

## CASE REPORT

## General Medicine

# An 82-year-old man with a prosthetic aortic valve and multimicrobial bacteremia

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## Abstract

The patient is an 82-year-old male with a past medical history of aortic valve replacement who presented to the emergency department after a fall. He developed atrial fibrillation with a rapid ventricular response and non-ST-segment-elevation myocardial infarction, leading to hospitalization. During hospital admission, the patient complained of midline thoracic back pain, and an extensive evaluation for this complaint revealed discitis and osteomyelitis with epidural abscess near the T7 and T8 vertebrae that did not result in neurological deficits and required no surgical intervention. A total of 2 blood cultures were reported positive for *Actinomyces naeslundii*, *Streptococcus mitis*, *Streptococcus oralis*, and *Abiotrophia defectiva*. A transesophageal echocardiogram showed a small vegetation on the aortic prosthetic valve with probable small vegetation on the mitral valve. He was prescribed ceftriaxone intravenously for 12 weeks, followed by amoxicillin 2 g orally twice a day for at least 12 months. *A. naeslundii* is not commonly known to cause infective endocarditis, whereas *S. mitis*, *S. oralis*, and *A. defectiva* have been reported to do so. One previous case of *A. naeslundii* was reported to cause prosthetic valve endocarditis as a single infectious agent. To our knowledge, this is the first case report for *A. naeslundii* as part of multimicrobial bacteremia leading to endocarditis, discitis, and osteomyelitis.

## KEYWORDS

*Actinomyces*, *Actinomyces naeslundii*, actinomycosis, multimicrobial bacteremia, infective endocarditis, indium WBC scan, photopenic area

## 1 | INTRODUCTION

*Actinomyces* species are branching filamentous gram-positive anaerobic bacilli that can cause actinomycosis. Actinomycetes are commensal inhabitants of the oral, intestinal, and urogenital cavities, but become pathogenic when mucosal tissue is damaged, leading to the formation of abscesses and fistulas in various anatomical sites such as the face,

bones, joints, respiratory tract, genitourinary tract, digestive tract, central nervous system, skin, and soft tissues.<sup>1-3</sup> The infectious process can mimic malignancy, tuberculosis, or nocardiosis as it spreads and presents as a cold abscess. The most common causative agent is *Actinomyces israelii*. Most *Actinomyces* spp. are facultative anaerobes, but some relevant species are strictly anaerobic, so cultures must be incubated in an anaerobic medium such as chocolate blood agar at 37°C.<sup>2</sup> Conclusion of a negative culture requires incubation of at least 10 days.

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Infections could be polymicrobial and associated with other “companion microbes” that help inhibit host defenses or reduce oxygen tension, contributing to the initiation and development of infection.<sup>2</sup>

## 2 | CLINICAL PRESENTATION

An 82-year-old man presented to the emergency department after a fall with complaints of fatigue, generalized weakness, lightheadedness that worsened with exertion, orthopnea, and an inability to ambulate >20 feet without falling short of breath. A review of the gastrointestinal symptoms included gastroesophageal reflux disease, decreased appetite, nausea, non-bilious emesis, and indigestion. The patient denied headache, neck pain, chest pain, upper respiratory infection symptoms, abdominal pain, hematemesis, or chills. His past medical history was significant for aortic prosthetic valve replacement, coronary artery bypass graft, and coronary artery disease, with no history of recent dental procedures.

In the emergency department, a chest x-ray was obtained that revealed possible hilar congestion, and community-acquired pneumonia was considered. Two sets of blood cultures were collected. Empirically, ceftriaxone 1 g and 1 dose of azithromycin 500 mg were administered intravenously. Azithromycin was discontinued.

The patient's vital signs included an initial temperature of 36.5°C, pulse of 110 beats per minute, blood pressure of 97/68 mmHg, and oxygen saturation of 98% on 2 L nasal cannula. On exam, he was an awake, alert, chronically ill-appearing, thin, elderly man in no acute distress, speaking in complete sentences. The heart exam revealed a 2/6 systolic murmur, no rubs, and no gallops. The patient's WBC count was 15,100 cells/mm<sup>3</sup> in addition to the following: RBC count, 3.1 million/mm<sup>3</sup>; hemoglobin, 8.6 gm/dL; hematocrit, 25.8%; platelets, 121,000 × 10<sup>9</sup>/L; neutrophil, 92%; potassium, 2.4 mEq/L; blood urea nitrogen, 34 mg/dL; creatinine, 1.5 mg/dL; beta natriuretic peptide, 29,174 pg/mL; and troponin I high sensitivity level, 3532.3 ng/L (0.0–58.9 ng/L). ECG showed ST depression and T wave inversions in V4, V5, V6, and aVL. He developed atrial fibrillation with a rapid ventricular response during his emergency department evaluation. He was administered diltiazem, heparin, and potassium. The patient was admitted for evaluation of his non-ST-segment-elevation myocardial infarction (NSTEMI) and atrial fibrillation with the rapid ventricular response.

