

Tubercular Tenosynovitis of the Flexor Tendons Presenting as a Benign Nerve Sheath Tumor in an Adolescent: A Case Report

Sumit Jain¹, Shriya Bhat², Md. Najim³, Jatin Ghai⁴

¹Associate Professor, Department of Plastic and Reconstructive Surgery, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India

²Senior Resident, Department of Plastic and Reconstructive Surgery, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India

³Senior Resident, Department of Plastic and Reconstructive Surgery, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India

⁴Senior Resident, Department of Plastic and Reconstructive Surgery, Guru Gobind Singh Medical College and Hospital, Faridkot, Punjab, India

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Corresponding author: Dr.Md. Najim

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Abstract

Introduction: Tuberculous flexor tenosynovitis is an uncommon manifestation of musculoskeletal tuberculosis, accounting for a small proportion of extrapulmonary tuberculosis. Due to its insidious onset, nonspecific clinical presentation, and resemblance to benign soft tissue lesions, diagnosis is often delayed leading to tendon damage, adhesions, and functional impairment.

Case Presentation: A 17-year-old male presented with a painless, progressively enlarging swelling over the volar aspect of the distal forearm extending into the hypothenar region for four months. There was no history of trauma, constitutional symptoms, tuberculosis exposure, or neurological deficit. Routine laboratory investigations, inflammatory markers, chest radiography, and serological tests were normal. Fine-needle aspiration cytology was inconclusive, while magnetic resonance imaging suggested a benign peripheral nerve sheath tumor. Surgical exploration revealed extensive hypertrophied flexor tendon synovium extending from the distal forearm to the A1 pulley, containing abundant caseous necrotic material. Histopathological examination demonstrated epithelioid granulomas with Langhans giant cells and caseous necrosis, and mycobacterial culture confirmed *Mycobacterium tuberculosis*. The patient underwent complete synovectomy followed by standard anti-tubercular chemotherapy and supervised physiotherapy. At six months, he regained full wrist and finger movements with no evidence of recurrence.

Conclusion: Tuberculous flexor tenosynovitis should be considered in the differential diagnosis of chronic painless swelling of the forearm and wrist, particularly in tuberculosis-endemic regions, even in the absence of constitutional symptoms or abnormal laboratory findings. Histopathological examination remains the cornerstone of diagnosis. Combined surgical synovectomy followed by anti-tubercular therapy provide excellent outcomes with minimal recurrence.

Keywords: Tuberculous Tenosynovitis; Flexor Tendon Sheath; Hand Tuberculosis; Extrapulmonary Tuberculosis; Synovectomy.

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Introduction

India is a tuberculosis-endemic country contributing to more than 33% of the world's TB burden [1]. Extrapulmonary TB accounts for 15%–20% of all TB cases [2]. Musculoskeletal tuberculosis accounts for approximately 10% of all extrapulmonary TB cases and is the third most common type of extrapulmonary TB after pleural and lymphatic disease.

Tuberculous tenosynovitis is a rare manifestation of musculoskeletal tuberculosis that most commonly affects the flexor tendon sheaths of the wrist and hand. Patients typically present with slow growing painless swelling, restricted wrist motion, reduced grip strength. Due to its slow progression and nonspecific clinical presentation, the diagnosis and management are often delayed.

Although MRI plays crucial role in diagnosis due to characteristic imaging features and determining the extent of involvement, histopathological examination remains the diagnostic gold standard. Early recognition and combined surgical and medical management with appropriate Anti-tubercular drugs give excellent outcomes.

We describe a patient with tuberculous flexor tenosynovitis of the distal forearm illustrating the diagnostic uncertainty due to its unusual presentation on MRI suggestive of nerve sheath tumor and the importance of considering

tuberculosis in the differential diagnosis of chronic wrist swelling in endemic settings.

Case Presentation: A 17-year-old male presented with a history of gradually progressive swelling over the distal volar aspect of the forearm for four months. The swelling had progressively extended toward the hypothenar region. The patient did not report pain, fever, weight loss, night sweats, or other constitutional symptoms. There was no history of trauma, preceding local infection, neurological symptoms, or known contact with a patient with tuberculosis.

