CASE REPORT

Weekly Teriparatide Therapy to Enhance Bone Healing in Pyogenic Spondylodiscitis with Severe Osteoporosis: A Case Series

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ABSTRACT
Introduction :
Pyogenic spondylodiscitis is a damaging spinal infection mainly seen in older adults and those with underlying health issues. The presence of significant osteoporosis can worsen vertebral collapse, delay the healing of bones, and prolong functional impairment even after the infection has been managed effectively. Teriparatide, a drug that promotes bone growth, has demonstrated advantages in treating osteoporotic fractures and enhancing spinal fusion; however, its effectiveness concerning bone loss due to infections remains unclear.
Aim: To evaluate the role of once-weekly teriparatide as an adjunct in promoting vertebral bone regeneration and functional recovery in patients with pyogenic spondylodiscitis associated with severe osteoporosis.
Materials and Methods: This case series included five elderly patients diagnosed with pyogenic spondylodiscitis and severe osteoporosis. All patients were treated with culture-directed antibiotics and appropriate surgical or conservative stabilization. After clinical and biochemical evidence of infection control, weekly subcutaneous teriparatide (56.5 µg) was initiated. Patients were followed clinically and radiologically to assess pain relief, functional recovery and vertebral bone healing.
Results: All patients demonstrated early radiological evidence of trabecular regeneration within 6–8 weeks, followed by progressive cortical consolidation by 3–5 months. Significant pain reduction and improvement in mobility were observed in all cases. No teriparatide-related adverse effects or recurrence of infection were noted.
Conclusion: Teriparatide administered once a week seems to be a safe and effective addition for improving vertebral bone regeneration and functional recovery in cases of pyogenic spondylodiscitis complicated by severe osteoporosis. Further large-scale prospective studies are necessary to confirm its conclusive role,

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INTRODUCTION

Pyogenic spondylodiscitis is an infection involving the vertebral body and intervertebral disc, most commonly caused by *Staphylococcus aureus* [1]. It is characterized by early disc involvement, rapid destruction of vertebral endplates, and potential progression to spinal instability, deformity, and neurological compromise [2,3]. The disease burden is increasing due to aging populations and rising prevalence of comorbid conditions such as diabetes mellitus, chronic kidney disease, immunosuppression, and malnutrition [4].

In this population severe osteoporosis often coexists and greatly exacerbates structural damage slows healing and prolongs rehabilitation. Conventional treatment approaches do not actively address impaired bone regeneration instead they concentrate on mechanical stabilization and the elimination of infections. In osteoporotic spine surgery teriparatide a recombinant human parathyroid hormone (1–34) has shown anabolic effects on bone improving fusion rates and speeding up fracture healing [5–7]. Its possible connection to vertebral bone loss caused by infection is examined in this case series.

MATERIALS AND METHODS

This retrospective case series included five patients diagnosed with pyogenic spondylodiscitis and severe osteoporosis treated at a tertiary care center. Diagnosis was established based on clinical features, laboratory markers (ESR, CRP), and MRI findings.

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Microbiological confirmation was obtained wherever possible.

All patients received culture-directed intravenous antibiotics for 4–6 weeks followed by oral therapy as per infectious disease recommendations [1]. Surgical stabilization was performed when indicated; others were managed conservatively with immobilization.

Teriparatide (56.5 µg subcutaneous weekly) was initiated only after clear evidence of infection control, defined by clinical improvement and normalization or downward trend of inflammatory markers. Patients were followed with serial clinical assessment and radiographs/MRI.

RESULTS

All five patients showed consistent patterns of recovery [Table 1]. Radiological evidence of early trabecular regeneration was noted by 6–8 weeks after initiation of teriparatide. Progressive cortical consolidation and restoration of vertebral body height were observed by 3–5 months.

Clinically, patients experienced significant pain relief, improved mobility, and earlier return to ambulation. No patient developed hypercalcemia, systemic adverse effects, or recurrence of infection during follow-up.

DISCUSSION

Pyogenic spondylodiscitis represents a challenging condition wherein infection-induced bone destruction is compounded by age-related and disease-associated osteoporosis. Even after microbiological eradication, restoration of vertebral structural integrity is often delayed, predisposing patients to progressive collapse, deformity, and chronic pain [3,4].

