Isolated Tuberculosis of the Patella
Report of Two Cases and Review of the Literature

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Abstract
Two cases of tuberculosis of the patella presenting as an osteolytic lesion with sequestrum are described. Timely diagnosis helped in successful management of both these cases, resulting in complete resolution of symptoms with a functional knee without need for patellectomy. Clinicians must consider the possibility of diagnosis of isolated patellar tuberculosis in patients presenting with an osteolytic lesion in patella especially in areas where tuberculosis is endemic and in immunocompromised patients.

It is estimated by the World Health Organization (WHO) that someone in the world is infected with tuberculosis (TB) bacilli every second. Approximately, one third of the world’s population is infected with TB, and the growing prevalence of HIV and associated TB infection is compounding the problem. With an annual death rate that reached 1.4 million in 2011, it is a major public health problem, especially in developing countries.1 In 2012, a total of 9,951 new tuberculosis cases were reported in the USA, an incidence of 3.2 cases per 100,000 population.2 This represents a relatively low incidence rate; however, it is unlikely that the USA will meet its goal of eliminating TB (defined as a rate of less than one per 1 million population) in the foreseeable future.3,4

It can affect any organ system of the body, and musculoskeletal tuberculosis accounts for around less than 3% of all tuberculosis.5 It most commonly affects spinal skeleton, hip, and knee. The knee is the third most common site to be affected; however, isolated patellar tuberculosis is very rare with reported incidence of 0.09% to 0.15%.6,7 Tuberculosis of patella is still uncommon with 10 cases reported in the past three decades. With ever increasing global immigration of people, orthopaedic surgeons outside of these endemic areas are becoming more likely to see patients suffering from osteoarticular tuberculosis.

Case Descriptions

Case 1
A 22-year-old, apparently healthy, female student reported to our outpatient clinic with chief complaint of anterior knee pain with swelling of 3 months duration. A complete history was taken and revealed that she had been vaccinated (including BCG) under the national immunization program as recommended by the Indian national government. There was no history of fever or weight loss. Patient did not report any pulmonary complaints in the past nor had any family history of tuberculosis. On examination, the patient had left knee swelling with slight effusion and tenderness over medial joint line. There was no synovial thickness or any discharging sinus. There was no inguinal lymphadenopathy.

Laboratory investigations revealed a hemoglobin level of 13.6 g/dL, hematocrit of 39.2%, a total leukocyte count of 7,300 mm³ with mild lymphocytosis, and raised erythrocyte sedimentation rate of 46 mm (Westergren) in the first hour. RFT, LFT, and RA factor were within normal limits. Mantoux test demonstrated an induration of 24 mm at the end of 72 h (N < 10 mm). USG abdomen and chest radiograph were normal. Serologic tests for HIV and hepatitis viruses were negative.

On radiography, anteroposterior, lateral, and skyline views of the knee joint showed a lytic lesion in the lower pole of the patella medially with sclerosis containing a hazy flaky sequestrum (Fig. 1). Articular surface remained intact and anterior cortex was not breached, suggesting that the knee joint was not involved.

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Case 2
A 27-year-old male college student with low socioeconomic status presented to the same outpatient clinic at our tertiary care hospital with chief complaint of right knee pain with mild swelling and some restriction of movements over the last 5 months. On history taking, the patient could not confirm being vaccinated nor did he have any vaccination record; however, he had a typical BCG vaccination scar on his left upper arm. On examination, the patient had anterior knee pain with mild swelling and tenderness over the knee-cap. The knee was slightly warm to touch with restriction of terminal 15° of flexion. Examination revealed moderate knee effusion with synovial thickness.

Laboratory investigations revealed hemoglobin of 10.2 g/dL, hematocrit of 34.6%, a total leukocyte count of 5,700 mm³ with mild lymphocytosis, and raised erythrocyte sedimentation rate of 57 mm (Westergren) in the first hour. Mantoux test demonstrated an induration of 28 mm at the end of 72 hours (N < 10 mm). The rest of the investigations were within normal limit

On radiography, lateral and patella skyline views revealed a similar lytic lesion without any sclerosis situated centrally and slightly laterally (Fig. 2). Articular surface remained intact, and there was no breach in anterior cortex as the lesion remained contained within patella. A CT scan was obtained in this case, which revealed contained osteolytic lesion with flaky sequestrum in patella (Fig. 3).

