodiscitis of the L3-L4-L5 segments.

Blood cultures collected at the patient's admission tested positive for *S. mutans* bacteria.

Consequently, transesophageal echocardiography was performed in search of the infectious focus. This examination demonstrated the presence of a laceration of the free edge of the right coronary cusp of the aortic valve determining severe regurgitation (Supplementary Video 1).

This evidence led us to the diagnostic conclusion of infective *S. mutans* endocarditis complicated by lumbar spondylodiscitis in a patient who had undergone multiple dental procedures without antibiotic prophylaxis.

Based on the antibiogram, antibiotic therapy was started with Ceftriaxone 2 g/day; to potentiate the antistreptococcal action of cephalosporin, Gentamicin was associated at a synergistic dose of 3 mg/kg/day. Pain control was achieved with therapy based on paracetamol, oxycodone/naloxone, and sublingual fentanyl.

Furthermore, the replacement of the infected and dysfunctional aortic valve was indicated.

The surgery was performed by mini-sternotomy access; the native aortic valve was characterized by fibrous thickening and remodeling of the three cusps; appositions referable to endocarditis were located at the free margins (Figures 2 and 3). Excision of the aortic valve, decalcification of the annulus, and implantation of a biological prosthesis were performed.

Figure 1. *MRI of the spine in frontal section-morphological alterations and high signal intensity in L3–L4 bodies and also in the intersomatic space; there is evidence of signal alterations in the paravertebral site especially at the level of the right Psoas; these findings suggest the diagnosis of spondylodiscitis with paravertebral inflammatory involvement.*

Discussion

The association between infective endocarditis and spondylodiscitis was first described in 1965; it is anything but rare: according to some scientific studies, 8% of patients with infective endocarditis have spondylodiscitis in association [1]; moreover, some risk factors have been identified: male sex, intravenous drug use, diabetes, and *Streptococcus viridans* or *Enterococcus* infections [1].

Streptococcus mutans is a species of *streptococcus* frequently isolated from patients with endocarditis; these microorganisms are commonly found in the oral cavity; they are also responsible for dental pathology due to efficient adhesiveness factors [2]. *Streptococcus mutans* is a member of the *viridans streptococci* (usually with alpha-hemolytic activity). It is characterized by the ability to survive in the bloodstream and by the production of fibronectin-specific glucans and adhesins that promote its adhesion to smooth surfaces such as dental enamel or connective tissue structures (endocardium and heart valves). These microbiological specifics could explain the bacterium's ability to adhere even at the level of spinal tissues. *Viridans streptococci* are usually sensitive to beta-lactam antibiotics but also resistance cases are reported [2].

Only one case of infective *S.mutans* endocarditis complicated by spondylodiscitis is reported in the literature [3]. In both cases, the patient underwent dental procedures in the absence of antibiotic prophylaxis. An important difference between the two cases is that in our patient cardiac surgery was indicated. It is reasonable to assume that the numerous dental extraction procedures (carried out a few weeks before the onset of symptoms) allowed the entrance of the pathogen into the bloodstream and consequently the adhesion to the heart valve. The clinical picture is further complicated by the spinal involvement, which is likely a consequence of the endocarditis, even if establishing the temporal sequence of these clinical events appears complicated. In intravenous drug users affected by endocarditis and spondylodiscitis, the frequent involvement of the left valves together with the high incidence of isolated spondylodiscitis in this patient population suggests that spondylodiscitis may precede endocarditis and thus

