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Research Article

Does Radiology and Pathology Correlate in the Diagnosis of Musculoskeletal Tuberculosis? - A Prospective Study on 110 Patients

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Abstract

Background: To evaluate the reliability of Clinical, Radiological and Pathological signs in making the diagnosis of Musculoskeletal Tuberculosis and to identify alternative pathological conditions that resemble it.

Materials and Methods: This is a prospective study including a total of 110 patients. Clinical and Radiological examination of all patients was done followed by Percutaneous biopsy of the involved region. The obtained tissue samples were sent for histopathological examination as well as CBNAAT for making a definitive diagnosis of Musculoskeletal tuberculosis.

Results: The study included 110 cases. Males were involved more (65.5%) as compared to females (34.5%). Clinically and radiologically, the most common sites involved were dorsal spine (35.5%) and lumbar spine (28.2%). Out of 110 patients, 100 were confirmed as Musculoskeletal tuberculosis which included 92 by HPE and 100 by CBNAAT. The remaining 10 cases which were non tuberculous consisted of 5 cases of metastatic deposits of carcinoma, 3 cases of pyogenic spondylodiscitis, 1 case of primary Giant cell tumour and 1 case of Hemangioma.

Conclusion: Musculoskeletal Tuberculosis is deep seated and paucibacillary condition. Diagnosis is difficult as inadequate sample yield is common. A multifaceted method involving direct smear examination, histopathological examination and CBNAAT is needed to arrive at a definite diagnosis. The gold standard test for diagnosis is culture but it can give false negative results in partially treated cases. Rapid tubercular bacilli detection is made possible by the high sensitivity and specificity of CBNAAT, but it can also produce false-positive results in non-viable bacilli.

Keywords: Musculoskeletal Tuberculosis; Percutaneous Biopsy; Histopathological Examination; CBNAAT

Introduction

Mycobacterium tuberculosis is the infectious illness that causes tuberculosis (TB).

One-fifth of all tuberculosis patients worldwide reside in India alone [1,2].

In 2012, it was projected that 3% of the 8.6 million tuberculosis cases had musculoskeletal tuberculosis [3]. The skeletal system is affected in roughly 1-2% of all patients with tuberculosis, with spinal tuberculosis accounting for about 50% among them [4]. Due to its non-specific symptoms, musculoskeletal TB is challenging to diagnose.

Early diagnosis of Musculoskeletal Tuberculosis largely relies on imaging and high index of suspicion on the part of doctor.

In cases of suspected musculoskeletal tuberculosis, a biopsy of the affected area aids in improving the yield of a conclusive diagnosis.

The gold standard method for diagnosing musculoskeletal TB is culture, although it has a slow replication rate of 6 to 8 weeks and can be negative in individuals that have only had partial treatment. For a clinical specimen to be culture positive, it requires 10-100 live bacilli/ml. A quick and reliable substitute for culture in the diagnosis of musculoskeletal TB is CBNAAT.

In addition to identifying other pathological disorders that are comparable to skeletal tuberculosis, the purpose of this study is to evaluate how reliable clinical, radiological, and pathological aspects are in making a diagnosis of musculoskeletal tuberculosis.

Materials and Methods

The present prospective study was conducted in the Department of Orthopaedic Surgery, Rohilkhand Medical College, Bareilly from November 2017 to November 2018 with the objective to study the Clinico-radiological and Pathological correlation in Musculoskeletal Tuberculosis. A total of 110 patients were included in the study.

Inclusion criteria

- Patients of all age group.
- Patient willing to give informed consent.
- Patients of both sexes.
- Patient with clinical and/or radiological features suggesting of musculoskeletal tuberculosis.
- Any patient not responding to ATT.
- Any patient who was suspected for any other pathology but biopsy came out to be tuberculosis.

Exclusion Criteria

- Patient not giving consent.
- Patient not willing for biopsy.
- Any contraindication for biopsy or surgery.
- Biopsy not obtainable (inaccessible sites).

Full history was obtained from each patient, and they were examined clinically. Then following investigations were done Haemoglobin, TLC, DLC, ESR, CRP, Chest X-ray, X-ray of involved region, MRI of involved region, Biopsy of the involved region for histopathological examination, AFB staining, culture and sensitivity, routine microscopy, and other relevant investigations.

