



Case Report

Spondylodiscitis due to anaerobic bacteria *Veillonella parvula*: Case report and literature review

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ABSTRACT

Background: While pyogenic spondylodiscitis due to Gram-positive aerobic bacteria and its treatment is well known, spondylodiscitis caused by anaerobic Gram-negative pathogen is rare. In particular, the spondylodiscitis caused by *Veillonella* species is an absolute rarity. Thus no established management recommendations exist.

Case Description: A case report of a 79-year-old man with spondylodiscitis caused by *Veillonella parvula* with intramuscular abscess collection managed conservatively with stand-alone antibiotic therapy without a spinal stabilization procedure. A review of literature of all reported spondylodiscitis caused by *Veillonella* species was performed. After 3 week-intravenous therapy with the ceftriaxone in combination with the metronidazole followed by 3 weeks per oral therapy with amoxicillin/clavulanate, the complete recovery of the patient with the *V. parvula* infection was achieved.

Conclusion: Treatment of the spondylodiscitis caused by *Veillonella* species should contain a beta-lactam with beta-lactamase inhibitor or third-generation cephalosporine. Six weeks of treatment seem to be sufficient for the complete recovery of the patient.

Keywords: Infection, Low back pain, Spine, Spondylodiscitis, *Veillonella*

INTRODUCTION

Spondylodiscitis, a term used for vertebral osteomyelitis, spondylitis, and discitis, is a severe disease, which occurs in patients with increasing age and risk factors such as diabetes, immunodeficiency, malignancy, intravenous drug use, recent gastrointestinal procedures, dental diseases/procedures, and renal failure. They can be causative to severe events such as meningitis,^[24] endocarditis,^[20] obstructive pneumonia,^[18] prosthetic joint infection,^[21] and bacteremia.^[19] According to literature incidence of spondylodiscitis is increasing: from 2.2 to 5.8/100,000 person between 1995 and 2008 in Denmark, with an average adjusted annual increase of 7%^[16] and incidence increased from 5.3 to 7.4/100,000 population/year over 2007–10 in Japan.^[1] This has been attributed to an aging population with inherent co-morbidities, and improved case ascertainment, particularly related to the widespread use of magnetic resonance imaging (MRI).^[1,16] 70–80% of pyogenic infections are caused by Gram-positive aerobic pathogens

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including *Staphylococcus aureus/epidermidis* or *Streptococcus spp.* Only 5% of infections are due to anaerobic pathogens.^[6,11] In particular, spondylodiscitis caused by *Veillonella* species is an absolute rarity.

Veillonella species are small, non-motile, non-fermentative, strictly anaerobic, Gram-negative cocci. They form part of the normal flora of the gastrointestinal tract, urogenital tract, and respiratory tract. *Veillonella* uses only a few glucose metabolites, especially lactic acid for energy production/consumption. That is why the strictly anaerobic conditions are essential for maintaining the growth of the bacterium.^[9] Thus, they are often isolated from the oral cavity, for example, in periodontitis or sinusitis.^[14] There are six known species of *Veillonella*: *Veillonella parvula*, *Veillonella alcalescens*, *Veillonella atypica*, *Veillonella dispar*, *Acidaminococcus fermentans*, and *Megasphaera elsdenii*. Only *V. parvula* and *V. alcalescens* have been isolated from clinical specimens.^[5] To identify the exact species, usually the restricted fragment-length polymorphism analysis of polymerase chain reaction (PCR) amplified 16s rDNA has to be done.^[29] Out of ten published spinal infections, only five cases specified *Veillonella* further into subspecies.

Spondylodiscitis is typically managed with antibiotics. Surgical treatment is indicated in the presence of implant-associated disease, neurological symptoms, intraspinal and epidural abscesses, signs of spinal instability, or refractory pain.^[7,26]

We present a rare case of a spondylodiscitis with intramuscular abscess collection in the psoas due to anaerobic pathogen – *V. parvula*.

We performed a search via PubMed using the search terms “*Veillonella*,” “Spondylodiscitis,” “vertebral/spinal osteomyelitis” and “spinal infection” to reveal all publications on spondylodiscitis with *Veillonella* species. Until this date, only ten cases of spinal infection caused by *Veillonella* species have been published.