Inflammatory cytokines released during infection stimulate osteoclastic activity, leading to aggressive cancellous bone resorption. In osteoporotic patients, baseline impairment of osteoblastic function further limits regenerative capacity. Conventional management strategies do not directly target this biological deficit, highlighting the need for adjunctive therapies that enhance bone formation.

Teriparatide exerts its anabolic effect by stimulating osteoblast differentiation and activity while reducing osteoblast apoptosis, thereby shifting bone remodeling toward formation [5]. Its efficacy in accelerating fracture healing and improving spinal fusion outcomes has been well documented [6–8]. In the present series, teriparatide was initiated only after infection control, ensuring that its anabolic effects coincided with the reparative phase rather than active inflammation.

A consistent radiological pattern was observed across all cases, with early trabecular regeneration followed by cortical consolidation. These changes occurred earlier than typically expected in severely osteoporotic patients managed with antibiotics and immobilization alone. Importantly, radiological improvement correlated with clinical outcomes, including pain relief and functional recovery, suggesting a meaningful therapeutic benefit.

The observed benefits were seen in both surgically and conservatively managed patients. In surgically stabilized cases, improved bone quality likely enhanced implant fixation and reduced micromotion, consistent with findings from spinal fusion literature [9]. In conservatively managed patients, accelerated vertebral remodeling may have contributed to mechanical pain reduction and prevention of delayed collapse.

Concerns regarding potential infection exacerbation with anabolic therapy were not supported by our findings. No recurrence of infection or inflammatory flare was noted, aligning with previous reports that teriparatide does not adversely affect infection outcomes when initiated after adequate antimicrobial therapy [10].

Despite encouraging results, this study is limited by its small sample size and observational design. The relative contributions of antibiotics, stabilization, and natural healing cannot be fully isolated. Nevertheless, the reproducibility of outcomes across high-risk patients strengthens the biological plausibility of teriparatide as an adjunctive therapy.

LIMITATIONS

Small sample size, lack of a control group, and short-term follow-up limit definitive conclusions. Quantitative bone density measurements and standardized functional scores were not uniformly available.

CONCLUSION

Once-weekly teriparatide, when used after adequate infection control, appears to improve vertebral bone regeneration and functional recovery in patients with pyogenic spondylodiscitis and severe osteoporosis. Its role as an adjunctive therapy requires further evaluation through larger prospective studies.

REFERENCES

1. Berbari EF, Kanj SS, Kowalski TJ, et al. 2015 Infectious Diseases Society of America clinical practice guidelines for the diagnosis and treatment of native vertebral osteomyelitis. *Clin Infect Dis.* 2015;61(6):e26-e46.
   Cottle L, Riordan T. Infectious spondylodiscitis. *J Infect*. 2008;56(6):401-12.
   Zimmerli W. Vertebral osteomyelitis. *N Engl J Med*. 2010;362:1022-29.
2. Tali ET. Spinal infections. *Eur J Radiol*. 2004;50:120-33.
   Neer RM, Arnaud CD, Zanchetta JR, et al. Effect of parathyroid hormone (1–34) on fractures and bone mineral density. *N Engl J Med*. 2001;344:1434-41.
3. Aspenberg P, Genant HK, Johansson T, et al. Teriparatide for acceleration of fracture repair in humans. *J Bone Miner Res*. 2010;25:404-14.
4. Tsujimoto T, Takayanagi H, et al. Once-weekly teriparatide improves bone microarchitecture. *Osteoporos Int*. 2017;28(2):559-66.
5. Gdowski AS, Reddy H, et al. Teriparatide in spinal fusion and bone healing: A systematic review. *Neurosurg Focus*. 2021;50(6):E9.
6. Poli JV, Picchi E, et al. Surgical management of pyogenic spondylodiscitis. *Clin Spine Surg*. 2018;31(8):317-24.