Clinical diagnosis was made based on signs and symptoms of the patients like

- In spinal tuberculosis - Backache is the most common symptom and there may be localized kyphotic deformity with muscle power weakness. Paraspinal muscle spasm, abscesses and sinuses may be present. Constitutional symptoms like malaise, loss of weight, loss of appetite, night sweats and evening rise of temperature.
- In tuberculosis of hip - Pain, limping, deformity, sinuses, abscess, and fullness around the hip with and without constitutional symptoms.
- In tuberculosis of knee joint – pain, swelling around knee joint, boggy synovium, sinuses, deformity, subluxation, and constitutional symptoms.
- In tubercular osteomyelitis -pain, swelling of bone with warmth and tenderness, overlying boggy swelling of soft tissues, abscess or sinus formation, and enlargement of regional lymph nodes.

Among Radiological investigations, Xray was the initial investigation followed by MRI, CT or ultrasound. Various MRI findings in cases of spinal tuberculosis involves local osteopenia, endplate destruction and reduction of disc space with collection in pre/paravertebral regions.

In case of tubercular arthritis, MRI shows synovitis, pannus formation, inflammation and destruction of periarticular region and articular cartilage, abscess, tenosynovitis, bursitis and bone marrow edema.

After clinico-radiological examinations, percutaneous biopsy of the involved region was done. Tissue specimen obtained was sendt for CBNAAT and histopathological examination.

Percutaneous biopsy procedure

- **Transpedicular approach (Figure 1):** Place the patient prone and give local anaesthesia. Insert the needle along the pedicle to enter the vertebra. The groove between transverse process and lateral aspect of superior articular facet serves as the entry point. More than 50% of cancellous bone can be accessed through this approach. Take care not to violate the inferior and medial wall of the pedicle. This can cause hematoma formation, spinal canal infection ultimately damaging spinal cord. Always keep the needle toward superior and lateral wall of pedicle.
- **Transforminodiscal Approach:** The needle enters the vertebra at its superior concave surface. This method does not allow access to the vertebra's superomedial region.

Figure 1: Transpedicle Biopsy.

- **Direct Lateral Approach (Figure 2):** for lumbar spine. With the patient in lateral position. After confirming the level using c arm, a needle was then inserted retroperitoneally and trans-psoas. Due to the thin biopsy trocar and needle, there is no peritoneal rupture, and the lumbar plexus is not harmed.

Figure 2: Transdiscal Biopsy through direct lateral approach.

Percutaneous Needle biopsy Procedure of knee joint

With the patient positioned supine, knee painted and draped. After administering local anaesthesia, stab incision of 1-2 mm long is given either over the medial or lateral aspect of the suprapatellar pouch at the upper pole of the patella (Figure 3). After completely inserting the inner tube into the outer tube, it is directed toward the superior pole of patella piercing the synovial membrane and traversing the articular space. Palpate the tip of outer tube at the opposite side of joint through overlying skin and soft tissues. Withdraw the inner tube to open the aperture of outer tube. Flow of synovial fluid out of the open end of the tube confirms that the instrument is in the joint space. Collected synovial fluid can be sent for testing. Withdraw the inner tube atleast 1 cm to free the hooked tip to catch synovial membrane. Tissue can be engaged by applying external digital pressure. Reinsert the inner cutting tube with a rotatory movement to cut off the engaged tissue. Again partially withdraw the inner tube and repeat the steps to obtain more samples.

Figure 3: Synovial Biopsy for Supra Patellar Pouch.