During hospitalization, the patient then complained of mid-back pain, which worsened when lying down flat and radiated from his sides to the front of his abdomen and chest. Back examination showed reproducible tenderness on percussion over the thoracic spine. A workup was initiated with an enhanced magnetic resonance imaging of the thoracic spine, shown as Figure 1A,B, which suggested discitis and osteomyelitis of the T7 and T8 vertebrae with subjacent prevertebral soft tissue signal and infectious process involving the body of the T4, T5, and T6 vertebrae with subjacent soft tissue signal. A total of 2 blood cultures were reported positive for *Actinomyces naeslundii*, *Streptococcus mitis*, *Streptococcus oralis*, and *Abiotrophia defectiva*. The ceftriaxone dose was increased to 2 g intravenously daily. Ampicillin and sulbactam 3 g intravenously every 12 hours were added. Maxillo-

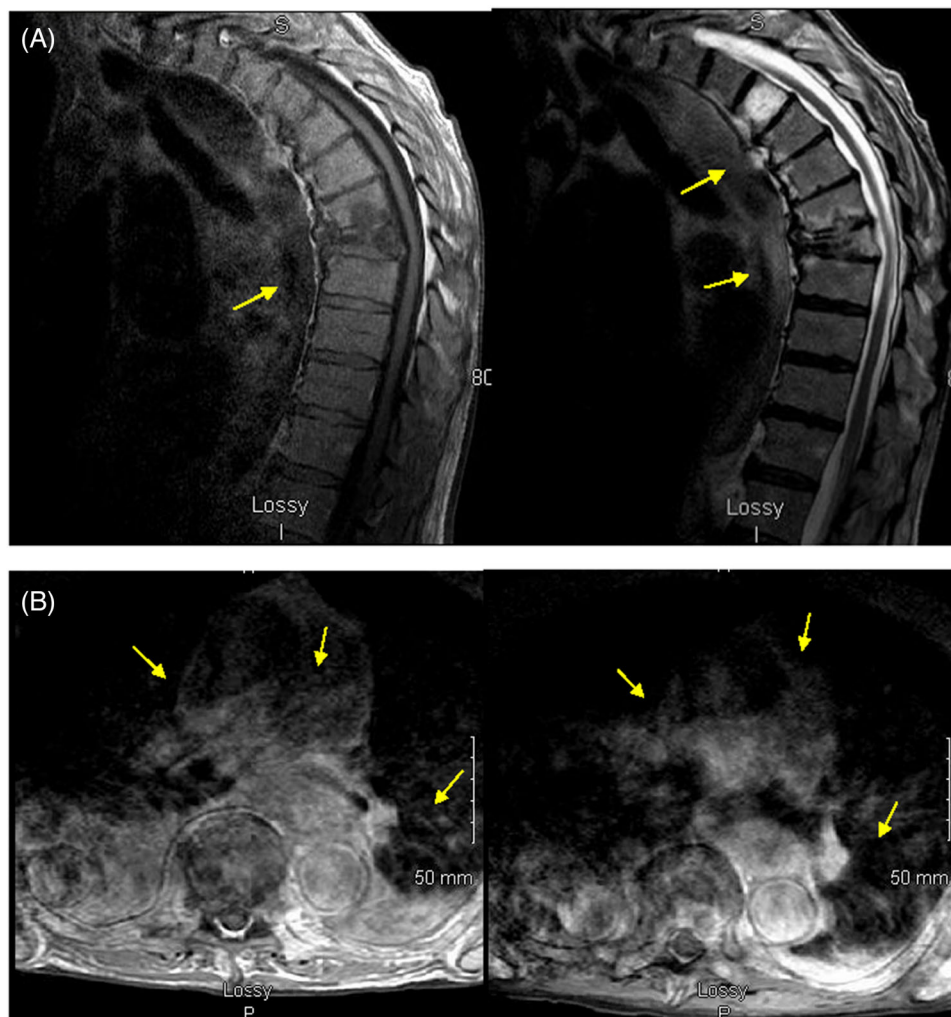
facial computed tomography (CT) scan showed no infectious process. Diagnosis of infective endocarditis was suspected, and the workup was expanded to a transesophageal echocardiogram, which revealed a small vegetation on the aortic valve prosthesis with probable small vegetation on the mitral valve, a normal functioning aortic valve bioprosthesis with no evidence of root abscess, and a severely depressed left ventricular ejection fraction. Nuclear medicine bone scan was performed to detect an occult infection, which revealed an abnormal focal radiotracer activity in the regions of T7 and T8, shown in Figure 2. Indium white blood cell (WBC) scan was performed to rule out other sites of infection that suggested an aggressive infectious process in the regions of T7 and T8, shown in Figure 3. Elevated troponin was thought to be attributed to NSTEMI with possible contributors including atrial fibrillation and endocarditis. A conservative approach was taken, and NSTEMI was medically treated with antiplatelet therapy and  $\beta$ -blockers. Troponin levels dropped to 934 ng/L on the third day of admission. The patient also experienced a period of dysphagia, and a subsequent swallow study revealed severe esophageal dysmotility with distal esophageal spasm, reflux, and mild proximal esophageal dilation. He was diagnosed with multimicrobial infective endocarditis, discitis, and osteomyelitis with *A. naeslundii*, *S. mitis*, *S. oralis*, and *A. defectiva*. A total of 3 sets of follow-up blood cultures were obtained on days 7 and 8 after admission and were reported as negative. Upon discharge, the patient was prescribed ceftriaxone 2 g intravenously for 12 weeks, followed by amoxicillin 2 g orally twice a day for at least 12 months or possibly indefinitely. His condition improved, and he was discharged home.