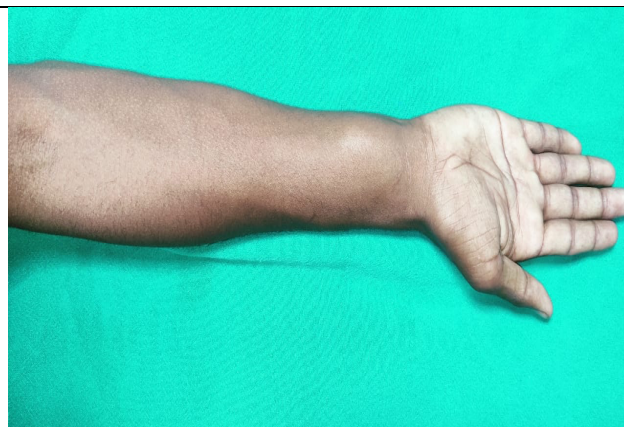


Figure 1: Swelling over distal forearm



Figure 2: MRI at distal swelling showing swelling relationship



Figure 3: MRI showing relationship of swelling to nerve sheath

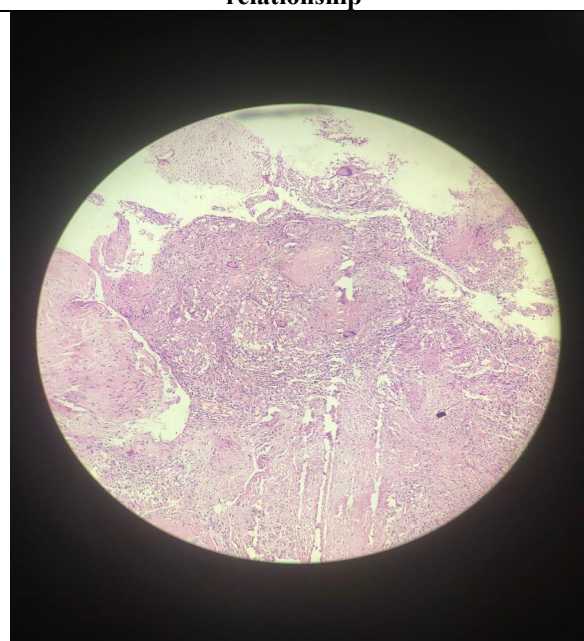


Figure 4: HPE showing granulomatous inflammation, caseous necrosis, epithelioid cells, and Langhans giant cells

Clinical Examination: On examination, a fusiform swelling measuring approximately 10×3 cm was present over the volar forearm, with an additional 2×2 cm extension toward the hypothenar region. The overlying skin was normal. On palpation, the swelling was soft, doughy, compressible, non-tender, and non-pulsatile. Tinel's test was negative. There was no clinically demonstrable motor or sensory deficit.

The chronicity and extent of the swelling suggested a soft-tissue lesion involving the flexor compartment. However, the absence of pain, inflammatory signs, neurological deficit, and constitutional symptoms made the clinical diagnosis uncertain.

Investigations: Routine laboratory investigations, including complete blood count, erythrocyte sedimentation rate, and C-reactive protein, were within normal limits. Screening for HIV and hepatitis B surface antigen was negative. Chest radiography did not demonstrate evidence of pulmonary tuberculosis.

Fine-needle aspiration cytology yielded scant cellular material and was inconclusive.

Magnetic resonance imaging of the forearm and wrist was performed and suggested a benign nerve sheath tumor. In view of the extensive swelling and uncertain tissue diagnosis, surgical exploration was planned.

Operative findings: On exploration, extensive thickening of the synovial tissue surrounding the flexor tendons was identified. The abnormal synovium extended longitudinally from the forearm toward the hand, reaching the level of the A1 pulley. On opening the involved tendon-sheath system, thick white caseous necrotic material was encountered and evacuated. The flexor tendons themselves were intact, although their movement was restricted because of the extensive synovial disease.

A thorough synovectomy was performed, with removal of the abnormal synovial tissue and caseous material. Tissue was submitted for histopathological and microbiological examination.

Histopathological examination: Histopathological examination demonstrated epithelioid cell granulomas containing Langhans giant cells, associated with areas of caseous necrosis and chronic inflammatory changes. These findings were strongly suggestive of tubercular infection.

Microbiological confirmation: Culture of the operative specimen subsequently confirmed the presence of *Mycobacterium tuberculosis*, establishing the diagnosis of tubercular tenosynovitis.