CASE DESCRIPTION

A 79-year-old man presented with a 1-month history of constant lower back pain (LBP) radiating to the right thigh. The pain had been increasing over time. Movements aggravated the symptoms. The patient reported 10 out of 10 points in the visual analog scale. He was afebrile but reported intermittent chills at night. There was no history of recent gastrointestinal procedures, dental diseases/procedures, oncological diseases, immunodeficiency, diabetes, or intravenous drug use.

On examination, the lumbar paravertebral muscles were tender, hip flexion on the right side revealed slightly paresis (M4/5), and minimal movement of the spine or the limbs was accompanied by severe pain.

On admission, the inflammation markers were elevated (C-reactive protein [CRP] 54,4 mg/l, white blood cells [WBC] count = 13,6 G/l, platelet count = 344 G/l). X-ray and a ct-scan of the lumbar spine revealed destruction of the intervertebral space L3/4 and the corresponding endplates. Because of the bony destruction, the L4-body presented an anterior wedging. The standing X-ray revealed a segmental kyphosis as a result of the wedge deformity of L4-body and the collapsed disc space L3/4 [Figure 1]. Blood cultures taken on admission were negative. During the next 12 h, the pain got worse, and the patient developed urinary retention, which required a bladder catheterization. MRI-scan of the lumbar spine 12 h after admission revealed an advanced spondylodiscitis L3/4 with a liquefied disc, blurred endplates, and a collection of two abscesses in the right psoas muscle. Furthermore, a diffuse signal enhancement in both psoas muscles and the autochthone muscles from L3 to S1 [Figure 2] was shown. A ct-guided fine needle biopsy was performed, and the empiric intravenous antibiotic therapy with amoxicillin/clavulanate 2.2 g 4 times daily intravenously (iv.) was initiated. As the results of the biopsy did not show any growth of bacteria amoxicillin/clavulanate was stopped. After an antibiotic-free interval of 5 days (9 days after the CT-guided biopsy), an open transpedicular biopsy was performed. On the same day, iv. amoxicillin/clavulanate was resumed. The bacteriological examinations on aerobic/anaerobic cultures showed no results. The eubacterial PCR (16S rDNA-sequencing) revealed *V. parvula* as the causing pathogen. The antibiotic therapy was switched to ceftriaxone 2 g iv. and metronidazole 500 mg i.v. A CT of the abdomen was



Figure 1: An X-ray/CT scan of the lumbar spine revealed the destructive pathological changes in the intervertebral space as well as in the adjacent plates of the L3 and L4 (ventrally>dorsally) resulting in the segmental kyphosis in the segment L3/4 on the lateral view. The loss of the disc space L3/4, especially on the right side could be seen in the anteroposterior scans/radiographs.



Figure 2: An MRI of the lumbar spine showing an advanced spondylodiscitis L3/4 with the fluid signal in the disc as well as the collection of two abscesses (white arrows) in the right Psoas major muscle with the diffuse signal enhancement.

performed on day 21, which showed increasing abscess collection in the right psoas major of 4.1×4.6 cm [Figure 3] but no signs of intraabdominal malignancy. A drain was inserted into the right psoas muscle, and the abscess formation was subsequently drained for 4 days.

Abnormal high calcium levels revealed an incidental parathyroid adenoma, which had to be removed surgically. Because of the additional surgery, the patient was discharged on day 27. On day 39, the patient presented himself in good health and pain-free to our outpatient clinic. Inflammation markers had normalized (CRP 2 mg/l, normal WBC count). A small residual abscess collection in the right psoas muscle was discovered on CT scan. The CT-scans and the standing X-rays of the lumbar spine showed no instability of the spine without any progression of the kyphotic deformity L3/L4. The antibiotics were switched to amoxicillin/clavulanate 1 g po 3 times daily for another 2 weeks, completing 6 weeks of the antibiotic treatment altogether. The patient presented himself to the last follow-up at day 95 in perfect shape, without any symptoms, and further changes in the lumbar spine X-rays [Figure 4].