7. Campbell’s Operative Orthopaedics. 13th ed. the Spine. Philadelphia: Elsevier; 2017. Chapter: Infections of

TABLE 1 : RESULTS

Parameter	Case 1	Case 2	Case 3	Case 4	Case 5	
Age / Sex	74 / F	79 / M	70 / F	67 / M	72 / M	
Comorbidities	Rheumatoid arthritis on methotrexate	Diabetes mellitus	COPD on chronic steroids	Long-term bisphosphonate therapy	Chronic kidney disease stage 3, hypertension	
Level involved	L3–L4	T12	T8–T9	L3	L1–L2	
Clinical presentation	Low-grade fever, worsening back pain	Severe back pain, difficulty standing	Mid-thoracic pain, high-grade fever	Acute-on-chronic lumbar pain, intermittent fever	Severe lumbar pain, difficulty ambulation, low-grade fever	
Organism isolated	*Staphylococcus aureus*	*Escherichia coli*	*Staphylococcus aureus*	MRSA	*Staphylococcus aureus*	
Inflammatory markers	CRP 9.8 mg/dL; WBC 12,400 cells/mm³	CRP 12.1 mg/dL; ESR 96 mm/hr	CRP 7.4 mg/dL; WBC 18,600 cells/mm³	CRP 10.5 mg/dL	CRP 11.2 mg/dL; ESR 88 mm/hr	
Baseline BMD (T-score)	−3.2	−2.8	−3.5	−2.6	−3.1	
Imaging findings	L3–L4 discitis	T11–T12 and T12–L1 spondylodiscitis with T12 collapse	T8–T9 destructive spondylodiscitis	L3 discitis with vertebral collapse	L1–L2 discitis with endplate erosion and early collapse	
Initial management	Intravenous antibiotics, TLSO brace	Intravenous antibiotics	Intravenous antibiotics, TLSO brace	Intravenous antibiotics	Intravenous antibiotics, TLSO brace	
Surgical intervention	Discectomy performed elsewhere	T8–L3 posterior fixation with discectomy	None	L2–L4 posterior fixation	None	
Initiation of teriparatide	After 2 weeks of IV antibiotics	After 4 weeks of IV antibiotics	After 2 weeks of IV antibiotics	After 2 weeks of IV antibiotics	After 3 weeks of IV antibiotics	
Teriparatide regimen	56.5 µg subcutaneous weekly	56.5 µg subcutaneous weekly	56.5 µg subcutaneous weekly	56.5 µg subcutaneous weekly	56.5 µg subcutaneous weekly	
Clinical outcome	Symptomatic relief	Pain reduced; ambulates with support	Ambulates independently	Ambulates with support	Pain significantly reduced; ambulates with minimal support	