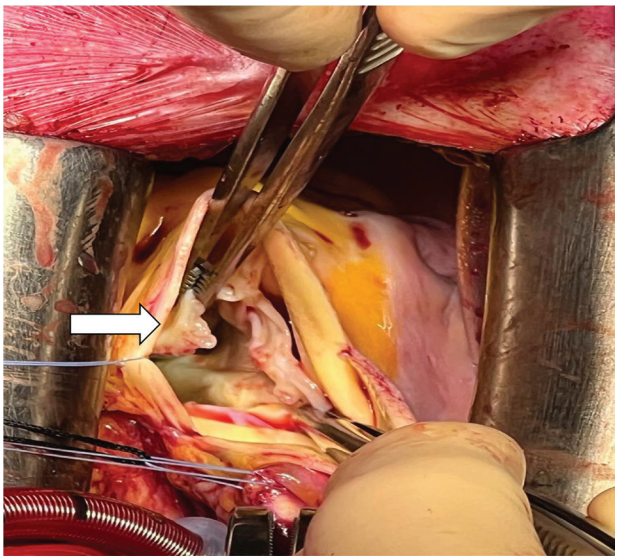

Figure 2. *Operating room photo-access performed in L-shaped median mini-sternotomy, pericardial opening, and aortotomy: in the image, the aortic valve is exposed and endocardial vegetations (indicated by the white arrow) can be observed.*

Figure 3. *Operating room photo–the native valve appears tricuspid with fibrous thickening and remodeling of the cusps on whose free margin there are appositions referable to endocarditis.*

constitutes the primary infectious focus [1]. However, our patient denies intravenous drug use.

This is believed to be the first case reported in the literature of *S. mutans* infective endocarditis complicated by spondylodiscitis that required cardiac valve replacement surgery. The case suggests a necessary reflection concerning the importance of antibiotic prophylaxis in patients undergoing dental surgery.

In the past, to prevent infective endocarditis, expert committees supported the systematic administration of antibiotics before any procedure that can induce bacteremia. More recently, the United Kingdom National Institute for Health and Clinical Excellence has recommended the discontinuation of all antibiotic prophylaxis for endocarditis. The trend in recent years toward a more restricted use of antibiotic prophylaxis also resulted from the dramatic problem of the growth of antibiotic resistance. However, animal studies suggest that antibiotic prophylaxis can be effective in preventing endocarditis [4]. The issue remains controversial and debated to this day, particularly whether antibiotic prophylaxis is truly effective in preventing infective endocarditis has yet to be determined [5,6]. The 2023 ESC guidelines recommend (class I) antibiotic prophylaxis for those procedures involving manipulation of the gingival tissue and periapical region of the tooth or perforation of the oral mucosa only in highest-risk patients (previous infective endocarditis, congenital heart disease, and prosthetic valve/material carrier) [7]. Considering the number of tooth extraction procedures the patient underwent within a short period of time, antibiotic prophylaxis could have played a crucial role in averting the succession of clinical events.

Conclusion

Although the new guidelines ESC 2023 suggest antibiotic prophylaxis only in high-risk patients, in particular situations, as in the case that we described, a tailored approach could improve the patient's outcome. Performing multiple dental procedures in a short period of time could represent a marker of a high risk for endocarditis.

What is new?

Streptococcus mutans infective endocarditis complicated by lumbar spondylodiscitis appears to be extremely rare (only one case reported in the literature). This could be the first case requiring cardiac surgery for the replacement of the infected valve.

List of Abbreviations

ESC European Society of Cardiology

Conflicts of interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

Funding

None.

Consent for publication

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

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Summary of the case

1	**Patient, gender, age**	Male, 76 year old
2	**Final diagnosis**	Infective S. mutans endocarditis complicated by lumbar spondylodiscitis
3	**Symptoms and signs**	General malaise, poor appetite, weight loss (of about 5 kg) and lower back pain radiating into the lower limbs (mostly on the right) for about 3 months, fever, and new-onset diastolic murmur
4	**Medications (generic)**	Ceftriaxone, gentamicin, paracetamol, oxycodone/naloxone and sublingual fentanyl
5	**Clinical/surgical procedure**	Replacement of the infected and dysfunctional aortic valve was performed in mini-sternotomy access.
6	**Specialty**	Cardiology

Supplementary Video 1. Transesophageal echocardiography showing severe aortic regurgitation caused by laceration of the free edge of the right coronary cusp.