



Pyogenic Spondylodiscitis

65

Yat-Wa Wong

65.1 Definition

Pyogenic spondylodiscitis is the bacterial infection of the intervertebral disc and its adjacent vertebral bodies. It is the most common form of spinal infection. Other forms of spinal infection include spondylitis (infection of the vertebral body), discitis (infection of the intervertebral disc alone), epidural abscess, and facet joint septic arthritis. Spinal infection can also be classified according to the causative microorganisms. They are bacterial (pyogenic), mycobacterial (granulomatous), fungal, or parasitic.

Hematogenous spread is the most common route of transmission in pyogenic spondylodiscitis. Bacteria seed on the bony end plate and migrate into the intervertebral disc causing infection. Skin infection, dental caries, genitourinary, and gastrointestinal tract infections are potential sources.

65.2 Natural History

Most patients respond to appropriate antibiotics if they are treated early. Diagnostic and treatment delays are potentially devastating. Death due to systemic sepsis, neurological deterioration, spinal instability, and deformity are possible consequences. Risk is higher for immunocompromised or debilitated patients.

Supplementary Information The online version contains supplementary material available at [https://doi.org/10.1007/978-3-030-80356-8_65].

Y.-W. Wong (✉)

The University of Hong Kong, Queen Mary Hospital, Hong Kong, China
e-mail: yatwa@hku.hk

65.3 Physical Examination

The most common presentation is pain (Chaps. 11 and 41), and if there is any one of the following additional features, it should raise the suspicion:

1. Fever of unknown source.
2. Intravenous drug abusers or immunocompromised patients.
3. Elevation of infective markers such as CRP, ESR, procalcitonin, and WBC.
4. Radiological features of pyogenic spondylodiscitis.

Pain at rest is the typical complaint of pyogenic spondylodiscitis. In the presence of fever and back pain, spondylodiscitis should be excluded. There may be local tenderness at the affected segment. Deformity if any is usually not severe especially in early cases. Detailed neurological assessment is mandatory (Video 65.4). The severe neurological deficit at presentation or deterioration is an indication for surgery. Any skin lesions or other septic foci should be treated accordingly. At least two sets of blood cultures (especially when patients have a fever, or chill and rigor) and one mid-stream urine for urinalysis/culture should be done. Other specimens (sputum, wound swabs) for culture should also be obtained, if clinically appropriate. Prolonged incubation during culture is needed if low virulence pathogens such as *Propionibacterium* and diphtheroids are suspected. Brucella serology must be checked if there is history of exposure such as farm visit, raw milk, or placenta consumption. Elevation of procalcitonin suggests pyogenic rather than tuberculosis (TB) infection.

65.4 Imaging

Spine radiographs may show decreased intervertebral disc height with adjacent bony end plate erosion (Fig. 65.1). Bony destruction is not apparent in the first or second week. The only radiological features may be soft tissue edema and loss of spinal sagittal alignment due to muscle spasms. In chronic infection, radiographs may show osteosclerosis and deformity. Clinical diagnosis is usually not difficult with compatible clinical, serological, and radiographic features. Magnetic resonance imaging is the most useful tool for early diagnosis before radiographic features develop. It also delineates the extent of the disease for surgical planning.

Blood culture can only catch less than 50% of the causative bacteria. Computed tomography scan or fluoroscopy-guided biopsy (Videos 65.7 and 65.8) is frequently necessary to get the bacteriological diagnosis. If there is a paraspinous abscess, percutaneous drainage can be done at the same time of the biopsy. Specimens should be sent for aerobic and anaerobic culture, AFB smear and culture, TB PCR, fungal culture, and histological examination. Special culture may be necessary if rare organisms are suspected.

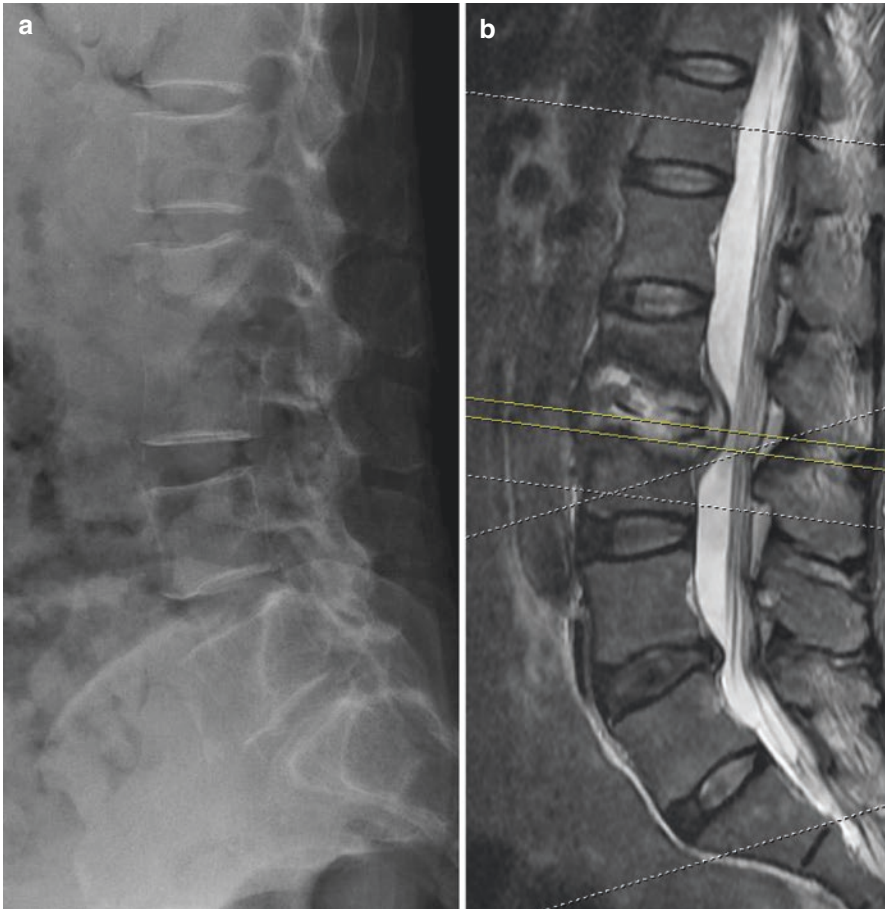


Fig. 65.1 (a, b) Showing the typical radiological features of destruction of intervertebral disc space and adjacent vertebral bodies in spondylodiscitis

