

Sp27: Are there differences in the natural history of spinal tuberculosis between children, adults, and the elderly?

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Response/Recommendation: The natural history of spinal tuberculosis varies across children, adults, and the elderly due to the effect of growth modulation in children, varying immune response, and comorbidities in the elderly. Children experience rapid vertebral destruction, increased kyphotic deformity during the healing phase and a dynamic deformity progression during the period of growth even after healing of the disease. and high post-healing complications. Adults have more localized disease, slower progression, lesser kyphosis and stable kyphosis after healing of disease. Elderly patients face delayed diagnosis, extensive spinal involvement, and higher morbidity due to weakened immunity and comorbidities. Early detection and knowledge of the natural history of the disease in different age groups is essential for improving outcomes.

Level of Evidence: Low

Delegate Vote:

Rationale:

Spinal TB in children

In children, vertebral bodies contain a higher proportion of cartilaginous tissue and are more vascularized than in adults. This facilitates rapid dissemination of the infection within the vertebrae. Consequently, pediatric patients often experience more extensive vertebral destruction in a shorter time frame (1).

One of the most significant concerns in pediatric spinal TB is the risk of severe deformity progression. Unlike adults, in whom the deformity stabilizes post-healing, children are prone to continue kyphotic changes due to the dynamic nature of their growing spine (2). Healing occurs through the spontaneous fusion of affected vertebrae, forming a fusion mass, but variable deformity progression can result from growth-related morphological changes in the fused kyphotic mass and adjacent vertebrae (3). Even after effective TB treatment, spinal deformity may continue to worsen until skeletal maturity is reached.

Rajasekaran et al.'s 15-year follow-up of 61 children with post-tuberculous kyphosis showed that 17% had no change in deformity, 44% showed improvement, and 39% experienced deformity progression (4).

Children under ten years old with spinal TB are at the highest risk of severe vertebral destruction and progressive kyphotic deformity due to their immature, flexible spine. (5,6,7,8,9). Rajasekaran et al. (4) found that vertebral body loss at the start of treatment was significantly higher in younger children, with a mean loss of 1.74 in those under five years and 1.70 in those aged six to ten, compared to only 1.0 in those over ten years. Additionally, their 15-year follow-up study revealed that vertebral collapse within the first 18 months per vertebral body loss in children under ten was nearly twice that seen in adults, emphasizing the need for early intervention to prevent severe spinal deformities (4).

Children under 10 years old exhibit significant disease progression, with 94% experiencing deformity changes during growth. In contrast, children aged 11 and older show less severe disease, reduced vertebral loss, and a more stable deformity pattern similar to adults. Over

50% of older children have no deformity progression or changes in fusion mass morphology (10).

Spinal TB in Adults

Compared to children, adults have a more localized disease with slower progression and less vertebral destruction. Kyphotic deformity stabilizes after healing, with minimal post-healing changes. Vertebral collapse and spinal deformity occur primarily during the active phase, but significant worsening post-healing is uncommon.

Although adults experience less severe vertebral destruction, the presence of chronic pain and stiffness due to fibrosis and vertebral fusion can impact long-term spinal function. While deformity progression is predictable, delayed diagnosis remains a concern in certain cases, especially when symptoms mimic other spinal conditions. (11)

Spinal TB in the Elderly

With increased life expectancy, spinal TB is being diagnosed more frequently in older adults. However, elderly patients face unique challenges due to weakened immunity, multiple comorbidities, and higher risks of drug interactions. Studies indicate that elderly patients with spinal TB have a higher risk of adverse drug reactions, mortality, and misdiagnosis. Diagnosing spinal TB in elderly patients is complicated by symptom overlap with degenerative spinal conditions, leading to delayed or missed diagnoses. Additionally, older patients have a higher risk of TB meningitis, systemic dissemination, and multi-organ involvement. Poor bone healing capacity further complicates recovery, leading to progressive kyphosis, instability, and neurological deficits (12). There is a 3-fold rise in the likelihood of adverse medication responses in the senior population, a 6-fold increase in the likelihood of death, and a 20-fold increase in the likelihood of misdiagnosis [13].

Conclusion

Spinal TB presents distinct clinical and pathological differences across age groups, necessitating tailored management strategies. Children are at the highest risk of severe kyphosis and long-term complications due to growth-related deformity progression. Adults experience slower disease progression with stable kyphotic changes post-healing, whereas elderly patients face the highest risk of delayed diagnosis, systemic TB spread, and poor healing outcomes due to comorbidities.

Early detection, prolonged follow-up, and age-specific treatment approaches are essential in preventing severe spinal deformity, neurological impairment, and systemic complications. Given the variability in disease progression, close monitoring and timely intervention remain critical for improving patient outcomes in all age groups.

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