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DIAGNOSIS AND TREATMENT SPONDYLODISCITIS : THE LITERATURE REVIEW

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Abstract

In many regions of the globe, pyogenic spondylitis remains a significant concern. It is a disorder that affects a very small proportion of the population, but it can be quite severe and even fatal. Frequently, it is difficult to make a diagnosis due to the absence of evident signs or symptoms. It encompasses a vast array of clinical entities, including pyogenic spondylodiscitis, discitis, vertebral osteomyelitis, and spinal osteomyelitis, among others. The success rates of conservative treatment are comparable to those of surgical treatment, but complications and mortality rates are lower. In the absence of a clear indication for surgical intervention, conservative treatment should be considered first. Patients with cervical tract or tuberculous spondylodiscitis should endure closer diagnostic and clinical monitoring due to the increased risk of developing bone collapse and neurological deficits.

Katakunci: *Infection; Pyogenic; Spondylodiscitis; Vertebral*

INTRODUCTION

Vertebral osteomyelitis is the third most prevalent kind of osteomyelitis in patients older than 50 years old, despite the fact that its incidence ranges from 3% to 5%. Because of the great variation that characterises spondylodiscitis, it is difficult to conduct scientific research on this condition and make therapy recommendations.[1] Polymyalgia rheumatica, activated osteochondrosis, vertebral hemangioma, destruction of the spinal column by tumours, fractures, and ankylosing spondyloarthritis are all potential differential diagnoses. The endogenous, the exogenous, and the per continuitatem infection routes are discussed from the standpoint of pathogenetics.[2]

They are used to characterise the propagation and spectrum of infections. The hematogenic form is the most frequent, and it can be distinguished from other hematogenic forms based on whether its aetiology is arterial or venous. Spondylodiscitis is typically caused by a single type of bacteria, and in Europe, more than fifty percent of cases are attributed to Staphylococcus aureus.[3] Gram-negative pathogens such as Escherichia coli account for eleven to twenty-five percent of cases. Mycobacterium tuberculosis is the most prevalent infectious agent found all over the world. Patients who originate from Mediterranean nations or the Middle East should have brucellosis tested as part of the pathogen identification process.[4]

Pyogenic vertebral osteomyelitis is a rare disease with possible severe complications. Diagnostic delay was often extensive as PVO has a non-specific clinical spectrum. Radiological results are just one factor considered when making a diagnosis; clinical, laboratory, and microbiological data are all taken into account.[5,6] Because of this, it is not unusual for there to be a delay of two to twelve weeks between the time of diagnosis and the beginning of treatment. If antibiotic treatment and, if necessary, surgical care are started as soon as possible in patients with spondylodiscitis who do not also have associated neurological impairments, the prognosis is favourable.[7–10]

The diagnosis and treatment of spondylodiscitis are both topics that will be covered in this article.

SPONDYLODISCITIS

Pyogenic spondylitis is still a significant issue in many parts of the world. It is a disorder that affects a very small percentage of people yet can be quite serious and even fatal. It is frequently difficult to make a diagnosis because there are no obvious signs or symptoms present. It includes a wide variety of clinical entities, such as pyogenic spondylodiscitis, discitis, vertebral osteomyelitis, and spinal osteomyelitis, among others. Pyogenic spondylitis is relatively rare with an incidence between 0.4-2.0 cases per 100,000 each year, and there is evidence suggesting that the incidence is increasing due to the improved life expectancy of patients with chronic debilitating diseases.[11]

There are many bacteria and fungi that can cause spondylodiscitis, which must be taken into account when identifying and treating patients. Most of the time, staphylococci are to blame. Also known as mycobacterium tuberculosis. Pyogenic spondylodiscitis is caused by Staphylococcus and has become more common in recent years as people are living longer with long-term physical problems. This kind of spondylodiscitis makes up 2-5% of all osteomyelitis cases and is more common in people over 50. Another type of spondylodiscitis that happens often is tuberculous spondylodiscitis. Mycobacterium tuberculosis is the bacteria to blame in this case. This type of spondylodiscitis is most likely to happen to people between the ages of 30 and 40.[7,12]

