A 60-Year-Old Man with Gingivitis and Poorly Controlled Diabetes Developing Low Back Pain 1 Week Following Recovery from COVID-19 Diagnosed with Spinal Abscess Due to *Streptococcus oralis*

**Patient:** Male, 60-year-old

**Final Diagnosis:** Pyogenic spinal infection

**Symptoms:** Low back pain • neck pain

**Medication:** —

**Clinical Procedure:** Fine needle biopsy • magnetic resonance imaging

**Specialty:** Infectious Diseases • Rehabilitation

**Objective:** Rare disease

**Background:** *Streptococcus oralis* (*S. oralis*) is a gram-positive bacterium and component of the oral microbiota that can rarely cause opportunistic infection in the immunosuppressed. This report presents a 60-year-old man from Hong Kong with gingivitis and poorly controlled diabetes who visited his chiropractor with low back pain 2 weeks following mild COVID-19 and was diagnosed with paraspinal, psoas, and epidural abscess due to *S. oralis*.

**Case Report:** The patient tested positive for COVID-19 when asymptomatic, then had a mild 10-day course of the illness, followed by low back pain 1 week later, prompting him to visit his primary care provider, who diagnosed sciatica and treated him with opioid analgesics. He presented to a chiropractor the following week, noting severe low back pain with radiation into the gluteal regions and posterior thighs, difficulty with ambulation, and mild neck pain. Considering the patient’s diabetes, widespread symptoms, and weakness, the chiropractor ordered whole-spine magnetic resonance imaging, which suggested possible multifocal spinal abscess and referred him urgently to a spine surgeon. The surgeon conducted testing consistent with bacterial infection, and referred to an infectious disease specialist, who confirmed *S. oralis* spinal infection via lumbar paraspinal needle biopsy and culture. The patient was first treated with oral antibiotics, then intravenous antibiotics in a hospital. Over 4 weeks, his spinal pain improved, and laboratory markers of infection normalized.

**Conclusions:** This case illustrates an opportunistic pyogenic spinal infection including paraspinal, psoas, and epidural abscesses caused by *S. oralis* in an immunocompromised patient following COVID-19 illness.

**Keywords:** Back Pain • Chiropractic • COVID-19 • Epidural Abscess • Psoas Abscess

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Background

Spinal infections can affect the intervertebral disc, body, spinal canal, or adjacent paraspinal tissue [1,2]. When caused by bacteria other than tuberculosis, they are termed pyogenic spinal infections [3]. Patients with pyogenic spinal infection typically present with neck and/or back pain [1,3]. However, such patients may be a challenge to diagnose as only about half will present with a fever, and only a minority have neurologic deficits [1,3]. Pyogenic spinal infection is important to detect early as it has a mortality rate of 2-20% even in developed countries [1].

Pyogenic spinal infections affect between 1: 100 000 and 1: 250 000 individuals per year [4]. Well-described risk factors for pyogenic spinal infection include immunocompromise, diabetes mellitus, substance abuse, chronic infection such as HIV, malnutrition, long-term systemic steroid use, and spine surgery [1,4]. Pyogenic spinal infections are most common in the lumbar region [3], and are multifocal in 35% of cases, affecting more than 1 spinal region [5].

Streptococcus oralis is a gram-positive bacterium that is a member of the Streptococcus mitis family, also called the Streptococcus viridans group, and is part of the oral microbiota [6]. S. oralis can spread via the bloodstream to the brain, spinal cord, and spine, which may be triggered by spinal instrumentation or anesthesia [7] or dental infection [8]. This bacterium can cause opportunistic infections in immunocompromised individuals [9,10].

According to a Search of PubMed and Google Scholar on August 17, 2022, and citation tracking of identified articles, 15 cases of pyogenic spinal infection occurring in patients with Coronavirus Disease 2019 (COVID-19) had been published [11-17]. Authors have suspected that patients with COVID-19 may be more susceptible to pyogenic spinal infections due to immune dysregulation, immune suppression, or lymphocytopenia [11-15]. However, in one series, the authors suggested spinal infection arose due to immune suppression induced by a medication used to treat COVID-19 (tocilizumab) [16]. In general, opportunistic secondary infections are common in those with COVID-19, and a recent systematic review found that 16% of COVID-19 patients develop a bacterial superinfection [18].