Both patients had their lesions biopsied. They underwent open biopsy with a medial parapatellar approach. Joint fluid samples were sent for routine analysis. Elevating the cartilage flap over the lesion revealed caseous grayish-white tissue, which was entirely curedt out, leaving an unfilled crater over which the joint cartilage was simply laid without need for any suture. The second patient also underwent a synovial biopsy. The material was sent for culture and histopathological examination. Intra-osseous lesions in both patients were diagnosed as tuberculosis when the histology revealed caseous necrosis surrounded by epithelioid and Langhans-type giant cells (Fig. 4) and yielded positive cultures for *Mycobacterium tuberculosis* when grown in Egg-based plate media, such as Lowenstein-Jensen, but liquid-based media (Becton-Dickinson and Co., BACTEC™ and BACTEC™ MGIT™) was also used. Growth was de-
tected within 3 weeks, but the typical hold period was 4 to 6 weeks. Synovial biopsy of second patient also confirmed the diagnosis of tuberculosis.

Antituberculosis drug treatment was instituted. The initial antituberculosis treatment was a regimen of isoniazid (5 mg/kg/day), rifampicin (10 mg/kg/day), ethambutol (15 mg/kg/day), and pyrazinamide (25 mg/kg/day) for 2 months followed by rifampicin and isoniazid for 16 months, with follow-up liver function test and eye examination every 3 months. Pyridoxine 10 mg/day was given throughout the course of treatment. Quadriceps strengthening exercises along with joint range of motion exercises were taught to both patients to overcome stiffness and prevent muscle wasting. The drugs were then discontinued 18 months later when clinical signs of the infection had resolved. A follow up at 12 to 18 months revealed that the lesions had healed clinically and radiologically with full knee movements. Both patients had no complaints and returned to their daily activities.

Discussion

The epidemic of TB, fueled by the incidence of HIV infection and emergence of resistant strains of Mycobacterium tuberculosis, the ever increasing ease in migration of people, increasing rates of poverty, and malnutrition, is increasing at a rapid pace. A resurgence of TB is occurring in both developed and developing countries, and this includes osteoarticular tuberculosis.8

Extrapulmonary involvement can be difficult to diagnose because several clinical and radiographic features of osseous tuberculosis mimic a wide range of pathologies; as a result, this condition is often misdiagnosed and discovered at a more advanced stage of the disease.9

Concomitant pulmonary involvement is unusual in cases of skeletal tuberculosis leading to further diagnostic delay. Chest radiographs offer little help in diagnosing osteoarticular tuberculosis, as only 15 to 33% of patients have a history of pulmonary involvement.10,11 Both cases reported here had normal chest radiographs without any history of pulmonary tuberculosis. Although both cases reported here had positive cultures for Mycobacterium tuberculosis, this is not the usual scenario. Osteoarticular tuberculosis is a paucibacillary lesion, and it is difficult to demonstrate or culture acid-fast Mycobacterium from these lesions.12 The differential diagnosis of such lesions includes tumors, such as chondroblastoma, osteoid osteoma, aneurysmal bone cyst, metastases or brown tumour, and even gout and infectious pathology.7

Presentation is indolent with the patient complaining of a gradual onset of joint pain associated with swelling and a decreased range of motion.13 After reviewing cases of isolated tuberculosis of the patella in the English literature (Table 1), a common radiographic finding was observed in almost all cases of an osteolytic lesion, which if detected early is usually contained, but in advanced stages, it breaches the articular surface to connect with knee joint or breaches the anterior cortex of patella to form a discharging sinus. Flaky sequestrum is present inside the osteolytic area in majority of the cases; if doubtful on radiographs, a CT scan can help to delineate it. Its presence suggests an infectious pathology. In the cases reported in literature, there is variability in the presence of a thin rim of sclerosis at the margin of the lytic lesion. Marginal sclerosis was present in the second case reported here but absent in the first case. Confirmatory diagnosis was made by biopsy and histopathology in all cases reported in literature with typical granulomatous lesion with caseous necrosis surrounded by epithelioid and Langhans-type giant cells.