Treatment and rehabilitation: Following confirmation of the diagnosis, the patient was commenced on antitubercular therapy. The treatment regimen consisted of isoniazid, rifampicin, pyrazinamide, and ethambutol (HRZE) for the initial two months, followed by isoniazid and rifampicin (HR). The total planned duration of treatment was 6–9 months.

Early postoperative physiotherapy was initiated to restore tendon excursion and minimize the development of adhesions and stiffness.

Outcome: The swelling showed complete clinical resolution by three months. Progressive improvement in tendon gliding and hand function was achieved with rehabilitation. By six months, the patient had regained full wrist and finger movements. No recurrence was reported during the available follow-up period.

Discussion

Musculoskeletal tuberculosis represents approximately 1–3% of all tuberculosis cases, whereas involvement of tendon sheaths and bursae constitutes only about 1% of osteoarticular tuberculosis. Tubercular tenosynovitis is therefore an uncommon manifestation. The hand and wrist are the sites most frequently affected, particularly the flexor tendon sheaths and ulnar bursa. Despite the high prevalence of tuberculosis in many developing countries, diagnosis is often delayed because the disease progresses slowly and presents with nonspecific clinical findings [3-5].

The present case demonstrates several characteristic features of tubercular tenosynovitis, including gradually progressive swelling, flexor tendon-sheath involvement, and delayed diagnosis. Similar patterns have been described in case reports and series, where the disease initially resembles more common disorders affecting the hand and wrist. Because its clinical manifestations overlap with inflammatory, degenerative, and neoplastic conditions, tubercular tenosynovitis has appropriately been described as a “great imitator” of hand infections [6-8].

The precise route by which *Mycobacterium tuberculosis* reaches the tendon sheath remains incompletely defined. Hematogenous dissemination from a primary pulmonary focus is considered the principal mechanism, although direct inoculation following trauma and contiguous spread from adjacent infected tissues have also been described.

Many patients have no evidence of active pulmonary disease when they present, indicating that isolated tendon-sheath infection can occur [3,5]. Repeated microtrauma and the relatively vascular nature of synovial tissues have additionally been proposed as factors that may

facilitate localization of the organism within the tendon sheath [7].

The flexor compartment of the hand is the anatomical region most commonly involved. Jaovisidha et al. reported hand and wrist involvement in 92% of patients in their imaging series, with the flexor tendon sheath affected in every case. Extensor involvement was considerably less frequent. Their study also demonstrated frequent involvement of the radioulnar bursae, with the ulnar bursa affected more commonly than the radial bursa [5].

The clinical course is usually chronic and indolent. Early disease may manifest only as a slowly enlarging swelling, while pain may be mild or absent. As the infection advances, restriction of finger movement, reduced grip strength, stiffness, and median nerve compression can develop. Constitutional features such as fever, weight loss, and night sweats are frequently absent, which is an important reason for delayed recognition [4,6,9].

Ngoc et al., in a prospective study of 25 patients, found swelling in every patient, whereas pain, restricted movement, and neurological symptoms were less consistently present. The mean duration from symptom onset to diagnosis was more than six months, highlighting the prolonged nature of the disease [4]. In a similar report, D'Souza et al. described seven months of progressive swelling accompanied by pain, limitation of wrist movement, and reduced grip strength [6].

From a histopathological perspective, tubercular tenosynovitis has been divided into three stages. The hygromatous stage is characterized by serous accumulation within the tendon sheath with relative preservation of the tendon. During the Sero-fibrinous stage, synovial proliferation and granulation tissue develop, together with formation of rice bodies. The advanced fungoid stage may show caseation, abscesses, sinus formation, tendon rupture, and bone destruction. Progression is influenced by disease duration, bacterial virulence, and the host immune response. Without treatment, infection may spread to adjacent joints, bones, and deep fascial spaces [6].

Rice bodies are among the characteristic findings associated with chronic tubercular tenosynovitis. Woon et al. described them as fibrin-coated structures produced by chronic synovial inflammation and ischemic microinfarction. Their gross appearance may resemble grains of rice, millet, or melon seeds. Importantly, rice bodies are not specific for tuberculosis and can also occur in rheumatoid arthritis, systemic lupus erythematosus, osteoarthritis, chronic bursitis, and seronegative arthropathies [10-11]. Udayakumar et al. noted that fewer than half of patients demonstrate rice bodies;

therefore, their absence cannot be used to exclude the diagnosis [9].