The majority of cases were caused by Staphylococcus spp (40.3%) and involved the lumbosacral region (52.3%). 27.8% of cases were associated to neurological compromise, 30.4% developed an abscess, 6.6% were associated to instability, and 54.7% underwent surgery. The abscesses mostly involved the lumbosacral region (60.4%) with paravertebral localization; 32.6% of cases involved the thoracic region, showing mostly epidural localization; a small number of cases (7%) involved the cervical region, mostly with epidural localization.[13]

CLINICAL CHARACTERISTICS

For pyogenic spondylitis to be diagnosed, changes in clinical signs, radiological findings, blood and tissue cultures, and histopathological results must be taken into account. There are three types of how pyogenic spondylitis starts: acute, subacute, and insidious. Acute pyogenic spondylitis causes severe symptoms like high fever, severe pain, and feeling sick. Subacute pyogenic spondylitis causes moderate symptoms like fever, moderately intense pain, and mild sickness.[14,15]

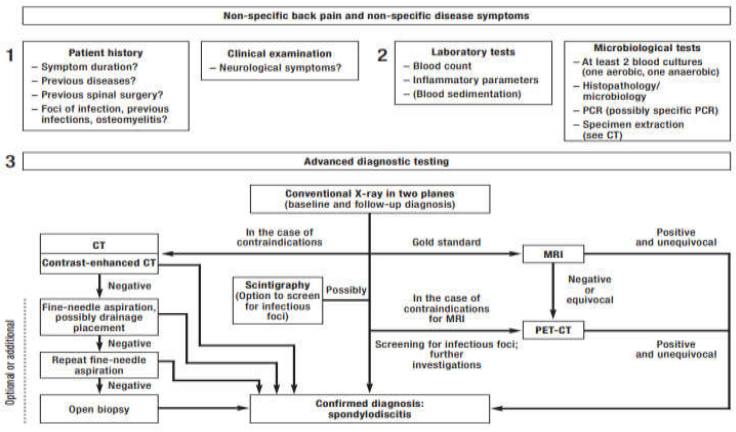

Figure 1. Three-step diagnostic algorithm to detect spondylodiscitis[7]

In contrast to the slow, sneaky symptoms of compression caused by tuberculosis, a pyogenic infection generally comes on quickly and dramatically. Most people with pyogenic spondylitis have pain, fever, limited movement, and soreness in the area where the infection is. There may also be sickness, vomiting, loss of appetite, weight loss, tiredness, and confusion. Neurological complications can also be caused by direct nerve infiltration and damage to the spinal cord caused by a lack of blood flow.[13,16]

The clinical signs of pyogenic spondylitis are used to make a diagnosis, but in some cases (the "slow-onset" type), there may not be many symptoms. Because it's not clear when the symptoms started, it often takes longer to figure out what's wrong. Patients with local pain could have tuberculous spondylitis, degenerative or metastatic spine disease, a herniated disc, a vertebral compression fracture, or an inflammatory spondyloarthropathy like ankylosing spondylitis or reactive arthritis.[15]

LABORATORY TESTS

Erythrocyte sedimentation rate (ESR) is a sensitive test for pyogenic spondylitis that can be done in a lab. If your ESR is high, it means you have an inflammatory response, but it doesn't mean you have an illness. Even though the ESR can tell you a lot about how well a treatment is working, it takes a long time to return to normal after a treatment has been successful.[16] Hepatocytes make C-reactive protein (CRP), which is a protein made during the acute phase. After a bacterial illness starts, CRP goes up quickly. It is high in most people and tells us more about them than the ESR does.[12]

After the right treatment, the CRP gets back to normal faster than the ESR. On the other hand, a patient's white blood cell (WBC) count may be high or in the normal range. It isn't very helpful for making a diagnosis, but it should be done as part of an infection / fever workup because it may give some general information about how a medicine will work. Because the source of the infection can vary, people who might have pyogenic spondylitis should have blood cultures, urinalysis, and urine cultures done. About half of the people have a positive blood culture. To check for a subclinical lung infection, a chest x-ray and a sputum culture should be done.[12]