As chiropractors are portal of entry providers that often manage spinal pain [19], they may rarely encounter patients with spinal infection [20-25]. However, given the potential rise in cases of pyogenic spinal infections related to COVID-19 [11], an aging population, drug use, or spine procedures [3], and considering these patients may present with back or neck pain as an isolated finding [1,3], it is possible patients with this condition could seek chiropractic care. Accordingly, we present a case of pyogenic spinal infection following COVID-19 illness that was initially misdiagnosed, and only identified after visiting a chiropractor.

This report presents a 60-year-old man from Hong Kong with gingivitis and poorly controlled diabetes who visited his chiropractor with low back pain 2 weeks following a mild COVID-19 illness and was diagnosed with paraspinal, psoas, and epidural abscesses due to S. oralis.

Case Report

Patient Information

A 60-year-old Asian male factory owner with a history of poorly controlled diabetes and gingivitis initially tested positive for Coronavirus 2019 (COVID-19) in March 2022 when asymptomatic as part of a screening program required for his work, considering he traveled regularly. Testing was conducted at a Hong Kong Community Testing Centre maintained by the Department of Health and involved nasopharyngeal swab and polymerase chain reaction testing through an accredited laboratory [26]. He had an uncomplicated course of COVID-19 illness, with mild symptoms of cough and congestion, and developed a fever for 3 days. He recovered while under quarantine at home over a span of 10 days, subsequently returning to work (Figure 1). He did not require a visit to the hospital, supplemental oxygen, or any antiviral or other specific medical treatment for COVID-19. He was also initially tested for influenza, which was negative. He had no history of COVID-19 vaccination.

One week after recovery from COVID-19, the patient developed low back pain. As his pain symptoms began to radiate into the lower extremities, he visited his primary care provider. This provider diagnosed the patient with bilateral sciatica and treated him with an opioid analgesic (tramadol) without success.

The following week, the patient presented to a chiropractor in a multidisciplinary office reporting progressively worsening low back pain and bilateral gluteal pain with associated numbness and paresthesia in the gluteal region and posterior thighs. He rated his pain an 8 out of 10 on the numeric pain scale. He reported excruciating pain when walking and had difficulty climbing stairs and walking for more than 5 min. He also noted mild localized neck pain. The patient denied any history of trauma, arthropathy, constitutional symptoms including fever, night sweats, chills, or weight loss, but did endorse chronic episodes of diarrhea.

The patient injected insulin subcutaneously (Mixtard® 30) twice a day and took metformin per os 3 times a day, but had failed...
to adhere to the dietary recommendations for diabetes. He also had been diagnosed with gingivitis but had no recent dental procedures. He previously had a self-limiting episode of neck pain 10 years prior, and cervical and shoulder radiographs at that time identified mild osteophytes at the lower cervical region. He had no history of tuberculosis or contact with individuals with tuberculosis, and no history of spinal instrumentation or injection. He was a non-smoker and was a social drinker.

Clinical Findings

On examination by the chiropractor, the patient was afebrile with an oral temperature of 36.8°C and his cardiopulmonary and abdominal examinations revealed no abnormalities. There was hypertonicity and mild tenderness along the cervical and lumbar paraspinal muscles. Motion palpation identified restriction and tenderness at the C4/5, T1/2, and T3/4/5 spinal levels and sacroiliac joints bilaterally. Muscle strength was graded 4/5 for hip flexion bilaterally with pain (Medical Research Council Scale), while the sensory examination and muscle stretch reflexes were normal. The patient’s active cervical spine range of motion was mildly limited without an increase in pain. However, his active lumbar range of motion was severely limited with pain in all tested planes of motion (ie, flexion, extension, and lateral flexion).

