

# Diagnosis & Management of Tuberculosis

## Chapter 2

### Tuberculosis of Rib

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#### 1. Introduction

Even in current era, incidence of tuberculosis remains high in certain parts of the world with more than half of the world's tuberculosis infected population residing in Asia [1]. In countries where tuberculosis is endemic or rampant due to poor socioeconomic status, malnutrition, emergence of multidrug resistant cases (MDR) and increasing association of TB with HIV infection; tuberculosis persists to pose a significant public health problem [2,3]. African population, the inhabitants of the Indian subcontinent and the Caribbean are most frequently affected by this disease.

Musculoskeletal tuberculosis is the most prevalent form of extrapulmonary tuberculosis and it accounts for 10-15% of all the different types of tuberculosis in the developing world; where as in the western world, it constitutes approximately 1-2% of all the cases diagnosed with tuberculosis infection [4]. The common sites affected in skeletal tuberculosis are vertebral column (50%), hip (15%) and the knees (5%). Although any bone in the body can be involved by the tubercular infection, involvement of the ribs is a relatively rare condition and it constitutes approximately 2% of the total cases of musculoskeletal tuberculosis [5,6]. In coming years incidence of this condition is expected to rise; mainly due to emergence of multi-drug-resistant (MDR) strains and due to the ever increasing numbers of immuno-compromised individuals in the given population [7].

#### 2. Pathology

The rarity of the tuberculosis of ribs may be ascribed to its surreptitious beginning and to the infrequency of the involvement of other organs; less than 50% patients have concomitant active pulmonary tuberculosis [8]. However, despite the rarity, tuberculosis remains the commonest inflammatory condition affecting the ribs and it is also implicated as the second commonest cause for rib destruction after metastatic affection [9]. Patients between 15-30 years of age are most often affected by tuberculosis of ribs and mostly males are liable to get diseased as compared to females with this condition.

Although skeletal tuberculosis primarily results from either the lymphatic or hematogenous dissemination of bacilli from the primary infective foci [10,11], but in cases of rib tuberculosis three possible mechanisms have been suggested to describe its pathogenesis [12].

1. Direct extension from the underlying pleural or pulmonary parenchymal disease.
2. Hematogenous dissemination associated with activation of a dormant tuberculous focus.
3. Direct extension from a lymphadenitis in the chest wall.

Direct extension from the underlying pleural or parenchymal disease seems to be a less common cause of rib tuberculosis as compared to the later two [11]. Mostly they present as either osteochondritis at the costochondral junction with or without rib destruction or tuberculous osteomyelitis involving the body of the affected ribs [13]. In some cases, especially in the patients of early ages, it can only involve the anterior chondral part of the rib and even these lesions can subsequently destroy the adjacent bone either due to pressure necrosis or direct involvement of the bone. In less than 10% of cases it may present as a cold abscess over the chest wall [14,15]. These cold abscesses appear at the site of infected lymphnodes that have been invaded by tubercle bacilli [12]. These lymphnodes then become caseous and this caseous material subsequently burrows externally to form a cold abscess over the chest wall [12] Almost in 25% of cases they present as chronic discharging sinuses in the chest wall (Fig.1).

Although we have not come across with post BCG tuberculosis of the rib but rare association with BCG has been postulated. It is not clear that rib tuberculosis has resulted due to direct inoculation of BCG. Many hypothesis have been suggested and post BCG rib TB postulation is stated to be acceptable only after exclusion of all possible modes that could lead to its infection, like: Reactivation of dormant focus, cold suppuration of draining lymph nodes (axillary, internal mammary and supraclavicular), haematogenous spread direct from the attenuated BCG bacilli especially in immunologically suppressed individuals, breaching the first lymph node barrier and spilling into systemic circulation to cause haematogenous spread to reach the rib, etc. Rib affection after BCG has been associated to be with but not as a result of direct inoculation [16,17,18].

### 3. Clinical Features and Diagnosis

This rare form of extrapulmonary tuberculosis is usually under-diagnosed in many settings. Perhaps the most important cause for under-diagnosis remains the failure of the busy clinicians to think of it; owing to rarity of this condition. Beside tuberculosis there are other conditions, which may mimic this infection clinically and these need to be included in the differential diagnosis of this condition viz. chronic non-specific osteomyelitis of ribs, rib affection following empyema necessitatis, eosinophilic granuloma, syphilis and benign & malignant tumors of rib.