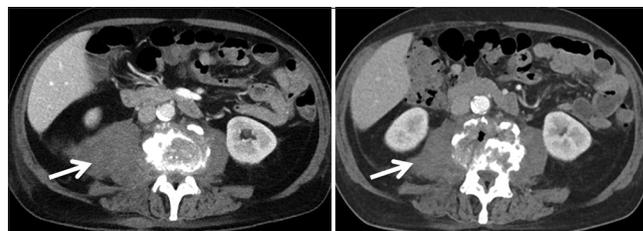


Figure 3: Abscess collection (white arrows) between the right Psoas major and inferior pole of the right kidney (left: Day 21, right: 6 weeks later).

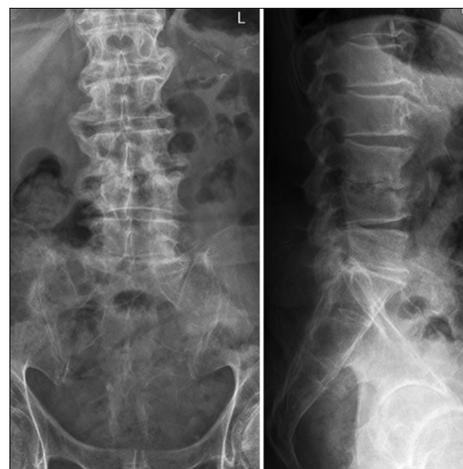


Figure 4: Standing X-ray of the lumbar spine, Follow-up: day 95.

There was no external immobilization of the spine during the whole duration of the treatment.

RESULTS

Cases of spondylodiscitis caused by *Veillonella* species are summarized in [Table 1].

The first to report *Veillonella* spondylodiscitis was in 1983 Barnhart *et al.*^[3] He reported a case of a 31-year-old male who had a history of a cervical spine operation who developed early post-operative *Veillonella* infection in the cervical spine caused by a iatrogenic lesion of the esophagus. The patient recovered clinically and biochemically thoroughly after drainage of the retropharyngeal abscess and antibiotic treatment with penicillin iv. for 6 weeks.

Singh and Yu^[30] reported a 61-year-old woman with the chronic use of prednisone for rheumatoid arthritis and Sjogren's disease. She presented with LBP and fever. Spondylodiscitis of L5/S1 was diagnosed radiologically. The patient underwent a microdiscectomy L5/S1 with a curettage end iliac crest grafting. Blood and tissue cultures were positive for *V. parvula*. Treatment consisted of 6-week

Table 1: Summary of cases of spondylodiscitis caused by *Veillonella* species.