The differential diagnosis is broad and includes pyogenic or fungal tenosynovitis, foreign-body granuloma, rheumatoid arthritis, pigmented villonodular synovitis, gout, de Quervain disease, systemic lupus erythematosus, and ganglion cysts. Similar clinical and radiological appearances among these conditions can lead to an incorrect diagnosis and inappropriate treatment. Several reports describe patients who were initially managed for ganglion cysts, rheumatoid arthritis, or nonspecific inflammatory disease before tuberculosis was identified [6,8,9].

Imaging is an important component of the diagnostic assessment. Plain radiographs are often nonspecific and may show little more than soft-tissue swelling. In advanced disease, periarticular osteopenia, calcification, and bone erosion may become evident. Jaovisidha et al. found soft-tissue swelling in all patients and calcification in approximately one-third; the calcified material was considered to represent caseous material within the tendon sheath [5].

Ultrasonography is a useful first-line investigation because it is inexpensive, widely available, and can demonstrate tendon-sheath fluid, synovial thickening, and rice bodies. MRI offers superior soft-tissue delineation and is therefore particularly useful for defining the extent of disease. Typical findings include tendon-sheath distension, synovial thickening, septate fluid collections, and multiple low-signal nodules corresponding to rice bodies. Tuberculous fluid is generally hypointense to isointense on T1-weighted sequences and hyperintense on T2-weighted images [5,6].

Molecular diagnostic methods have become increasingly valuable in musculoskeletal tuberculosis. Conventional techniques such as acid-fast staining and culture may have limited sensitivity because these lesions are commonly paucibacillary. Histopathology remains a major diagnostic method and usually demonstrates granulomatous inflammation, caseous necrosis, epithelioid cells, and Langhans giant cells, although tissue findings may occasionally be inconclusive. In such cases, molecular tests such as GeneXpert MTB/RIF and cartridge-based nucleic acid amplification testing (CBNAAT) can improve diagnostic yield [6,9]. D'Souza et al. reported a patient with negative acid-fast staining and inconclusive histology in whom GeneXpert subsequently established the diagnosis [6]. Udayakumar et al. similarly reported confirmation by CBNAAT despite an unusual clinical presentation [9]. Antitubercular chemotherapy remains the mainstay of treatment, although the indications and timing of surgery continue to be

debated. Surgery may be necessary to obtain tissue for diagnosis, decompress the median nerve, perform extensive synovectomy, or manage tendon rupture. Tuli recommended surgical debridement in patients who fail to respond adequately after four to five months of chemotherapy [9]. Other authors support earlier surgery because it provides diagnostic tissue while also reducing the local burden of infection [6,9].

Most reports support prolonged antitubercular therapy, generally for approximately 9–12 months. Favourable functional recovery and low recurrence rates have been described with combined medical and surgical treatment [4,6,9]. Rehabilitation after surgery is also important because prolonged immobilization can result in tendon adhesions and joint stiffness, adversely affecting hand function [6].

Prognosis is strongly influenced by the timing of diagnosis and initiation of treatment. Delayed disease can produce irreversible tendon damage, median nerve compression or carpal tunnel syndrome, tendon rupture, osteomyelitis, and destruction of adjacent joints. In tuberculosis-endemic regions, clinicians should therefore maintain a high degree of suspicion when evaluating patients with chronic or unexplained hand or wrist swelling, particularly when tendon-sheath enlargement, rice bodies, or atypical imaging findings are present. Early tissue diagnosis followed by prompt antitubercular treatment is essential for preserving hand function and reducing the likelihood of permanent disability [9].

Conclusion

Tubercular tenosynovitis should remain an important differential diagnosis for chronic, painless swelling of the hand, wrist, or forearm, even in young patients without constitutional symptoms or evidence of pulmonary tuberculosis. Normal inflammatory markers and a benign appearance on MRI do not exclude the diagnosis.

When a chronic tendon-sheath swelling has an atypical clinical course or fails to fit the presumed radiological diagnosis, tissue sampling should be considered. Histopathological demonstration of granulomatous inflammation with caseous necrosis, supported by microbiological confirmation,

establishes the diagnosis.

In extensive disease, surgical synovectomy combined with appropriate antitubercular therapy and early rehabilitation can achieve excellent anatomical and functional outcomes.

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