The presenting symptoms of rib tuberculosis can be a swelling in the chest wall, non-healing sinus, cold abscesses and recurrent chest pain with or without any pleura-pulmonary involvement. Commonly they present as painless chest wall mass having variable consistency and size. Local tenderness, with or without erythema of these lesions, usually denotes superinfection of the cold abscess. Mostly they present as solitary lesion and most frequently they involve the shaft of the rib [12]. To establish a diagnosis of this condition may be a difficult task despite the visible lesion on the affected chest wall. In addition to a good history and meticulous clinical examination, use of certain radiological investigations i.e. CXR, CT scan and dedicated assistance and effort from an experienced cytologist for accurate percutaneous needle aspiration for obtaining material for smear, culture and cytopathological examination are essential. Of course, a trucut biopsy, ultrasound guided core biopsy are advocated for obtaining tissue for histopathological confirmation.

These lesions may become apparent on routine chest X-ray (Fig.2); however this imaging modality cannot detect the changes occurring in the early stages of this disease. Therefore, CT scan seems to be the preferred imaging modality to diagnose rib tuberculosis in doubtful cases (Fig.3). Additionally, the CT scan gives a detailed evaluation of chest wall lesion and the intra-thoracic organs, it may also show the nature and extent of the soft tissue lesion, associated intrathoracic lymphadenopathy and bony destruction or erosion [19]. Radiologically, presence of an osteolytic lesion, widening of the rib with added periosteal reaction and the presence of sequestrum - is highly suggestive of a tuberculosis osteomyelitic lesion [11]. There has been significant advancement in the interpretation of CT images. In an invention claimed by Djankaeva OV et al, they utilised the appearances of tissues before and after contrast enhancement, at the area of interest to distinguish among the granulation tissue, capsule of the abscess cavity and the normal tissues [20]. This investigation seems to be useful to know the exact extent of the diseased segment and thereby appears to be helpful in planning surgical intervention or image guided biopsies. Other imaging modalities i.e. Bone scan, MRI and USG may also provide some additional information, which can be helpful in corroborating evidence towards diagnosing these lesions.

Undoubtedly, establishing the presence of acid fast bacilli in the aspirate or tissue from the affected site is confirmatory for diagnosis. Therefore, needle aspiration for smear, culture and cytopathological analysis or histopathological tissue biopsy from the lesion is an essential requirement to reach to a final diagnosis. This biopsy, in addition, is beneficial and helpful to differentiate the diagnosis of rib tuberculosis from other pathological conditions of rib [21]. Understandably, it is imperative and important on the part of treating clinicians to have a pathological or microbiological confirmation of tuberculosis before embarking upon any therapeutic decisions [21]. Currently, the polymerase chain reaction (PCR) is a great contribution; as it allows an early diagnosis, especially when classical bacteriological methods to establish a diagnosis fail.

With the help of the mentioned procedures, a diagnosis of tuberculosis is established through the presence of caseating granuloma with giant cells, acid-fast bacilli in a direct smear or *Mycobacterium tuberculosis* in culture or in PCR. In clinical practice diagnostic yield of needle aspiration is low ranging from 29% to 36% [12,21]. Therefore if the diagnosis of tuberculosis remains uncertain after needle aspiration, surgical excision of the involved segment for diagnosis becomes mandatory. This surgical procedure for diagnosis must be performed with a therapeutic intent i.e. whole of the affected tissue should be preferably removed leaving the grossly healthy looking cut rib edges. In such cases these surgical interventions minimize the morbidity of the slow to heal wounds and sinuses of the disease of the ribs and surrounding chest wall [22] which the patients have already endured for a long time. Moreover, following surgery, the fibrosis resulting from the long drawn disease affliction is removed and so in the post-operative period, it also promotes neovascularisation in the fresh healing tissue which enhances and aids in better distribution of anti-tubercular medications, thereby increasing the efficacy and the ultimate response to therapy [22]. We recommend that skin should be closed primarily as this will prevent the formation of chronic draining sinus, [12,22] and thus reducing the resulting prolonged morbidity of the patient.