65.5 Differential Diagnosis

Spinal tumors, both primary and secondary, tend to affect the vertebral bodies alone without intervertebral disc involvement. TB is a great mimicker that can present with either spondylitis or spondylodiscitis (Chap. 64). The lymphocyte monocyte ratio is a cheap and good indicator for differential diagnosis of TB spine and pyogenic spondylodiscitis. The ratio is typically elevated in specific infections like TB.

65.6 Treatment Options

Most patients respond well to antibiotic treatment, and surgery is not required for most patients. Antibiotics are withheld until the bacteriological diagnosis is confirmed. However, empirical antibiotics can be started early after essential diagnostic workups especially if the patients are septic looking and ill. For community-acquired infection, cloxacillin 2 g IV every 6 h will cover the most common organisms such as methicillin-sensitive staphylococci and streptococci. For hospital-acquired infection or immunocompromised patients, ceftriaxone 1–2 g IV daily plus vancomycin 15–20 mg/kg/dose IV every 12 h provides broader coverage including Gram-negative bacilli and MRSA. The subsequent antibiotic regime is adjusted according to the culture result. Duration of antibiotic treatment varies but normally ranges from 3 to 12 weeks depending on the clinical, serological, and radiological responses. Typically, antibiotics can be stopped if patients' symptoms improve; infective markers return to normal; radiographs showed evidence of stopping new vertebral destruction. A regular blood examination is essential, not just to check infective markers but also to monitor patients' liver and renal function because of the prolonged antibiotic treatment. Like other infections, spondylodiscitis is catabolic, and adequate nutritional support promotes early recovery. Spondylodiscitis may be very painful. Adequate symptomatic treatments including analgesics, corset or collar, and appropriate rest relieve patients' suffering.

The sizable paraspinal abscess should be drained, preferably image-guided percutaneous drainage. Loculated abscess or thick pus may need open drainage. Surgery is generally indicated if there is neurological deterioration, persistent instability, unacceptable deformity, debilitating pain not under control by nonoperative treatment, an uncertain diagnosis, and unfavorable response to medical treatment. The aims of treatment are to decompress the spinal cord or nerves, debride necrotic tissues, drain abscesses, correct deformity, and stabilize the spine.

Anterior or anterolateral approach accesses the infective focus directly and provides wide exposure for thorough debridement and spinal canal decompression. Reconstruction can be done by autologous iliac crest tricortical, rib, or fibular graft. Alternatively, titanium cage or mesh cage filled with a bone graft can be used. Anterior instrumentation at the cervical and thoracic spine provides additional stability, while anterior fixation at the lumbar spine is less secure, and additional posterior instrumentation may be necessary (Fig. 65.2).

The posterior approach alone is effective for decompression of the spinal canal and allows rigid instrumented fusion (Fig. 65.3). It is particularly useful for the upper thoracic spine since the anterior approach there is difficult (may need split manubrium approach). However, surgeons cannot normally debride the infective focus as thoroughly as the anterior approach.

The choice of surgical approaches is dictated by surgeons' expertise and the indications for surgery. Regardless of the approaches, metallic cages and implants can be safely used to reconstruct the spine if patients are covered by adequate antibiotics and the surgical bed is relatively clean. PEEK cages should be avoided because it is more difficult to eradicate the bacteria on the PEEK surface.



Fig. 65.2 (a, b) Anteroposterior and lateral radiographs showing the L2/3 spondylodiscitis. (c, d) T2-weighted sagittal and T1-weighted contrast axial MRI demonstrating the active infection. Patient did not respond to empirical antibiotics after negative biopsy. (e, f) Radiographs after anterior debridement and fusion followed by posterior stabilization

65.7 Expected Outcomes

Most patients can recover completely with early treatment. The mortality and morbidity rates become higher if the patient has many comorbidities.



Fig. 65.3 (a, b) Radiographs showing L4/L5 spondylodiscitis. (c) T1-weighted contrast sagittal MRI demonstrating the extensiveness of the infection. (d) Sagittal CT scan illustrating L4 vertebral body fragmentation. Due to neurological deterioration and poor response to antibiotics, anterior debridement, fusion, and posterior fixation via posterior approach alone were done. (e, f) Postoperative radiographs

65.8 Potential Complications

- Uncontrolled sepsis leading to mortality.
- Neurological deterioration.
- Spinal instability (Chap. 47).

-
- Kyphosis.
 - Secondary degeneration and chronic pain (Chap. 41).

65.9 What Should Patient and Family Know?

Prolonged antibiotic treatment and close monitoring of treatment responses are necessary.

Further Reading

Yee DK, Samartzis D, Wong YW, Luk KD, Cheung KM. Infective spondylitis in Southern Chinese: a descriptive and comparative study of ninety-one cases. *Spine*. 2010;35(6):635–41.