IMAGING STUDIES

All patients suspected of having pyogenic spondylitis should have plain radiographs obtained. Plain radiographs do not reveal changes in pyogenic spondylitis until 2 to 8 weeks after the onset of symptoms. The abnormalities include a narrowing of the disc space, blurring of the endplates, and height loss of the affected vertebral bodies. After eight to twelve weeks, visible bone degeneration can be observed. Less common than tuberculosis infections, soft tissue extension is suggested by an abnormal psoas shadow, expansion of the mediastinum, or enlargement of the retropharyngeal space.[2,3,17]

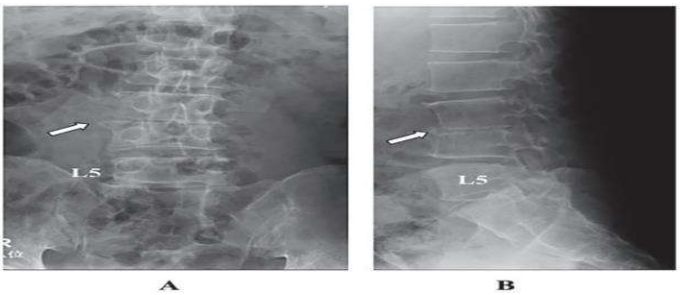

Figure 2. Plain radiograph findings of pyogenic spondylitis due to Streptococcus pneumoniae in 59-year-old man. Anteroposterior (A) and lateral (B) radiographs show loss of disc space and endplate destruction at L3-4 (arrow)[14]

Study showed radiographically categorised the bone degradation stage as early (narrowing of the disc space), destructive (bone destruction, collapse of softened vertebra, and bone proliferation), and osteosclerotic (new bone formation and osteosclerotic changes). For imaging pyogenic spondylitis, magnetic resonance imaging (MRI) is the most sensitive method. When other imaging modalities are benign or nonspecific, it is particularly useful. The signal intensity of the vertebral body, endplate, and intervertebral disc decreases on T1-weighted images.[17]

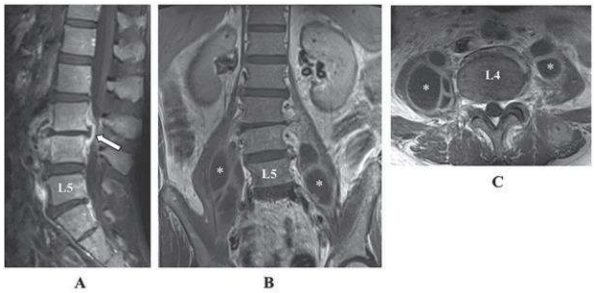

Figure 3. Magnetic resonance imaging (MRI) findings of pyogenic spondylitis in 59-year-old man (same case as Figure 1). The contrast-enhanced T1 weighted sagittal image (A) shows the enhancement of L3-4 epidural abscess (arrow). Coronal (B) and axial (C) contrast-enhanced T1 weighted images show peripheral enhancement of paravertebral abscess (*)[14]

The signal intensity of the vertebral body and/or disc is increased on T2-weighted images. The use of fat suppression techniques, specifically short T1 inversion recovery (STIR), provides the greatest sensitivity for detecting an increase in tissue water content. Important for the diagnosis and treatment of pyogenic spondylitis is the pattern observed on contrast-enhanced MRI. Typically, exudate collections appear as hypointense signals on T1-weighted images and as hyperintense signals on T2-weighted images. The T1-weighted contrast-enhanced image will reveal a mass lesion with peripheral enhancement. Granulation tissue is more consistent with diffuse enhancement throughout the mass lesion.[17]