As the patient had low back pain with radiation, severe pain, weakness, reportedly poorly controlled diabetes, lack of response to previous treatment, and severely limited range of motion without specific trauma, the chiropractor considered spinal stenosis as a working diagnosis yet also wanted to assess for severe spinal pathology such as cancer or infection. Given the patient’s concerns involved both cervical and lumbar regions, the chiropractor ordered a whole-spine magnetic resonance imaging (MRI), which was performed the same day of consultation at the facility’s imaging center.

MRI of the whole spine revealed lesions in the cervical and lumbar posterior paraspinal regions, the psoas muscles bilaterally, and lumbar epidural space (Figures 2-5). The radiologist suggested these findings were consistent with inflammatory changes, and could represent a multifocal abscess, malignancy, or myositis, and, less likely, paraspinal muscle and epidural hematomas. Although there were degenerative changes at the L3/4 intervertebral disc, there was no evidence of spondylodiscitis or vertebral osteomyelitis, as the endplates had reduced short tau inversion recovery (STIR) signal, consistent with fatty bone marrow.

The chiropractor then conferred with the orthopedic spine surgeon within the multidisciplinary office and together they formulated a differential diagnosis. Spinal infection was considered
the primary working diagnosis given the imaging findings of a paraspinal, psoas, and epidural inflammatory lesion, and the patient’s background of diabetes, despite an absence of imaging features of spondylodiscitis. Myositis related to COVID-19 was also considered given the potential for this to include imaging features of paraspinal inflammation [27]. Metastasis and hematoma were less probable. While these may involve the epidural space and paraspinal muscles, the imaging findings were not as consistent with these diagnoses [28]. The surgeon recommended seeing the patient urgently, and the patient saw the spine surgeon 3 days after obtaining the lumbar MRI. The surgeon ordered several laboratory tests to evaluate for potential infection.

Tests revealed elevated acute-phase reactants, including a C-reactive protein (CRP) at 85 mg/L (normal ≤5), erythrocyte sedimentation rate (ESR) of 95 mm/h, and procalcitonin of 0.09 ng/mL (normal <0.07). The white blood cell count was elevated at 10.7×10⁹/L (normal 3.7-9.4), with 78.7% neutrophils (normal 41.5-73.8%), suggestive of bacterial infection. The patient's red blood cell (RBC) and morphology testing showed a low RBC count of 4.18×10¹²/L (normal 4.3-5.8), low hemoglobin at 12.2 g/dL (normal 13.3-17.5), and low hematocrit at 35.5% (normal 40.0-51.0), while platelets were increased at 470×10⁹/L (normal 127-350), suggestive of infection-related hemolysis and reactive thrombocytosis. The patient’s HbA1c was also elevated at 7.6% (normal 4.0-6.0%), which was suggestive of poor long-term glucose control.

Given the concerning signs suggestive of pyogenic spinal infection, including paraspinal, psoas, and epidural abscesses, the surgeon accordingly referred the patient to an infectious disease specialist, who the patient saw 8 days later. The infectious disease specialist ordered further testing, and while waiting for results, conferred with the spine surgeon, who refilled the patient’s prescription for tramadol.

Figure 2. Cervical magnetic resonance imaging suggestive of paraspinal abscess. Short tau inversion recovery (STIR) right parasagittal view (A), and axials at the C4 vertebral segment including a T1-weighted axial (B), and STIR axial (C), showing an intramuscular T1-weighted hypointense, STIR hyperintense lesion at the right posterior paraspinal muscle from C2 to C5 level, measuring 1.97×2.94×4.47 cm (arrowheads).
A routine throat swab and culture were conducted, which revealed commensal flora. Considering the patient’s history of diarrhea, a stool culture was also conducted, which was normal. A urine examination and culture, Widal test, and melioidosis serology testing (IgG, IgM) were normal. The QuantiFERON-TB test was borderline elevated (TB 1 Ag minus nil control 0.37; TB 2 Ag minus nil control 0.44; normal <0.35), suggestive of possible *Mycobacterium tuberculosis* infection, while the chest radiograph...