To differentiate tuberculosis from erosive bone tumours, a definitive biopsy is mandatory if destruction of bone or lytic lesions are found on radiographs. Therefore, cases with typical radiographic features and isolation of a caseating granuloma from the tissues should be considered tuberculosis and treated accordingly until proven otherwise.

A negative tuberculin test does not rule out a diagnosis of tuberculosis.14,15 In a study to treat children with histologically confirmed cystic tuberculosis of bone, the Mantoux skin test was negative in 30%.11,16 Markers of acute phase response, such as ESR and CRP, don’t offer much help in diagnosing skeletal tuberculosis and are nonspecific.11,28 An MRI or CT scan may aid in early detection of the lesions before they are discernible clearly on plain radiographs. The CT scan could better delineate the sequestrum inside the lytic lesion in second case reported here, which was not evident on plain radiograph. Although both the CT scan and MRI are

Figure 4 Histopathology showing tuberculous granuloma with caseous necrosis.
Table 1 Cases of Tuberculosis of Patella in the English Literature

<table>
<thead>
<tr>
<th>Study</th>
<th>Cases</th>
<th>Age in Years</th>
<th>Chest X-ray</th>
<th>Site of Lesion</th>
<th>Clinical Features</th>
<th>Radiologic Features</th>
<th>Biopsy</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aitken, 1938</td>
<td>1 M</td>
<td>NA</td>
<td>Normal</td>
<td>Anterior</td>
<td>Pain, swelling</td>
<td>Multiple spots of rarefaction</td>
<td>NA</td>
<td>Patellectomy</td>
</tr>
<tr>
<td>Hartofilakidis-Garofalidi, 1969</td>
<td>1 M</td>
<td>7-57</td>
<td>Normal</td>
<td>2 Proximal</td>
<td>Pain, swelling, stiffness</td>
<td>Osteolytic lesion</td>
<td>Caseating granuloma</td>
<td>Patellectomy in all cases</td>
</tr>
<tr>
<td>Martini, 1986</td>
<td>1 F</td>
<td>40</td>
<td>NA</td>
<td>Middle</td>
<td>NA</td>
<td>Osteolytic lesion</td>
<td>NA</td>
<td>Refused treatment: 1 Year later - debridement, arthrodesis, and ATT</td>
</tr>
<tr>
<td>Hernández Gimenez M et al, 1987</td>
<td>1 M</td>
<td>8</td>
<td>Normal</td>
<td>Middle</td>
<td>Pain fever swelling effusion synovial thickening</td>
<td>Osteolytic lesion with sclerotic border</td>
<td>Granulomata and caseation typical of tuberculosis</td>
<td>Sequestrectomy and ATT</td>
</tr>
<tr>
<td>Shah and Ramakantan, 1990</td>
<td>1 M</td>
<td>25</td>
<td>Normal</td>
<td>Pain swelling, movement restriction</td>
<td>Osteolytic lesion</td>
<td>Tuberculous granuloma</td>
<td>Patellectomy</td>
<td></td>
</tr>
<tr>
<td>Tuli, 1991</td>
<td>1 N/A</td>
<td>NA</td>
<td>NA</td>
<td>Proximal pole</td>
<td>Pain</td>
<td>Osteolytic lesion, sclerosis</td>
<td>NA</td>
<td>ATT and functional treatment</td>
</tr>
<tr>
<td>Bonnet et al, 1992</td>
<td>1 M</td>
<td>48</td>
<td>Normal</td>
<td>Middle</td>
<td>Pain</td>
<td>Osteolytic lesion with sequestrum</td>
<td>Chronic granulomatous caseation</td>
<td>Partial excision of patella and ATT</td>
</tr>
<tr>
<td>Dhillion et al, 1995</td>
<td>1 M</td>
<td>28</td>
<td>Normal</td>
<td>Inferior pole</td>
<td>Pain, effusion</td>
<td>Osteolytic lesion</td>
<td>Degenerative changes</td>
<td>Patellectomy, Arthroscopy and debridement</td>
</tr>
<tr>
<td>Dhillion et al, 1998</td>
<td>1 F</td>
<td>18</td>
<td>Normal</td>
<td>Lateral aspect of lower part</td>
<td>Pain, swelling, effusion discharging sinus, fixed flexion deformity</td>
<td>Diffuse periarticular osteoporosis lytic lesion, marginal sclerosis containing sequestrum</td>
<td>Chronic granulomatous tissue with areas of caseous necrosis and Langhans-type giant cells</td>
<td>Curreatage and ATT</td>
</tr>
<tr>
<td>Galois et al, 2003</td>
<td>1 M</td>
<td>33</td>
<td>Normal</td>
<td>Inferior</td>
<td>Pain, swelling, effusion, stiffness, discharging sinus, fixed flexion deformity</td>
<td>Slight osteolysis of the lower part of the patella.</td>
<td>Chronic granulomatous tissue</td>
<td>ATT</td>
</tr>
<tr>
<td>Fnini et al, 2009</td>
<td>1 F</td>
<td>18</td>
<td>Normal</td>
<td>Central</td>
<td>Pain, swelling, stiffness, effusion</td>
<td>Lateral view revealed circumferential rosette form with a light peripheral halo.</td>
<td>Caseous necrosis surrounded by epithelioid and giant-cell follicles.</td>
<td>Curettage and ATT</td>
</tr>
<tr>
<td>Mittal et al, 2006</td>
<td>2 M</td>
<td>20 - 33</td>
<td>Normal</td>
<td>NA</td>
<td>Pain, swelling</td>
<td>Well defined lytic lesion</td>
<td>Epithelioid cell granulomata</td>
<td>ATT</td>
</tr>
<tr>
<td>Agrawal and Agrawal, 2011</td>
<td>1 F</td>
<td>34</td>
<td>Normal</td>
<td>Anterior</td>
<td>Pain, swelling, effusion</td>
<td>Osteolytic lesions</td>
<td>Caseating granulomas with Langhans giant cells.</td>
<td>Incision and drainage, ATT</td>
</tr>
</tbody>
</table>