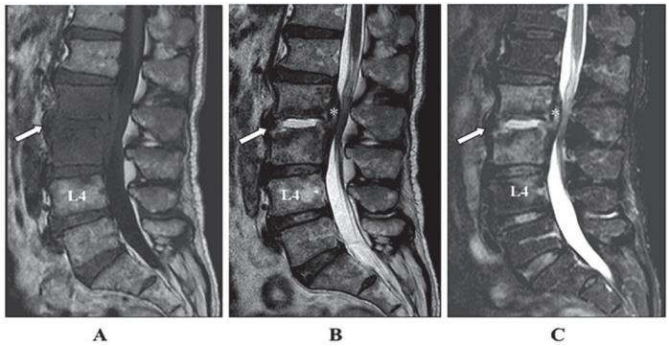

Figure 4. Magnetic resonance imaging (MRI) findings of Staphylococcus aureus pyogenic spondylitis in 77-year-old man. (A) T1 weighted sagittal image demonstrates hypointense signal in L2-3 vertebral bodies and the disc space (arrow). (B) T2 weighted sagittal image shows hyperintense signal in L2-3 disc space (arrow) with epidural mass (*). (C) The short T1 inversion recovery (STIR) sagittal image shows hyperintense signal in L2-3 vertebral bodies and disc space (arrow) with epidural mass (*)[14]

On MRI images (T2-weighted and contrast-enhanced T1-weighted images), intraspinal sepsis and the general pathological process of a pyogenic lesion in the vertebrae were classified into five categories based on the enhancement pattern of the suspected septic lesion: stage I, bruise and localized radiolucency in the endplate of the vertebra; stage II, vertebral edema and/or suspected fluid collection within the vertebral corpus (inhomogenously increased signal intensity on the MRI with disc space narrowing) in one or two vertebral levels, with poor demarcation of the lesion; stage III, irregularly increased signal intensity area on the MRI, with confinement of the lesion within the posterior longitudinal ligament (subligamentous); stage IV, evident fluid collection in the disc in association with extensive endplate destruction and diffusely extended high-signal lesions in the vertebral corpus, together with transligamentously extended epidural mass lesions at multiple levels; and stage V, obvious disappearance of the disc, vertebral collapse with inhomogenously increased signal intensity within the vertebral collapse, epidural fluid collections of mass lesions, and abnormally increased signal intensity in the vertebrae, including spinous process and paravertebral ligaments as well as muscles.[17]

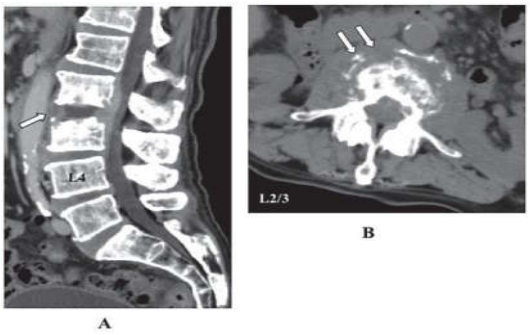

Figure 5. Computed tomography (CT) findings of pyogenic spondylitis in 77-year-old man (same case as Figure 2). Sagittal reformat CT image (A) and axial image (B) show a destructive change at L2-3 (arrow)[14]

Stages I through III abscesses are circumscribed lesions, while stages IV and V lesions with circular or "ring-like" enhancement at the abscess' periphery are unconfined lesions. In the early phases, computed tomography (CT) reveals hypodensity and flattening of the involved disc, erosion of the vertebral body and endplate, soft tissue swelling, and obliteration of fat planes around the vertebral bodies (Fig.4). Radionuclide studies, including Gallium-67 citrate and technetium-99 m scans, are more sensitive than conventional radiographs at detecting the early stage. Fluorodeoxyglucose (FDG)-positron emission tomography (PET) has also been demonstrated to be an effective imaging adjunct in the diagnosis of pyogenic spondylitis.[17,18]

TREATMENTS

Conservative

For pyogenic spondylitis, the first choice of treatment is conservative care, like immobilisation and taking medicines all over the body. In the early stages of an illness, you should stay in bed until the pain gets better. But people should be aware that bed rest can cause problems like asthma, dementia, decubitus, ulceration, deep vein thrombosis, and pulmonary embolism, especially in older people. The patients may then be able to stand up while wearing a cast or brace that keeps

the spine from moving too much. Depending on how much bone damage or curvature there is, this should be worn for 3 or 4 months.[17]

External immobilisation helps to keep the spine stable, reduce pain, and stop deformity and nerve damage. Unless the patient is septic or very sick, antibiotic treatment shouldn't start until the right samples have been done. Blood cultures should be done often, and they can be used to find out what kind of germs are in the blood. Patients whose blood cultures come back negative are most likely to need a biopsy. Samples from biopsies should be sent for Gramme staining, histopathology, aerobic, anaerobic, tuberculous, and fungal culture. If the organism can't be identified, medicines like first-generation cephalosporin or penicillin are often used to cover the most common organisms that cause infections, like staphylococcus and streptococcus.[17,19]