**Figure 3.** Lumbar right parasagittal magnetic resonance images suggestive of paraspinal abscess. T1-weighted (A) and T2-weighted (B) sections reveal an ill-defined T1-weighted hypointense, T2-weighted hyperintense lesion at the right posterior paraspinal region from L2/3 to L5 (arrowheads).

**Figure 4.** Lumbar spine magnetic resonance image suggestive of psoas and paraspinal abscesses. An axial T2-weighted view at the level of L3 demonstrates T2 hyperintense muscular signal in the psoas muscles bilaterally and right transversospinalis muscles (arrowheads).

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was normal. As the QuantiFERON-TB test can produce false-positive results [29], and the patient had no history of, contact with, or other signs of tuberculosis, the infectious disease specialist considered this screening test to be a false positive. The specialist also recommended a biopsy and culture of the paraspinal lesion; however, this was delayed upon request of the patient.

Throughout the course of testing with spine surgery and infectious disease, the chiropractor remained in contact with the patient via daily telemedicine and monitored the patient’s symptoms. The patient reported a brief improvement in ability to walk and climb stairs 2 weeks after initial presentation, which was followed by a relapse of symptoms.

During the fourth week after initial presentation to the chiropractor, the patient consented to a fine-needle biopsy of the lumbar paraspinal lesion. The histopathology report noted evidence of moderate acute inflammation, with some fibrous tissue and skeletal muscle fibers, with focal fat necrosis and fibrosis, and no evidence of malignancy. On a gram stain there were 2+ white blood cells, yet no stained bacteria were evident. Culture of the biopsy material revealed *S. oralis*. Considering this finding, the specialist concluded that an oral source of *S. oralis* had disseminated to the spine, causing paraspinal, psoas, and epidural abscesses, likely related to the patient’s gingivitis. Based on the results of antibiotic sensitivity testing, the infectious disease specialist then treated the patient with oral clindamycin (150 mg) and levofloxacin (250 mg) for 2 weeks while considering surgical options.

The patient’s episodic back pain initially reduced after administration of antibiotics but relapsed 6 weeks after initial presentation to the chiropractor. The chiropractor, who remained in contact with the patient, referred the patient to a nearby hospital for urgent attention, where he was admitted as an inpatient. Reportedly, his laboratory testing remained abnormal with signs of ongoing infection. The medical team accordingly began a 6-week course of intravenous cephalosporins.

By the fourth week of intravenous antibiotics, the patient reported his laboratory tests had returned to normal, including markers of infection and anemia, and he felt significantly improved. The chiropractor had 2 virtual/telemedicine visits with the patient at weeks 2 and 4 of his hospital stay, and demonstrated exercises (pelvic tilts, gluteal stretches, and cat-cow quadruped exercise) to the patient. The patient was able to complete these exercises daily without an increase in symptoms. He also began to walk regularly and no longer had increased symptoms with ambulation, although he did have residual mild neck and low back pain. The patient provided written informed consent for the publication of this case report, including his clinical details and imaging tests.

**Discussion**

This case illustrates a 60-year-old man with gingivitis and immunocompromise related to diabetes who developed multifocal cervical and lumbar pyogenic infection (ie, paraspinal, paravertebral, and psoas abscesses) caused by *S. oralis*. The patient responded well to antibiotics and physical therapy, which improved his mobility and function.
psosas, and epidural abscesses) shortly after COVID-19 illness. Accordingly, this case reinforces previous associations between immunocompromise and opportunistic pyogenic spinal infection [5], and adds to the growing literature showing that COVID-19 illness is another potential risk factor for these types of infections [11-17].

In the current case, the source of the pyogenic spinal infection was confirmed as S. oralis, a commensal bacteria normally occurring in the oral flora, which has been associated with opportunistic infections [9,10,30]. It is likely that this bacterium spread hematogenously to the spine from the mouth. Bacteremia and end-organ infection is possible even with routine dental hygiene such as toothbrushing, especially in those with gingivitis and immune compromise (eg, diabetes) such as in the current case [31]. Further, the patient’s recent COVID-19 may have been a risk factor for development of pyogenic spinal infection [18].