Results

- Out of 110 cases included in the study, 65.5% were males as compared 34.5% females. Manual labourers (37.5%) was most common occupation among the patients involved.
- The most prevalent symptom among the patients was mid-back pain (35.1%). The second most frequent symptom among patients was low back pain (27.9%), and the third most frequent symptom was hip pain (11.7%).
- 69.1% patients had evening rise of temperature, 67.3% had history of weight loss and 68.2% patients had loss of appetite.
- 21.8% patients had some sort of deformity.
- Dorsal spine was involved in 35.5% whereas lumbar spine was involved in 28.2% patients.
- Hip joint (11.8%), Knee joint (8.2%) and Wrist Joint (5.5%) were other joints involved.
- 83.6% of patients had chronic tubercular granulomatous infection with Langerhans giant cell formation and epitheloid cell formation as histological findings (Figure 4).
- 8.2% patients had chronic non-specific granulomatous infection in histology.
- AFB stain was positive in 21.8% and CBNAAT was positive among 90.9% patients respectively (Figure 5).
- More than half of patients (58.1%) had tubercular spondylodiscitis, which was followed by diagnoses of TB of the hip (11.8%), knee (8.2%), and wrist (5.5%) joints (Figure 6).
- 9% of the lesions were non tubercular.

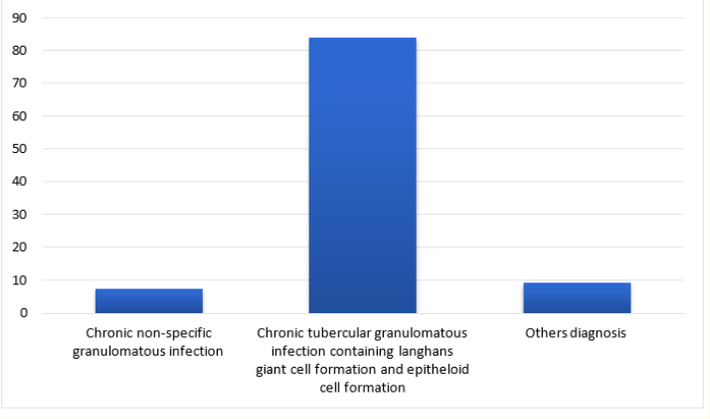

Figure 4: Distribution of patients according to Histological finding.

Figure 5: Distribution of patients according to microbiological finding.

Figure 6: Distribution of patients according to diagnosis.

Discussion

Any part of the body can be affected by Tuberculosis with lungs being the most common. Approximately 50% cases of skeletal tuberculosis involves spine.

Spinal tuberculosis results in kyphotic deformity, intervertebral disc involvement, bone destruction and collapse of the vertebrae, paravertebral abscess, psoas abscess, epidural abscess, and edoema in the soft tissue planes [5].

The most common presentation in this study was mid back pain (35.1%) followed by low back pain (27.9%) and hip joint pain (11.7%).

In a similar study of 52 patients by Singh., *et al.* (2018) [6], pain and difficulty walking was the main symptom in 45 patients (90.4%) followed by backache in 29 patients (55.8%) and discharge from joints in 25 patients (48.1%).

Constitutional symptoms ranged from evening rise of temperature (69.1%), weight loss (67.3%) and loss of appetite (68.2%). In a similar study by Singh., *et al.* (2018) [6], constitutional symptoms of Tuberculosis involved fever (46.2%) and weight loss (42.3%). Almost similar findings were reported by Sharma., *et al*. (2016) [7] (45%) and Sandher., *et al*. (2007) [8] (48.1%).

Deformity of some form was present in 21.8% patients of musculoskeletal tuberculosis. 45.8% patients had kyphotic deformity, 25% patients had Flexion, adduction, internal rotation with apparent shortening, 20.8% had Flexion, abduction, external rotation with apparent lengthening, 4.2% patients had angular kyphotic or scoliotic deformity.

In our study the involvement of musculoskeletal tuberculosis was in following order - Dorsal spine (35.5%), lumbar spine (28.2%), hip joint (11.8%), Knee joint (8.2%) and wrist joint (5.5%) and others (< 5%). In a similar study by Sharma., *et al*. (2016) [7] spine was the most common site of involvement (50.77%) followed by hip joint (19.17%).

Monisha Kandal., *et al.* [9], in their study, found out that in spine thoracolumbar region (42.85%) was most commonly involved followed by lumbar, cervical and cervicothroacic regions.

AFB stain was positive in 21.8% whereas CBNAAT in 90.9% patients in our study.