Table 1. Recommendations on antibiotic treatment

Pathogen	First line treatment	Alternative treatment
Staphylococci, oxacillin-susceptible	• Flucloxacillin 1.5–2 g i. v. • (3–4 × d) • Cefazolin 1–2 g i. v. (3 × d) • Ceftriaxone 2 g i. v. (1 × d)	• Vancomycin i. v. 15–20 mg/kg (2 × d) (monitor serum levels) • Daptomycin 6–8 mg/kg i. v. (1 × d) • Linezolid 600 mg p. o./i. v. (2 × d) • Levofloxacin p. o. 500-750 mg (1 × d) and rifampin p. o. 600 mg/d or clindamycin i. v. 600–900 mg (3 × d)
Staphylococci, oxacillin-resistant	• Vancomycin i. v. 15–20 mg/kg (2 × d) (monitor serum levels)	• Daptomycin 6–8 mg/kg i. v. (1 × d) • Linezolid 600 mg p. o./i. v. (2 × d) • Levofloxacin p. o. 500–750 mg (1 × d)
Enterococcus spp., penicillin-susceptible	• Penicillin G 20–24 million IU i. v. continuously over 24 h or in 6 partial doses • Ampicillin 12 g i. v. continuously over 24 h or in 6 partial doses	• and rifampin p. o. 600 mg/d • Vancomycin 15–20 mg/kg i. v. (2 × d) (monitor serum levels) • Daptomycin 6 mg/kg i. v. (1 × d) • Linezolid 600 mg p. o. or i. v. (2 × d)
Enterococcus spp., penicillin-resistant	• Vancomycin i. v. 15–20 mg/kg (2 × d) (monitor serum levels)	• Daptomycin 6 mg/kg i. v. (1 × d) • Linezolid 600 mg p. o. or i. v. (2 × d)
β-Hemolytic streptococci	• Penicillin G 20–24 million IU i. v. continuously over 24 h or in 6 partial doses • Ceftriaxone 2 g i. v. (1 × d)	• Vancomycin 15–20 mg/kg i. v. (2 × d) (monitor serum levels)
Enterobacteriaceae	• Cefepime 2 g i. v. (2 × d) • Ertapenem 1 g i. v. (1 × d)	• Ciprofloxacin 500–750 mg p. o. (2 × d) • Ciprofloxacin 400 mg i. v. (2 × d)

The choice of antibiotic is changed based on the results of the next bacterial culture. It is important to talk to microbiologists to get the most out of antibiotics and find out what could be causing bacteraemia. Inappropriate use of antibiotics can lead to longer hospital stays and higher costs, and it can also hurt the patient's chances of getting better. It's not clear how long antibiotic treatment should last. Some studies suggest six to eight weeks of intravenous therapy, while others say only four weeks is enough. When antibiotics are used for less than four weeks, the risk of recurrence may be too high.[17]

Study showed patients treat with antibiotics given through an IV until the CRP is back to normal, which takes about two to four weeks. After that, we switch to antibiotics that are taken by mouth for a total of three months. If you have pyogenic spondylitis, hyperbaric oxygen treatment (HBO) might help. HBO boosts the absolute oxygen tension at the site of the infection, which improves the oxidative activity of neutrophils and helps wounds heal and grow new blood vessels. This therapy is now suggested as a primary or supplementary treatment for a wide range of clinical disorders. Half to three-quarters of all patients react well to conservative treatment, and 6 to 24 months after the start of symptoms, interbody fusion happens on its own. But between 10 and 20% of people need surgery.[17]

Surgery

Study showed 95% of paravertebral abscesses were treated percutaneously, while 85.7% of epidural cases underwent "open" surgery. Spinal cord compression mainly occurred in the cervical region (55.9%), neurological deficit was observed in over half of cases (65%), and surgery was required in most of the cases (83.9%). The majority of cases of instability involved the lumbosacral region (53.3%) and underwent surgery (87%). The focus of infection was mostly lumbosacral (61%) and almost all cases (95%) were treated surgically.[13]