Detection of pyogenic spinal infection relies on a thorough history and examination, with attention to any red flags such as fever, drug use, immune compromise, or focal neurologic deficit [32]. Laboratory testing, including CRP, ESR, blood count, and procalcitonin, may be useful markers of spinal infection [1,2]. In addition, blood and urine cultures should be obtained prior to antibiotic therapy in those suspected of spinal infection [1]. MRI with gadolinium contrast is the criterion standard test to diagnose spinal infection due to its high sensitivity and specificity [1,2]. For cases with equivocal or uncertain imaging findings, positron emission tomography CT with F-18 fluorodeoxyglucose may be used [2]. Ultimately, bacteriological or microscopic examination of the site of spinal infection is necessary to confirm the diagnosis, as other testing can be unreliable [1].

Use of whole-spine MRI, as in the current case, remains somewhat controversial for screening purposes given the low probability of identifying serious pathology [33], added cost, and increased scanning time [34]. However, a recent review proposed that whole-spine imaging is useful and appropriate for evaluating suspected spinal infection as well as “skip lesions” involving multifocal spinal disease [35], as in the current case. In the setting of the current case, MRI was readily available, which facilitated obtaining whole-spine MRI. Further, chiropractors in Hong Kong can order MRI [36,40], a management step which appeared to speed the process of identifying the pyogenic spinal infection.

Antibiotics are the mainstay of treatment for pyogenic spinal infection [1-3]. While the route of administration and duration of antibiotics are not well agreed-upon in the literature, a recent review concluded antibiotics should be used for a minimum of 6 weeks [1]. When the specific bacterial agent cannot be identified, empiric antibiotic therapy is recommended [2]. However, when a specific agent is diagnosed, target therapy can be performed [2]. Aspiration/drainage of spinal abscesses may be needed when they are of a larger size, which can be done surgically or percutaneously [1]. Surgery is typically considered when antibiotic treatment has failed, imaging findings show worsening, or there is spininal instability or deformity [1,2].

Practitioners that triage patients with spinal pain, such as chiropractors, should be aware that patients with pyogenic spinal infection may not have any overt signs of infection such as fever [1,3]. Accordingly, these providers must have a high index of suspicion for risk factors for infection and other red flags such as persistence of symptoms despite previous conservative care [37]. Further, spinal infections are a contraindication to spinal manipulative therapy [38], which could exacerbate an underlying spinal infection [23]. Providers such as chiropractors should always refer patients suspected of pyogenic spinal infection for urgent medical care, given the potential morbidity of this condition [39].

As an individual case, these findings may not be broadly generalizable. Although COVID-19 appeared to be a risk factor in this patient’s spinal infection, it is possible it was merely a coincidence of timing. While larger studies have shown a general association between COVID-19 and opportunistic infection [18], further epidemiologic research is needed to determine if this association also applies to pyogenic spinal infections. Gadolinium contrast was not used in the patient’s MRI, but it seemed unnecessary to repeat the MRI with gadolinium due to the several imaging abnormalities that appeared in the non-contrast images. Instead, laboratory testing and biopsy became the next most important diagnostic steps. Although chiropractors in the United States and Hong Kong can order MRI [36,40], this may not be the case in other countries. Accordingly, chiropractors in other regions may have a different management strategy more reliant on referral. Certain clinical records, including a gram-stain photomicrograph and detailed inpatient notes describing the patient’s intravenous antibiotic therapy, were unavailable upon request.

Conclusions

This case highlights a 60-year-old immunocompromised man with poorly controlled diabetes and gingivitis who developed low back pain 1 week after recovery from a mild course of COVID-19 illness, which was diagnosed as an opportunistic pyogenic spinal infection with multifocal involvement including paraspinal, psosas, and epidural abscesses caused by S. oralis.
Department and Institution Where Work Was Done

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