## 3 | DISCUSSION

Based on past literature, multimicrobial bacteremia with *A. naeslundii* along with *S. mitis*, *S. oralis*, and *A. defectiva* causing prosthetic valve endocarditis, discitis, and osteomyelitis have not been previously reported. Only 1 prior case of prosthetic valve endocarditis caused by *A. naeslundii* as a single etiologic agent has been reported.<sup>4</sup> Actinomycosis most commonly presents as cervicofacial lesions; however, the CT maxillofacial scan ruled out oral dental involvement in this patient.

*Actinomyces* spp. can be found worldwide and primarily affects middle-aged individuals and is 2 to 4 times more common in men.<sup>1,5,6</sup> However, the rise in intrauterine device use has also led to an increased incidence in women. In addition, individuals of lower socioeconomic status are more likely to be infected.<sup>7</sup>

*Actinomyces* bacteremia is described well in the dental literature, but it is not commonly known to cause infective endocarditis. The other known case of *A. naeslundii* causing prosthetic valve endocarditis was prompted by recent dental work and poor oral hygiene; in contrast, this patient did not have an oral infectious process. Although the exact pathogenesis is unknown in this patient, it may include transient bacteremia leading to infective endocarditis with valve vegetations and subsequent embolizing to the thoracic spine. Another potential site of origin may have been the esophagus. As the patient developed dysphagia, a subsequent barium swallow study revealed an irregular



**FIGURE 1** (A) T1-weighted (left) and T2-weighted (right) sagittal images show abnormal signal intensity of the T7 and T8 levels with extensive subjacent prevertebral soft tissue phlegmonous changes, indicated by the arrows. (B) T1-weighted (left) and T2-weighted (right) axial images show abnormal signal intensity of the T7 and T8 levels with extensive subjacent prevertebral soft tissue phlegmonous changes, indicated by the arrows. S, superior; I, inferior; P, posterior

appearance of the distal esophagus with spasm, reflux, and multiple projections suspicious for diverticula, suggesting that *Actinomyces* bacteremia may have originated from the esophagus.