FIGURES

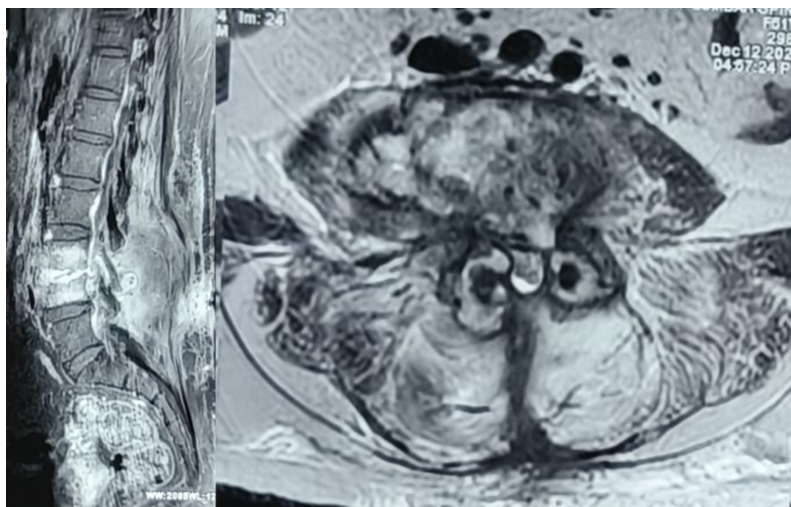

Fig 1 - Initial MRI

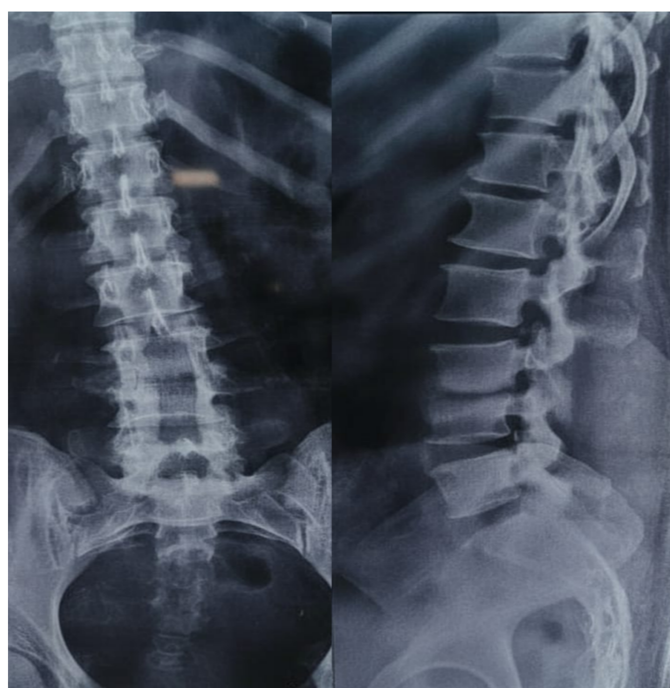

Fig 2 - Xray at 5 months

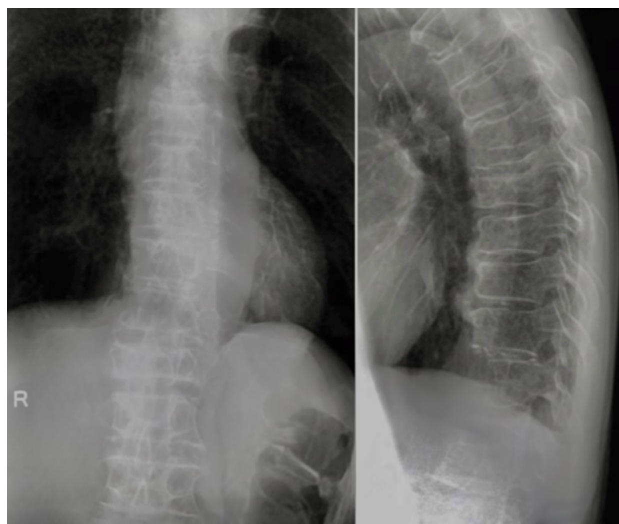

Fig 3 - Pre Op Xray

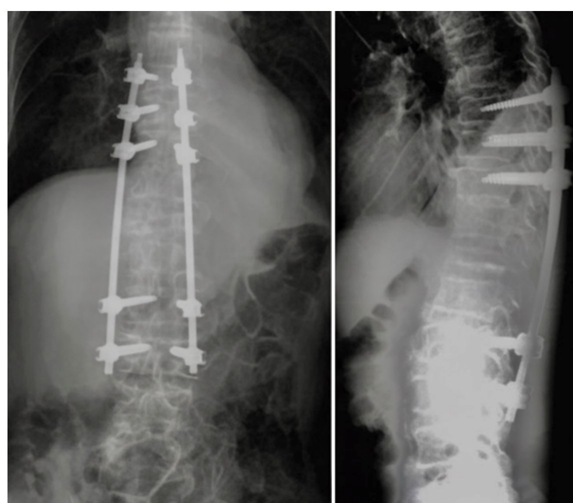

Fig 4 - Post Op Xray

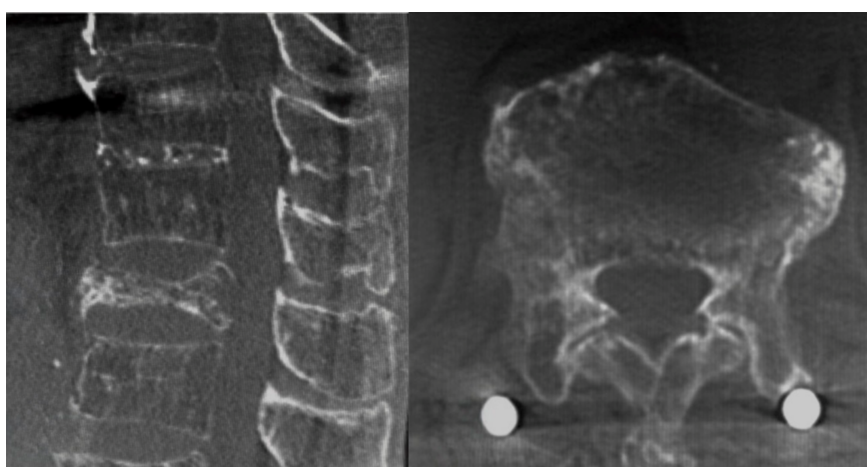

Fig 5 - MRI at 3 months