ATT = Antitubercular Therapy; NA = Not available; M = Male; F = Female; *Mean age in years.
nonspecific in making the diagnosis of skeletal tuberculosis, they should be ordered when clinically indicated to better visualize the lesion morphology and confirm the findings of radiography.17

Pulmonary tuberculosis patients can be treated with a short course of antituberculosis therapy, but it is recommended that patients with musculoskeletal tuberculosis undergo drug therapy for 12 to 18 months.10,18,28 The initial regimen, which may include streptomycin intramuscular for 2 months, is followed by isoniazid, rifampicin, and pyrazinamide continued for an additional 12 months.10,17

The regimen that we followed with both of our patients is slightly different from the aforementioned regimen and was recommended by Mittal and coworkers.15 They instituted “quadruple therapy,” including isoniazid, rifampicin, pyrazinamide, and ethambutol for 2 months, followed by “dual therapy” with isoniazid and rifampicin for 16 months with follow-up every 3 months for ocular examination and liver function tests. The results are satisfactory if patient complies with adequate treatment regimen for an appropriate length of time.19

**Conclusion**

With increasing incidence of tuberculosis worldwide, we expect the treating physicians in both developing and developed countries to become increasingly aware of bizarre presentations of patients with skeletal tuberculosis. Patients with isolated patellar tuberculosis (as demonstrated in lateral and skyline view radiographs of the knee) show lytic lesion with or without marginal sclerosis that may contain a flaky sequestrum. Diagnosis is confirmed by histopathology and bacteriology. Temporal institution of standard antitubercular drug therapy ensures complete recovery and a well-functioning knee without need for patellectomy.

**Disclosure Statement**

None of the authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

**References**