Sp32: In the present age of 'posterior only' surgeries, when is anterior surgery required in spinal tuberculosis?

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Recommendation:
There is growing evidence in literature that most of the spinal tuberculosis in the thoracic, thoracolumbar and lumbar region can be treated for anterior column debridement and reconstruction and spinal stabilisation by an '**all-posterior approach'**. In view of this, the need for anterior approach is limited. In the thoracic, thoracolumbar and lumbar spine, the indications for anterior approach are severe multisegmental disease with a vertebral bone loss of > 2; recurrent or resistant disease where a thorough debridement is required and where lumbar lordosis needs to be restored in the lumbosacral TB. Most of the cervical spinal diseases are treated anteriorly.

Strength of recommendation: Weak

Delegate Vote:

Rationale: Tuberculosis remains a major health problem. In 2023, WHO estimated that 10.8 million people suffered from tuberculosis.[1] The incidence of tuberculosis has increased from 10.7 million in 2022, 10.4 million in 2021, and 10.1 million in 2020. Tuberculosis also accounted for 1.25 million deaths in 2023 with a net reduction of death of only 23%, far from the WHO End TB Strategy target of 75%. About 1-3% of all tuberculosis is extrapulmonary tuberculosis, and 50% of them are spinal tuberculosis.[2] Spinal tuberculosis is also the most common spinal infection, accounting for up to 40% of all spinal infections.
Although anti-TB chemotherapy is the mainstay of treatment, the risk of neurological deterioration is up to 10-43%.[3] Therefore, surgery is also an important method to treat spinal TB.[4] Surgery is indicated in patients with back pain that cannot be alleviated after regular conservative treatment, impairment of spinal cord or nerve function, giant abscess, persistent or recurrent TB infection, kyphosis deformity, or spinal segmental instability.[5]
Surgery for spinal TB can be achieved by anterior-only surgery, posterior surgery, and a combination of anterior and posterior surgery. Historically, anterior-only surgery is the treatment of choice.[6] However, in the last few decades, the surgery has shifted to posterior-only surgery.[7] Nevertheless, whether anterior surgery or posterior surgery is the best to treat spinal TB remains debated.

Cervicothoracic TB
Wu et al.[8] reported a multicentre retrospective review of surgical approaches to cervicothoracic TB. They found no difference between anterior and posterior only regarding hospital stay, surgery duration, blood loss, kyphosis correction, and loss of correction at the last follow-up visit. Neurological status, VAS, and NDI score, as well as JOA score following the surgery, were also improved in both groups. However, they suggested performing anterior-only surgery in lesions located in the anterior and posterior columns of the spine, the presence of abscess or sequestrum, spinal cord compression causing the neurological deficit, and the presence of kyphosis and spinal instability. The indications for posterior-only surgery are narrow, only for lesions confined to the posterior column, poor condition to tolerate anterior surgery or previous history of anterior surgery.

Zeng et al.[9] also found similar results regarding operation time, blood loss, and day of hospitalization between anterior and posterior surgery. However, they found that loss of correction was higher in the anterior only group. Hardware-related complications and revision rates were also higher in the anterior only group. They recommended that the indication for anterior surgery is single-segment lower cervical lesions such as C6, C7, and T1, especially in long neck patients, with infection and destruction confined to the anterior column, abscess, and necrotic tissue compressing the front spinal cord, and mild kyphosis (less than 30^{o}). They suggested posterior-only surgery in kyphotic deformity of less than 50^{o}, multicentric spinal TB with only one or two target segments with lesion accessible through the posterior approach, spinal cord compression with paravertebral/epidural abscess, patients with a history of several anterior operations in whom anatomical structure was unclear, severe or progressive neurological dysfunction or persistent neck pain unresponsive to conventional therapy, and patient intolerant to extreme surgical intervention.

Subaxial cervical spine

Cervical tuberculosis lesions are typically located in the anterior and middle columns of the vertebrae. Surgeons often consider the anterior approach a practical surgical method due to its straightforward incision structure, ease of internal fixation, adequate lesion exposure, and reduced risk of infection recurrence.[10,11] Luan et al. reported on 23 patients with subaxial cervical spine tuberculosis treated using the anterior approach. The study demonstrated significant improvements in the Japanese Orthopaedic Association (JOA) score, Visual Analog Scale (VAS), and Neck Disability Index (NDI) following anterior surgery. The anterior approach is recommended for patients with a C2–C7 Cobb angle > 0° or C2–C7 sagittal vertical axis (SVA) > 4 cm, as these conditions are associated with a higher incidence of kyphotic deformity.[12] Destiansyah et al. reported a case of cervical tuberculosis involving three vertebral levels (C4–C6) treated using the anterior approach. At a one-year follow-up, the patient exhibited no residual neurological impairment or limitations in daily activities. Cervical X-ray and MRI findings showed good ossification and significant improvement in lordotic curvature.[13] Similarly, a retrospective study reported the use of the anterior approach for cervical tuberculosis, with more than 50% of the cases involving the C5–C6 vertebrae. The outcomes demonstrated significant neurological and functional improvement, along with effective correction of kyphosis.[14]

