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Thorn induced culture negative synovitis: could be a case of tuberculosis? Polymerase chain reaction is an important diagnostic tool

KEYWORDS: Thorn induced synovitis, Monoarthritis, Mycobacterium tuberculosis, PCR, Antitubercular drugs

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ABSTRACT *Background: Thorn induced synovitis is an uncommon cause of monoarthritis and often misdiagnosed or overlooked. Symptoms may be vague and can mimic other conditions. If not investigate properly the condition can be disabling and cause marked joint destruction.*

Material and method: Fives cases of thorn induced synovitis were identified. Three of whom were men. Mean age was 28.6 years (range, 15 to 42 years). In all the present cases the site of injury was on the knee joints. Symptoms included pain, swelling, effusion and stiffness. Clinical examination showed synovitis with decreased range of movements of knee joint. There was considerable delay in the diagnosis, averaging 16.2 weeks. All were investigated. Joint aspirate sent for routine microscopy and PCR (polymerase chain reaction) analysis. Treatment consists of Synovectomy with removal of the foreign body. Specimen sent for histopathological examination. Anti-tubercular drugs (DOTS; Category I) was administrated. All the cases were followed up for 12 months to check for relapse.

Results: Three of five cases showed neutrophilic leucocytosis, raised ESR and anemia. Radiographs of knee showed no bony involvement. Ultrasonography (USG) of knee joint revealed effusion and loculated collection with small foreign body in suprapatellar region. Synovial fluid aspirated was found to be aseptic. Histopathological examination of the synovium showed chronic non suppurative synovitis with evidence of retained thorn in all except one patient. PCR of the joint aspirated showed the presence of Mycobacterium tuberculosis complex. Management comprises of Synovectomy, removal of the foreign body and anti-tubercular drugs. All patients showed uneventful recovery.

Conclusion: All joint aspirates should be sent for PCR examination in patients with thorn-induced synovitis. We emphasize the need for prompt and early diagnosis. Optimal treatment is synovectomy, foreign body removal, and antitubercular drugs.

Introduction:
Penetrating plant thorn injury or retained thorn can show vivid presentation such as synovitis, arthritis, rheumatism, granuloma or osteomyelitis [1],[2],[3],[4],[5],[6],[7]. Various authors considered Tuberculosis in the differential diagnosis thorn induced granuloma [1],[8],[9],[10]. Despite a history suggesting thorn injury in present cases, diagnosis was often delayed and often be misdiagnosed as septic arthritis. All were on antibiotic therapy. Symptoms persisted despite the antibiotic therapy and then the patients reported to this institution for further evaluation and management. All patient s had complete clinical, laboratory and imaging evaluation. Ultrasonography revealed the presence of small foreign body. PCR of joint aspirate showed mycobacterium tuberculosis complex. A definite diagnosis was made. Such a diagnosis may readily be overlooked, probably because it has rarely been reported. To the best of our knowledge, the present series is the first of mycobacterium infection of knee joint being reported in literature from India secondary to Penetrating plant thorn injury or retained thorn foreign body.

The primary aim of the present study is to draw attention to the possibility of the mycobacterium infection when evaluating patient with history of thorn injury. The present study also illustrates the superior use of Ultrasonography in detecting foreign bodies like thorn.

Material and method:
Fives cases of thorn induced synovitis were identified. Three of whom were men. Mean age was 28.6 years (range, 15 to 42 years). In all the present cases the site of injury was on the knee joints. Three out of five had a definite history of thorn injury and stated that it is still present. In rest two, there is a history of injury and the patient states that the thorn has been removed. Symptoms included pain, swelling, effusion and stiffness. Clinical examination showed synovitis with decreased range of movements of knee joint. There was considerable delay in the diagnosis, averaging 16.2 weeks. All were investigated (laboratory, and imaging). Joint aspirate sent for routine microscopy and PCR analysis. Treatment consists of Synovectomy with removal of the foreign body. Specimen sent for histopathological examination. Anti-tubercular drugs (DOTS; Category I) was administrated. All the cases were followed up for 12 months to check for relapse.

Results:
The hematological parameters were within normal limits in two of five cases. Three cases showed neutrophilic leucocytosis, raised ESR (range 25-48mm end of 1 hr) and normocytic normochromic anemia. Blood urea, fasting blood sugar and serum creatinine were normal. The straw colored joint aspirate on routine microscopy showed exudative lymphocyte rich characteristic with negative AFB (Acid Fast Bacilli) and gram stain. The results of cultures for bacteria and fungi were negative. AP and lateral view of thigh with knee joint showed the soft tissue swelling, but no bony involvement (figure 1). Each of the cases underwent ultrasonographic (USG) examination of the knee joint. USG of the knee showed moderate suprapatellar effusion. In four of five cases there were small sized loculated collections

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superior to effusion with small elongated foreign body within it (figure 2). Synovectomy with enbloc removal of the foreign body was done (figure 3 and 4). In other partial synovectomy were done with thorough irrigation of joint. Histopathological examination of the synovium showed non- specific synovitis (figure 5: H & E stained section). A definitive diagnosis was not given. On PCR (polymerase chain reaction) analysis, the synovial fluid found to be positive for mycobacterium tuberculosis complex. The patients were kept on antitubercular drugs (Directly Observed Treatment Short Course (DOTS) Cat I regimen) [11],[12]. All the patients are kept under observation and were followed up until complete recovery of joint function was regained. None of the patient show any sign of recurrence at the latest follow up.