Author/ Study	Age/ Sex	Diagnosis	Symptoms	Risk factors	Culture/ Pathogen	Antibiotics	Surgery	outcome Follow up
Barnhart et al. (1983) ^[3]	31/M	Cervical spine spondylodiscitis	C-spine pain, Odynophagia, Fever for 72 h	Iatrogenic oesophageal rupture	Tissue/ <i>Veillonella sp.</i>	Penicillin 6 w	Yes	Cure/ 6 w
Singh and Yu (1992) ^[30]	61/F	Spondylodiscitis L5/S1	LBP 1 w	Rheumatoid arthritis, Sjögren's disease (on steroids)	Blood+ Tissue/ <i>V. parvula</i>	Ceftriaxone 6 w	Yes	Cure/ 12 w
Hidalgo et al. (2000) ^[12]	70/M	Spondylodiscitis L3/L4	LBP 4 w	None	Tissue/ <i>V. parvula</i>	NS	No	Cure/NS
Bongaerts et al. (2004) ^[4]	74/M	Spondylodiscitis Th12/L1	LBP 16 w	Dental infection	Tissue/ <i>V. parvula</i>	Penicillin 6 w	No	Cure/NS
Isner-Horobeti et al. (2006) ^[15]	27/M	Spondylodiscitis L4/L5	LBP 3 w	None	Tissue/ <i>Veillonella sp.</i>	Amoxicillin 11 w	No	Cure/NS
Marriot et al. (2007) ^[22]	55/M	Spondylodiscitis L2/L3	LBP 8 w	Colon biopsy	Blood+ Tissue/ <i>V. parvula</i>	Ceftriaxone 6 w, then Amoxicillin/Clavulanate 6 w	No	Cure/ 6 w
Kishen et al. (2012) ^[17]	76/F	Spondylodiscitis L1/L2	LBP 12 w	None	Blood+ Tissue/ <i>Veillonella sp.</i>	Cefotaxime+Metronidazole 4 w, then Amoxicillin/Clavulanate+ Metronidazole 6 w	Yes	Cure/NS
Chen et al. (2016) ^[8]	68/M	Spondylodiscitis L1/L2, Epidural Abscess	LBP 3 w	Sinus squamous cell carcinoma, postradiotherapy mucositis	Blood+ Tissue/ <i>V. parvula</i>	Amoxicillin/Clavulanate 6 w	Yes	Cure/1 y
Baker and Allyn (2017) ^[2]	67/M	Spondylodiscitis L4/L5	LBP 2 w	Traumatic dental dislodgement	Blood+ Tissue/ <i>Veillonella sp.</i>	Ceftriaxone 6 w	No	Cure/ 6 w
Gouze et al. (2018) ^[10]	35/F	Spondylodiscitis	LBP NS	None	Tissue/ <i>V. parvula</i>	NS	No	Cure/NS
Ziga M (2021)	79/M	Spondylodiscitis L3/L4	LBP 4 w	None	Tissue/ <i>V. parvula</i>	Ceftriaxone+ Metronidazole 3 w, then Amoxicillin/Clavulanate 3w	No	Cure/ 12 w

M: Male, F: Female, w: Week, LBP: Lower back pain, NS: Not specified, *V. parvula*: *Veillonella parvula*

antibiotic therapy with the ceftriaxone. The patient showed clinically and labor chemically no signs of infection in 12-week follow-up.

Another case presented by Kishen et al.^[17] involved a 76-year-old female with LBP for 12 weeks. She had no risk factors for infection. X-ray and lumbar MRI-scan showed instability due to discitis on level L1/L2. Blood and tissue cultures were positive for *Veillonella* species.

The 2-step anterior-posterior stabilization was performed. After 4-week antibiotic therapy with cefotaxime and metronidazole, followed by 6-week treatment with the amoxicillin/clavulanate and metronidazole, the patient recovered completely. Chen et al.^[8] reported a 68-year-old male with LBP for 3 weeks duration. The patient had oral mucositis due to radiotherapy due to sinus squamous cell carcinoma presumably as focus of infection. A MRI scan revealed a spondylodiscitis of L1/L2 with an epidural

abscess. The surgical evacuation of the empyema with debridement was performed. The blood and tissue cultures were both positive for *V. parvula*. 6-week antibiotic therapy with amoxicillin/clavulanate was applied. The patient presented himself completely recovered at 1 year follow-up.

In the previous four cases, surgical therapy had to be performed additionally to antibiotic treatment.

In the next six cases, stand-alone antibiotic therapy was sufficient to cure the patients completely.

Bongaerts *et al.*^[4] reported a 74-year-old man with a 4-month history of LBP and poor dental status. The MRI showed a discitis of T12/L1 and the surrounding tissue which proved the *V. parvula* as the pathogen in tissue cultures. The infection was treated with 6 weeks of iv. penicillin. Marriott *et al.*^[22] presented a 55-year-old male patient with LBP and night sweats 2 months after a colonoscopy and rectal biopsy. *V. parvula* was isolated from the blood and tissue obtained by a percutaneous biopsy taken from the L2/L3 disc after the MRI-diagnostic was done. The patient underwent treatment with iv. ceftriaxone for 6 weeks, followed by oral amoxicillin/clavulanate for a further 6 weeks. Baker and Allyn^[2] presented a case of a 67-year-old man with traumatic dental dislodgment 2 weeks before the onset of LBP. Spondylodiscitis of L4/5 was diagnosed and *Veillonella* species isolated in tissue and blood cultures. The antibiotic therapy was done with the ceftriaxone for 6 weeks and full recovery was achieved.