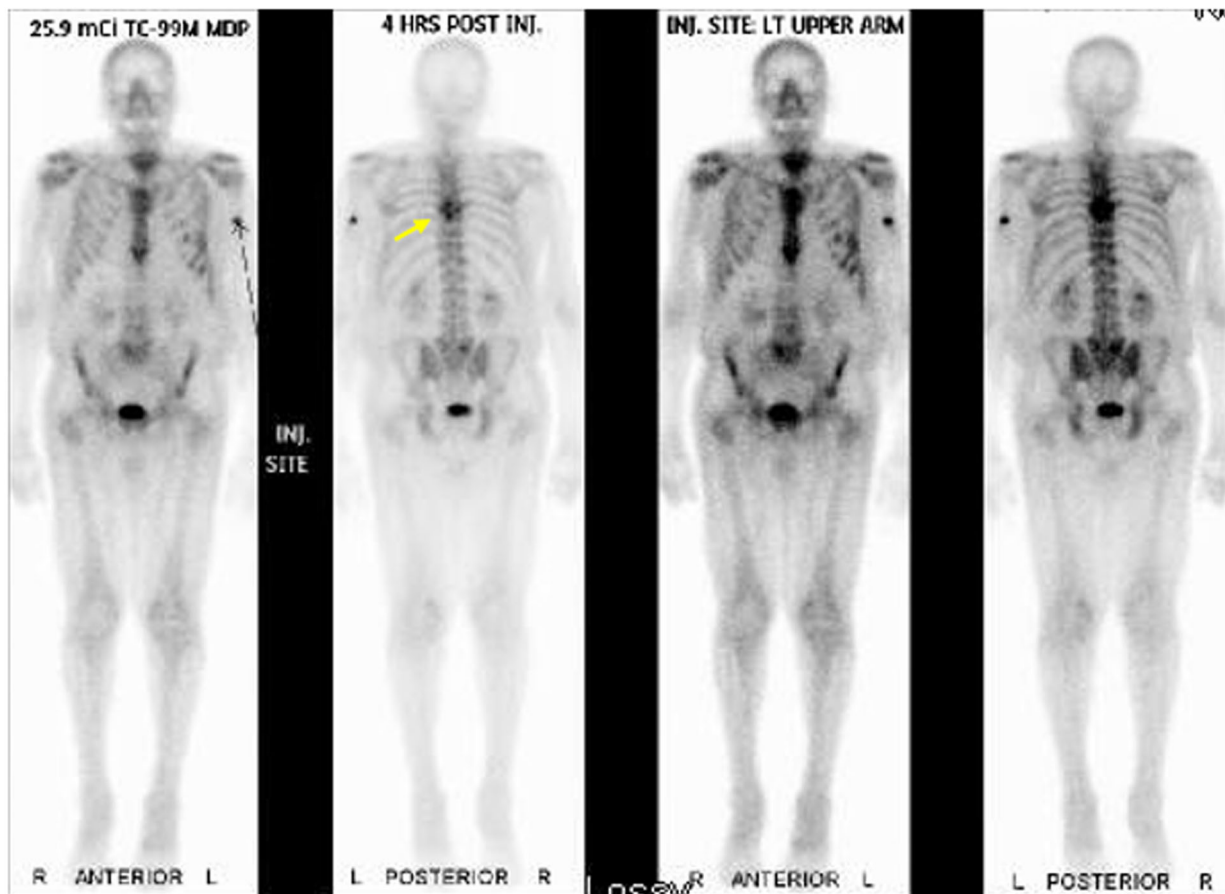
*Actinomyces* spp. in the dental or oral cavities are commensal but become pathological when compounded by periodontal disease and poor dental hygiene.<sup>6</sup> Specifically, the mucosal barrier would be invaded by a predisposing factor, such as plaque, calculus, or periodontitis.<sup>6</sup> *Actinomyces* bacteremia is also possible after dental procedures, such as molar extraction or as a complication of maxillofacial trauma.<sup>8</sup>

Drugs of choice are penicillin or amoxicillin for 6 to 12 months. Drug resistance is not considered an issue; *Actinomyces* spp. are sensitive to  $\beta$ -lactam antibiotics, particularly penicillin G or amoxicillin.<sup>2</sup> As third-generation cephalosporins are not frequently used, it is notable that some *Actinomyces* spp. are resistant to ceftriaxone.<sup>2</sup> This patient was empirically started on ceftriaxone, to which he responded well, and was continued because of its once-daily dosing, minimal adverse-effect

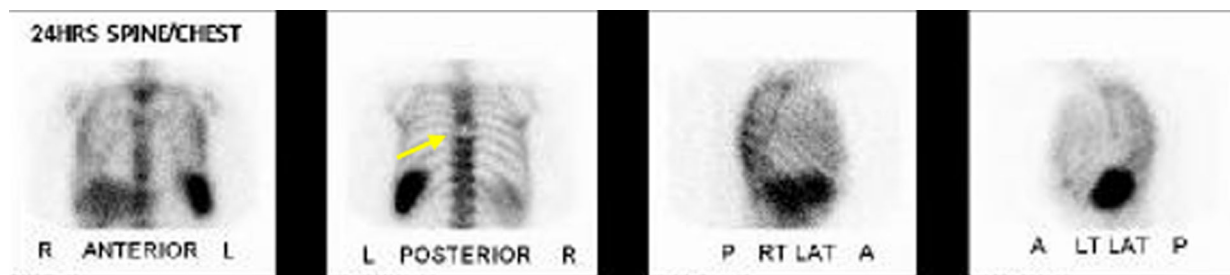
profile, and cost-effectiveness. Piperacillin–tazobactam, imipenem, and meropenem are believed to be effective, but the use of such broad-spectrum antibiotics should be limited to avoid the emergence of resistant flora.<sup>2</sup> Macrolides and clindamycin have been used successfully as alternatives.<sup>2</sup> Oxacillin, cloxacillin, cephalexin, and fluoroquinolones are not usually believed to be effective.<sup>2</sup> Doxycycline has shown clinical successes but is considered to have poor activity against *Actinomyces* spp.<sup>2</sup> It is not helpful to add  $\beta$ -lactam inhibitors, such as clavulanic acid as *Actinomyces* spp. that do not produce  $\beta$ -lactamases.<sup>2</sup>