Thoracal TB

Spinal tuberculosis (TB) most commonly occurs in the thoracic spine region and typically involves the anterior and middle columns of the spine. While various surgical options are available for treating thoracic TB, the choice of the most appropriate surgical approach remains a subject of ongoing debate and controversy. The indications for the anterior approach in thoracic tuberculosis include cases with mild kyphosis of less than 30 degrees and recurrent thoracic spinal tuberculosis following posterolateral decompression and strut grafting with posterior instrumentation.[15,16] A study reported that anterior surgery offers good clinical efficacy in treating thoracic spinal tuberculosis (TB). Additionally, this study recommended that the anterior approach is particularly suitable for patients with three or more affected vertebral bodies, vertebral body collapse predominantly in the anterior and middle columns, and spinal nerve-related symptoms primarily caused by anterior compression.[17] A retrospective study comparing the anterior and posterior approaches for single-lesion thoracic tuberculosis found that the anterior approach offered greater advantages in kyphosis correction, bone fusion, wound healing, protection of the normal spine, and lower costs. However, no statistically significant differences were observed between the two groups regarding VAS score

improvement, ASIA grade, neurological function, loss of kyphotic correction, complication rates, operative time, intraoperative blood loss, or hospital stay.[18]

Thoracolumbar junction TB

In anterior column spine disease, the anterior approach gives a high chance of anterior clearance of neurological tissues and decompression of roots and cords, and it can be minimally invasive.[19] It also allows direct access to the focus, complete debridement, and valid decompression.[20] An anterior approach was recommended for treating active tuberculosis spondylitis and appropriate to prevent deterioration of the kyphus during treatment. An anterior approach was not recommended for a lesion above T5, in patients with more than 60° kyphosis, in patients with disease involving the posterior elements, and in patients with a bad preoperative chest condition. Additionally, this study indicates that the anterior approach surgery should be considered if neurological deficits do not respond to 4–6 weeks of anti-tuberculous chemotherapy if kyphosis exceeds 40°, or if there is instability (such as anteroposterior or lateral translation or greater than 40° of segmental kyphosis).[21]

Lumbar TB

Spinal tuberculosis predominantly affects the thoracic and lumbar spine, accounting for approximately 90% of cases. The lesions typically involve the anterior and middle columns of the spine, with posterior column involvement being rare.[22,23] Qiu et al. reported that both anterior and posterior approaches are viable options for managing lumbar tuberculosis. However, for thoracic and lumbar tuberculosis patients with a single lesion confined to the anterior and middle columns of the spine and without severe kyphosis, the anterior approach may offer greater advantages. These include better kyphosis correction, enhanced bone fusion, improved wound healing, preservation of the normal spine, and reduced medical consumables and costs.[18] A similar study reported that the anterior approach is effective for mono-segment lumbar tuberculosis. However, single posterior surgery was associated with shorter operative time and reduced blood loss compared to the anterior approach.[23]

Lumbosacral TB

Jiang et al. compared the anterior approach with conservative treatment for patients with lumbosacral tuberculosis. They recommended surgery for patients with severe back and/or radicular pain, developing neurological deficits, significant kyphosis (>30°), or progressive deformities. Both conservative and surgical treatments were found to be safe and effective. However, the anterior approach showed better outcomes due to its thorough debridement, spinal cord decompression, and adequate spinal stabilization.[24] A similar study demonstrated that the anterior approach could be a feasible and effective therapeutic option for lumbosacral junction tuberculosis. This approach significantly improved the lumbosacral angle, neurological performance, and VAS scores.[25] Some studies recommend that the L4-5 and L5-S1 levels are primary levels for which an anterior approach is indicated in lumbosacral tuberculosis. Anterior surgery via retroperitoneal approach may be necessary to reduce the risk of vascular injury.[26-28] In contrast, a study reported that the anterior approach for lumbosacral tuberculosis has a higher risk of inadequate kyphosis correction, peritoneal injury, and vascular complications. The posterior approach was found to be superior in terms of shorter surgery time, reduced intraoperative blood loss, and improved Cobb angle correction.[29]

There is growing evidence in literature that most of the spinal tuberculosis in the thoracic, thoracolumbar and lumbar region can be treated for anterior column debridement and reconstruction and spinal stabilisation by an all-posterior approach. [30]

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