A source of infection could be identified in the previous three cases: In the first case, poor dental status with periodontitis was considered the entry point. In the second case, the colonoscopy with the rectal biopsy was suspected as the cause, and in the third case, it was traumatic dental dislodgment. On the other hand, three cases of healthy patients without the risk factors suffering the *Veillonella* spondylodiscitis have also been published. Isner-Horobeti *et al.* published the first such case.^[15] He reported on a 27-year-old man without any risk factors who was diagnosed with L4/L5 spondylodiscitis. The *Veillonella* species was confirmed in tissue culture, and the patient was treated with amoxicillin for 11 weeks. Similar cases were reported by Hidalgo *et al.*^[12] and Gouze *et al.*^[10] In both cases, *V. parvula* was the cause of spondylodiscitis in healthy patients. The infection was treated with antibiotics alone.

In five cases out of ten known in literature, the length of antibiotic therapy was 6 weeks. In other three cases, the length of the therapy was 11 or 12 weeks. In two cases, the length of the therapy was not specified. In all ten cases, the beta-lactam antibiotics in different grades were used, in one case in combination with the metronidazole.

DISCUSSION

We report a severe case of spondylodiscitis and abscess of the psoas muscle caused by *V. parvula*. To the best of our knowledge, this rare anaerobic pathogen has only been reported in ten further cases previously [Table 1]. Risk factors for infection or the specific treatment algorithms are not known because of the lack of evidence but can be based on case reports. We hypothesize that lesions of the gastrointestinal tract or destruction of the oral mucosa are risk factors for spondylodiscitis with *Veillonella* species. We could not find association with gastrointestinal malignomas since this was only reported in one case. The infection can occur in healthy patients as well.^[13,17]

Once detected, the *Veillonella* species are mostly part of the polymicrobial processes or/and are often considered contamination and non-pathogenic.^[14] Based on our observations detection of *Veillonella* in cultures from tissue biopsies or blood cultures should raise concern of spondylodiscitis.

As the *Veillonella* grows slowly and under strictly anaerobic conditions, it can take 4–5 days until diagnosis and antibiotic resistance is done. Due to the lack of literature, there is no specific antibiotic strategy to treat the infection.

Veillonella species respond well to penicillin therapy and *in vitro* to cephalosporins, ceftriaxone, clindamycin, metronidazole, and chloramphenicol. On the other hand, the resistance was shown to vancomycin, tetracycline, aminoglycoside, and ciprofloxacin.^[23,27,28,31,32] Nevertheless, in a study published by Nyfors *et al.*, the *Veillonella* species isolated from the oral cavities showed high resistance to penicillin G (MIC, >2 µg/ml).^[25] These penicillin G-resistant isolates had reduced susceptibility to ampicillin or amoxicillin but were susceptible to the combination of amoxicillin and clavulanate.

Our patient was cured with a 6-week antibiotic therapy with beta-lactams. (Ceftriaxone+Metronidazol for 3 weeks, Amoxicillin/Clavulanate for 3 weeks). The same therapy approach was also reported by others. Thus, based on case reports and our experience we recommend treatment of spondylodiscitis caused by *Veillonella* species with betalactame plus beta-lactamase-inhibitor for 6 weeks.

The primary source of *V. parvula* in the presented case remains unclear as the patient had no risk factors or interventions performed (good dental status, no diabetes, good renal functions). As *Veillonella* is a pathogen from the gastrointestinal tract, source of seeding is suggested to be from the oral cavity or intestine. We advice on performing radiographs of the abdomen (CT-scan and colonoscopy) and visitation of a dentist to rule out malignancy other abscesses.

Even though this was also performed in our patient primary source could not be identified.

CONCLUSION

We present a case of spondylodiscitis caused by *V. parvula* with good clinical outcome. Surprisingly no risk factors and predispositions such as instrumentation or diseases of the digestive tract could be identified. We advise physicians to maintain a high level of suspicion when *Veillonella* is discovered on cultures or by PCR from biopsies. Treatment should contain a beta-lactam with beta-lactamase inhibitor or third-generation cephalosporine. Six weeks of treatment seem to be sufficient for the complete recovery of the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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