#### 4 | CONCLUSION

Infections with *Actinomyces* spp. are rare and generally associated with cervicofacial mycetomas. *Actinomyces* spp. rarely cause infectious endocarditis. This case report demonstrates that *A. naeslundii* can be a part of multimicrobial bacteremia causing prosthetic valve



**FIGURE 2** A nuclear medicine bone scan of increased focal radiotracer activity at the T7 and T8 levels. L, left; R, right; LT, left; MCI, millicuries; TC-99M MDP, Technetium-99M Methylene Diphosphonate; INJ, injection



**FIGURE 3** Indium white blood cell (WBC) scan shows photopenic area at the T7 and T8 levels consistent with an aggressive infectious process, such as actinomycosis. L, left; R, right; RT, right; LT, left; LAT, lateral; A, anterior; P, posterior

endocarditis, discitis, and osteomyelitis. Although this patient had a multimicrobial infectious process, it is not classified as polymicrobial endocarditis; to be considered polymicrobial, at least 2 microorganisms should be cultured in at least 3 blood samples or isolated from infected tissues simultaneously or consecutively after 7 days of obtaining the initial positive blood culture while ruling out other clinical infections.<sup>9</sup> If infectious endocarditis is suspected, it is imperative for emergency department practitioners to order at least 3 sets of blood cultures before administration of antibiotics and inform the microbiology laboratory to hold cultures for more extended periods.

Also, in geriatric populations, falls are commonly associated with the infectious process; therefore, complaints such as back pain should be pursued to initiate diagnostic and therapeutic interventions in a timely fashion.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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## REFERENCES

1. Cintron JR, Del Pino A, Duarte B, Wood D. Abdominal actinomycosis. *Dis Colon Rectum*. 1996;39(1):105-108. [10.1007/BF02048278](https://doi.org/10.1007/BF02048278)
2. Valour F, Sénéchal A, Dupieux C, et al. Actinomycosis: etiology, clinical features, diagnosis, treatment, and management. *Infect Drug Resist*. 2014;7:183-197. [10.2147/IDR.S39601](https://doi.org/10.2147/IDR.S39601)
3. Bonnefond S, Catroux M, Melenotte C, et al. Clinical features of actinomycosis. *Medicine (Baltimore)*. 2016;95(24):e3923. [10.1097/MD.0000000000003923](https://doi.org/10.1097/MD.0000000000003923)
4. Cortes CD, Urban C, Turett G. Actinomyces naeslundii: an uncommon cause of endocarditis. *Case Rep Infect Dis*. 2015;2015:602462. [10.1155/2015/602462](https://doi.org/10.1155/2015/602462)
5. Ferrari TC, Couto CA, Murta-Oliveira C, Conceição SA, Silva RG. Actinomycosis of the colon: a rare form of presentation. *Scand J Gastroenterol*. 2000;35(1):108-109. [10.1080/003655200750024623](https://doi.org/10.1080/003655200750024623)
6. Thukral R, Shrivastav K, Mathur V, Barodiya A, Shrivastav S. Actinomyces: a deceptive infection of oral cavity. *J Korean Assoc Oral Maxillofac Surg*. 2017;43(4):282-285. [10.5125/jkaoms.2017.43.4.282](https://doi.org/10.5125/jkaoms.2017.43.4.282)
7. Sharma S, Hashmi MF, Valentino III DJ. Actinomycosis. *StatPearls*. StatPearls Publishing; 2022. Accessed May 10, 2022. <http://www.ncbi.nlm.nih.gov/books/NBK482151/>
8. D'Amore F, Franchini R, Moneghini L, et al. Actinomycosis of the tongue: a case report and review of literature. *Antibiotics*. 2020;9(3):124. [10.3390/antibiotics9030124](https://doi.org/10.3390/antibiotics9030124)
9. García-Granja PE, López J, Vilacosta I, et al. Polymicrobial infective endocarditis: clinical features and prognosis. *Medicine (Baltimore)*. 2015;94(49):e2000. [10.1097/MD.0000000000002000](https://doi.org/10.1097/MD.0000000000002000)

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