#### **4. Treatment**

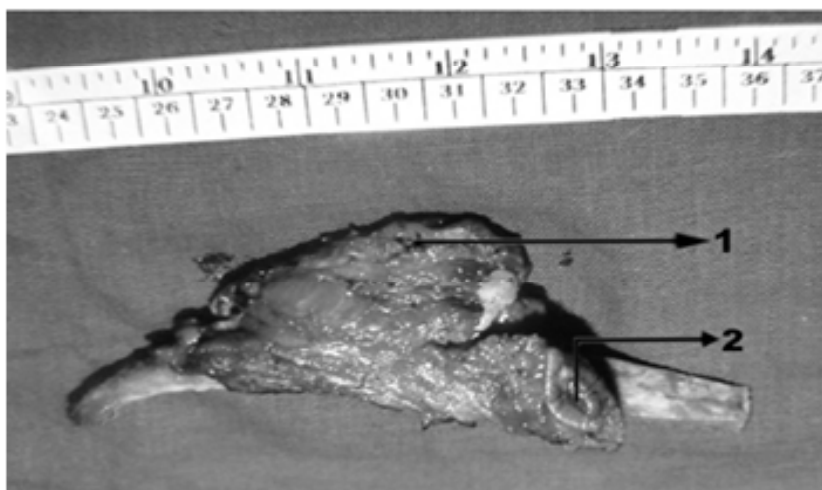
Based on previous reports [12,21,23], we recommend that if the diagnosis of tuberculosis becomes evident after needle aspiration; the patient should be put on anti-tubercular medication and the diseased area allowed to heal. In doubtful cases or when these lesions do not show any significant improvement despite 1 to 3 months of anti-tubercular medication, then surgical excision must be performed. In endemic areas, many a time, anti tubercular treatment is initiated on presumption and the nature of response then becomes the only clue to the etiology of the disease [12]. Considering the logistic constrains in the countries where tuberculosis is endemic or rampant, commencement of this empirical therapy on clinical grounds cannot be condemned entirely. However one should adopt such an approach with caution; it should be utilised only in highly suspicious cases and it must be discontinued in the absence of prompt

and adequate response to these drugs, even after 3 months of regulated consumption, in favour of surgical excision which will be of both diagnostic and therapeutic value, as has been explained above.

In tubercular patient, there are several subpopulations of *Mycobacterium tuberculosis* with different rates of metabolic activity. Majority of the organisms are rapidly reproducing but some reproduce slowly or are semi-dormant with occasional spurts of metabolism. Therefore, combinations of multiple effective drugs, at correct dosage and for a prolonged period, are needed to treat this condition. Most of the extra pulmonary form of tuberculosis is generally treated with the standard six month regimen as required for pulmonary tuberculosis. In musculoskeletal tuberculosis more extended duration of treatment is required and is desirable; as there is affirmation that the standard six month treatment may not provide complete cure [24]. Therefore, rifampicin containing regimen of nine months or more duration is favoured by some authorities [25,26].

Nonetheless, appropriate duration of chemotherapy particularly in cases of tuberculosis of rib still remains unclear. On the basis of our experience and according to various other available literature [11,21,22,27], we propose at least a 12 month regimen of anti-tubercular medication with rifampicin in the doses of 10-15 mg/kg, isoniazid 5 mg/kg, ethambutol 15 mg/kg and pyrazinamide 25 mg/kg of body weight for initial two months (induction therapy), followed by a ten month therapy with two drugs rifampicin and isoniazid (maintenance therapy) in the same dosage [22]. The majority of the organism are eliminated in the first two months of intensive phase but for achieving complete cure and to decrease the chances of recurrence, it is advisable to continue rifampicin and isoniazid for ten months. It may be wise to add injection streptomycin (15mg/kg as intramuscular injection and not more than 1 gm/day) in the induction phase, especially in chronic sufferers and immunocompromised patients.

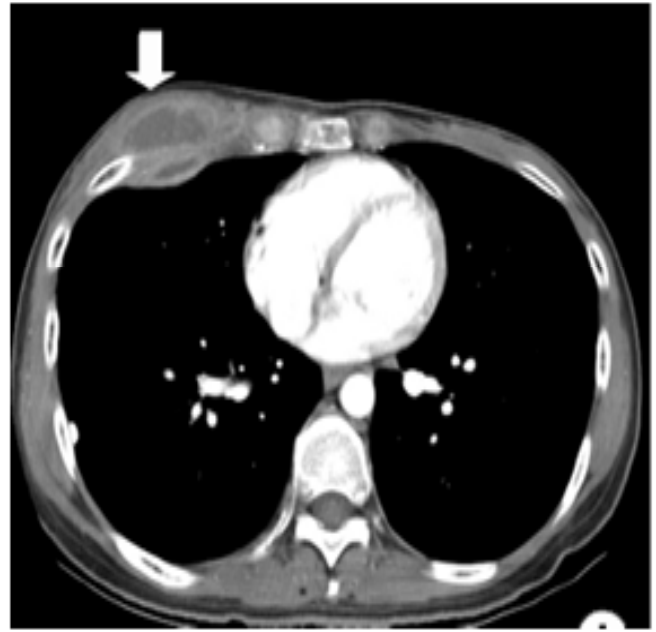
## 5. Figures



**Figure 1:** Excised specimen of tubercular rib showing granulation tissue on the inner surface (1) and sinus opening on the outer surface (2).



**Figure 2:** Osteolytic lesion of rib as seen in plain chest x-ray (arrow)



**Figure 3:** Chest CT showing soft tissue mass with central low density and with peripheral rim enhancement in the inner and outer sides of ribs (arrow).

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