M Held., *et al.* [10] analysed the efficacy of CBNAAT MTB/RIF in diagnosing musculoskeletal tuberculosis by evaluating biopsy samples of 206 patients. Out of them 201 were positive with sensitivity of 92.3% and specificity of 99.1% respectively.

CBNAAT MTB/RIF was able to diagnose 8.8% more cases than culture.

In the current study, 83.6% of patients had chronic tubercular granulomatous infection with Langerhans giant cell formation and epitheloid cell formation on histology. In 8.2% of patients, a chronic non-specific granulomatous infection was found histologically.

Jain., *et al*. (2008) [11] demonstrated that the histology in every case was positive for TB. More than half of patients (58.1%) had a diagnostic of tubercular spondylodiscitis, followed by diagnoses of the hip (11.8%), knee (8.2%), and wrist (5.5%) joints. 9% lesions that were non tubercular included metastasis (4.5%), pyogenic spondylodiscitis (2.7%) and primary neoplastic lesion (1.8%). In a study by Shaikh et al (2013) [12]. 166 cases were histologically proven to be tuberculosis, while 74 were confirmed to be non-tuberculous lesions. Rafiqi., *et al.* (2103) [13]. were able to confirm diagnosis as musculoskeletal tuberculosis in 92% of cases by histology.

60 of the 70 cases described by Sugnaneswar., *et al*. (2017) [14] had spinal TB verified by histology and CBNAAT. Confirmatory diagnosis was made just by histopathological analysis in 59 cases (98.33%) and CBNAAT in all 60 cases (100%).

Out of 110 cases in this study, Musculoskeletal tuberculosis was clinically suspected in 74 cases. Based on radiolological findings of these 74 cases, 60 cases were further presumed as musculoskeletal tuberculosis which were confirmed using Biopsy (58 were positve on HPE and all 60 were positive on CBNAAT). The other 14 cases which were considered non tuberculous based on radiological investigations on biopsy further revealed 11 cases to be positive for musculoskeletal tuberculosis (HPE 10 and CBNAAT 11) and rest 3 were negative on biopsy.

The remaining 36 cases out of 110 which were clinically suspected to be non-tubercular were further tested radiologically. Based on radiological findings 24 cases were considered to have musculoskeletal tuberculosis. On further testing of biopsy sample, 19 out of these 24 cases were confirmed to be tubercular and rest 5 were negative. Out of 12 cases which were suspected to be non-tubercular based on radiological findings, 10 were tested positive on biopsy specimen testing and 2 were negative. In conclusion, out of 110 cases, 100 were found to have musculoskeletal tuberculosis, and 10 were found to have a non-tubercular illness (Figure 7).

Figure 7: Flow diagram of the present study.

Conclusion

Numerous non-tubercular lesions and musculoskeletal tubercular lesions may share clinical and radiographic characteristics. In the clinico-radiological diagnosis of musculoskeletal TB, false positive and false negative results are highly susceptible to occur. One cannot afford to put off a definitive diagnosis because conditions such as secondaries, pyogenic spondylodiscitis, multiple myeloma, etc. might mimic musculoskeletal tuberculosis.

Therefore proper evaluation of biopsy sample with histopathological examination, CBNAAT, and culture is necessary to provide a correct diagnosis in all patients of suspected musculoskeletal tuberculosis.

Musculoskeletal Tuberculosis is deep seated and paucibacillary condition. Diagnosis is difficult as inadequate sample yield is common. A multifaceted method involving direct smear examination, histopathological examination and CBNAAT is needed to arrive at a definite diagnosis. The gold standard test for diagnosis is culture but it can give false negative results in partially treated cases. Rapid tubercular bacilli detection is made possible by the

high sensitivity and specificity of CBNAAT, but it can also produce false-positive results in non-viable bacilli. Cost effectiveness is one of the factors preventing CBNAAT from being used widely. CBNAAT and histopathological examination are additive but not a substitute for culture.

The results of this study can serve as a link between early detection of musculoskeletal tuberculosis at community or primary health care centres and early prevention and treatment of deformity because these facilities lack the ability to collect clinical specimens from deep joints, and conventional methods of diagnosis are challenging. The priority must be to increase patients with musculoskeletal TB's access to tertiary care facilities and specialised care.

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