Surgical treatment may be needed to get rid of major spinal cord or nerve root compression, prevent or fix biomechanical instability and deformity, relieve severe, long-lasting pain, or drain abscesses. Surgery can be used to treat pyogenic spondylitis in many different ways, such as an anterior or posterior approach with or without instruments. For pyogenic spondylitis, the standard surgical treatment is anterior decompression and debridement, followed by an anterior union without instruments.[20]

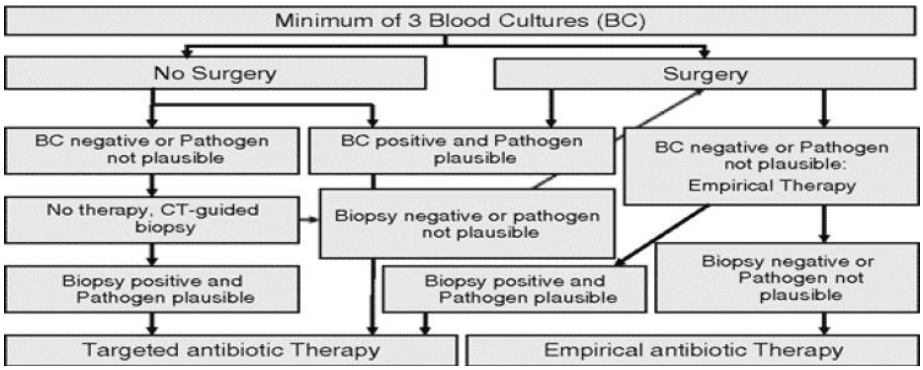

Figure 6. Treatment of spondylodiscitis[19]

One problem with this treatment is that the patients are often malnourished or in bad health, which makes them more likely to get sick. This is because they are exposed to a lot of germs during open surgery. Percutaneous suction aspiration and drainage (PSAD) under local anaesthesia has been shown to work well for pyogenic spondylitis that doesn't respond to other treatments. Already study suggested this treatment for people with early-stage pyogenic spondylitis in 1998.[20,21] For this technique to be used to treat pyogenic spondylitis, the patient's condition must not have improved with antibiotics and bed rest for at least one month, there must be only one affected intervertebral disc, the affected vertebrae must be in the lower thoracic or lumbar spine, there must be no major neurologic deficit, and radiographs must not show any significant bone destruction or severe deformity in the area of the affected vertebral body.[20,22]

Also, this method is used on patients whose x-rays show a lot of damage to the affected vertebrae and whose general health is too bad for them to be able to have an anterior surgery under general anaesthesia. In 2010, Ando et al. said that PSAD is not too invasive and can be used to find pathogens, make a histopathological diagnosis, and even treat the patient at the same time. This treatment is also more cost-effective because it shortens treatment times and doesn't require open surgery.[20]

PSAD should be seriously considered for people who are paralysed because of an epidural abscess and can't get general anaesthesia because their health is bad. Recent improvements in minimally invasive surgery (MIS), like percutaneous pedicle screw stabilisation (PPS), offer an alternative way to treat pyogenic spondylitis with surgery. Even though using instruments to treat pyogenic spondylitis has been debated, MIS is better than traditional open surgery because it causes less damage to muscles, loses less blood, and takes less time.[20,23]

A surgery study compares two methods. Group A, with 23 patients, received only dorsal transmuscular treatment, while Group B, with eight patients, received two-stage posteroanterior surgery. JOA, VAS, and Kirkaldy-Willis functional criteria were used to evaluate both groups before, six weeks, and one year following surgery. Cobb modified angle assessment of the afflicted section assessed sagittal balance restoration. Group A had the fewest major surgical consequences and higher sagittal balance without clinical connection. Group B had no post-operative infection recurrence.[21]

CONCLUSION

Conservative treatment has comparable success rates to surgical treatment, but lower rates of complications and mortality. In the absence of an absolute indication for surgery, conservative treatment should be considered as the initial option. Due to the increased risk of developing bone collapse and neurological deficits, patients with cervical tract or tuberculous spondylodiscitis should undergo closer diagnostic and clinical monitoring.

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