Sp23: What are the indications for surgical intervention in terms of neurological deficit in spinal tuberculosis?

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Response/Recommendation:
Acute rapidly progressive or severe neurological deficits (MRC < 3/5), neurological deficits of any severity associated with mechanical instability or progressive deformity are indications for surgical intervention. In cases with mild neurological deficit, non-responders to chemotherapy or deterioration while chemotherapy are also indications for surgical intervention.

Strength of recommendation: Weak

Delegate Vote:

Rationale:

Approximately 10-41% of patients with tuberculosis (TB) of the spine may present with neurological deficits, predominantly paraplegia, resulting from thoracic spine involvement. [1] TB paraplegia can be classified into early-onset paraplegia, occurring within 2 years of disease onset, and late-onset paraplegia, developing several years post-apparent healing. [1] The primary causes of early-onset paraplegia are mechanical compression (from abscesses, granulation tissue, or sequestrum), spinal instability or deformity, and non-compressive causes (such as cord inflammation (myelitis), arachnoiditis, or vascular thrombosis). [2] Late-onset paraplegia arises from intrinsic spinal cord injury or localized pressure exerted by the transverse ridge of bone or a constrictive band surrounding the dura. [2]

Surgical correction of deformities is the standard treatment for late-onset paraplegia, which has a relatively poor prognosis. [1] Conversely, early-onset paraplegia necessitates anti-tuberculous therapy (ATT) with or without surgical decompression. However, no consensus exists regarding the indications for surgical intervention for early-onset paraplegia. Several studies, notably the landmark study conducted by the Medical Research Council, have demonstrated favorable rates of neurological recovery with ATT alone.[3,4] In 1975, Tuli et al. reported that 38% of their cohorts experienced neurological improvement after 4–6 weeks of ATT alone, while 62% required surgical decompression. [5] Tuli proposed a "middle-path regimen," initiating all patients on ATT and reserving surgery for those exhibiting neurological deterioration or complications within 4-6 weeks. [5]In low-resource endemic TB regions, this regimen was widely adopted because it reduced surgical burdens, risks, and costs and bought time to improve sick patients' general health and nutrition. [5] Most surgeons in developed countries universally advocate for surgical decompression for TB paraplegia, citing higher rates and quicker neurological recovery. [1,6,7] Two schools of thought concerning the treatment of early-onset paraplegia have emerged, influenced by insufficient evidence to substantiate either and by divergent health economics. [1]

Clinical Indications of Surgical Decompression for TB Paraplegia

Clinical and demographic predictors of slow or incomplete neurological recovery post-treatment may suggest the necessity for early surgical decompression.[5] Notably, multiple reports indicate the presence of severe, flaccid, or acute progressive motor weakness is associated with a slower and incomplete neurological recovery.[5] Furthermore, malnutrition and advanced age were correlated with suboptimal neurological recovery. [8]

Instability or deformity as an indication for treatment for TB paraplegia

TB paraplegia associated with instability or deformity may benefit from surgical decompression and stabilization, as spine instability can lead to rapid neural compression. [1] Rajasenkaran et al. proposed criteria for evaluating instability in TS, including age ≤ 15 years, involvement of the cervicothoracic/thoracolumbar junction, a sagittal deformity angle ratio ≥ 15°, a vertebral body loss-segmental ratio ≥ 0.5, and the presence of spine-at-risk signs. [9] Early surgical intervention addresses early-onset paraplegia and reduces the incidence of late-onset paraplegia, which is highlighted by its complexity and unfavorable neurological outcomes. [1]

The role of MRI in guiding the need for surgical decompression in TB paraplegia

MRI may help in selecting the best treatment for TB paraplegia (ATT only vs. surgery) in a number of ways. [1] MRI can discern the fundamental mechanism of neurological impairments, such as cord compression vs. inflammation, recognizing that a combination of processes frequently occurs. [1] MRI can also show intrinsic cord changes such as edema, myelomalacia, and cord atrophy, which correlate with the severity of deficit and response to treatment.[10]

TB paraplegia with evidence of myelitis, edema, or arachnoiditis without significant cord compression may recover well with ATT alone. [1,10] In contrast, surgical decompression may yield a better neurological recovery for patients with significant cord compression. [1] What constitutes substantial cord compression is debatable, as patients with 76% canal compression on MRI may still be neurologically intact due to the slowly progressive nature of compression. [11] Intrinsic cord changes, such as edema with preserved cord size, correlate with a better neurological recovery, while myelomalacia or severe cord atrophy may indicate the need for surgical intervention. [1],[10]Ahuja K et al.. demonstrated that low fractional anisotropy values were independently correlated with slower neurological recovery and may indicate the necessity for early surgical decompression. [8]

MRI also might reveal the nature of compressive lesions, which may dictate the response of ATT and the need for surgery. [2,5] Extradural primarily fluid collections, such as abscesses, referred to as wet lesions, respond favorably to ATT alone. [2] Conversely, early decompression may be required for extradural granulomatous, sequestrated disc material, or sequestrum (dry lesions), as these may not respond adequately to ATT. [2] Wet lesions typically appear as a hyperintense core in T2 with ring enhancement, while dry lesions appear as a hypointense or isointense core in T2 with homogenous enhancement. [2]

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Conclusion:

Late-onset paraplegia should be treated surgically to correct deformity. No consensus exists regarding the indications for surgical intervention for early-onset paraplegia. The presence of

mechanical instability or deformity in association with neurological deficit is an absolute indication for surgical decompression and stabilization. The acute, rapidly progressive, severe neurological deficit that does not respond to antitubercular therapy indicates the need for surgical decompression. MRI evidence of significant cord compression due to wet lesions is better treated surgically.

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