Discussion:

If the retained foreign body is not phagocytized during the acute inflammatory phase or is not removed immediately, it becomes encapsulated with fibrous tissue and forms a granuloma [13]. In the present cases there is a history of a thorn having intruded the skin, diagnosis is easy, but in cases where such a history is lacking, diagnosis is an arduous task. In cases which are overlooked of or of missed diagnosis, the classical picture usually is of a transient synovitis followed by a relatively asymptomatic period and later by a chronic arthritis long after the thorn injury has been forgotten. Unfortunately, thorns cannot be visualized on radiographs because the thorns themselves are not radiopaque, but they may be detected on ultrasound scan [14] as echogenic structures surrounded by inflammatory hypoechoid tissue; computed tomograms [15] or magnetic resonance imaging (MRI) scans [4]. Authors speculated that ultrasound is less expensive and more widely available than MRI. CT is less sensitive than ultrasound and involves radiation exposure [15]. In thorn induced synovitis, ultrasound is therefore the diagnostic tool of choice. In cases where the joint fluid is sterile or cultures are negative just as in the present cases, diagnosis can be confirmed through PCR analysis of the synovial fluid. PCR analysis of the synovial fluid is a rapid and cost effective tool for early recognition and treatment of bone and joint tuberculosis [16]. Owing to paucibacillary nature of extra-pulmonary tuberculosis diagnosis is challenging as conventional methods like Ziehl-Neelson smear examination and traditional culture (Lowenstein Jenson Media) of Mycobacterium tuberculosis showed low positive or negative results [17], [18]. As the specificity of PCR is high, in cases where PCR is positive and biopsy is negative as in present cases, trial of treatment for tuberculosis should be advised as also suggested by peer review literature.[16] Furthermore, Antibiotics are indicated only if the culture shows positivity for organism. Antibiotics may cause partial regression clinically but never cures it; only surgical removal of the thorn will resolve the inflammatory cascade [9], [19],[20], [21],[22]. Authors advocated extensive synovectomy. Study [23], [24] showed that in cases where limited synovectomy has been done, the patient eventually required further surgery for complete resolution. Experimental studies revealed [10] deleterious effects on the articular collagenous tissues due to chronic inflammation provoked by presence of foreign body in the joint tissue. In view of these critical concerns authors emphasize the need for prompt diagnosis and early treatment. Furthermore, ultrasound being less expensive, widely available and no radiation is the diagnostic tool in case of thorn induced synovitis. Authors speculated that tuberculosis should be included in the differential diagnosis in patients with recurrent pain and swelling of the knee following thorn injury.

Conclusion:

Tuberculosis should be kept in mind while treating cases of Synovitis with culture and/or biopsy-negative specimens following history of thorn injury and /or retained thorn foreign body. PCR analysis of the synovial fluid should be advised for early recognition and treatment of bone and joint tuberculosis. Appropriate antibiotics must be started after intra-operative culture. If the diagnosis of osteo-articular tuberculosis can be made rapidly, the timely institution of antituberculous drugs can prevent further joint destruction and greatly reduce the functional disability. Removal of the thorn with synovectomy along with antitubercular drugs is the key to successful treatment and early recovery.

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Table 1:
Patients characteristic with knee synovitis following thorn injury were evaluated.

S. No	Age/sex	History /Type Thorn injury	Time elapsed since injury	Presence of puncture wound	Clinical presentation	Procedure done	Biopsy /Histopathological	PCR (Joint aspirate)
1.	25y/M (PL)	Present / Babul, Acacia nilotica	3 Years	Yes	Synovitis left knee (Pain; Effusion; Swelling distal third of thigh; Painful restriction of movements)	Synovectomy with removal of thorn with Lavage	Chronic Non-Specific inflammation	Positive
2.	25y/M (SP)	Present/ Babul, Acacia nilotica	2 years	Yes	Synovitis left knee (Pain; swelling Effusion; Painful restriction of joint)	Synovectomy with removal of thorn with Lavage	Chronic Non-suppurative inflammation.	Positive
3.	42y/M (JA)	Present/Rose (Rosacea)	9 weeks	No	Synovitis right knee (Pain; swelling Effusion; Painful restriction of joint)	Synovectomy with lavage With removal of thorn	Chronic Non-suppurative inflammation.	Positive
4.	36y/F (RG)	Present /type not known	5 weeks	No	Synovitis right knee with effusion	Partial synovectomy with lavage Thorn or intra-articular foreign body was not retrieved	Chronic Non-suppurative inflammation.	Positive
5.	15y/F (SG)	Present/type not known	7 week	Yes	Synovitis right knee (Pain; swelling Effusion; Painful restriction of joint)	Synovectomy with removal of thorn with Lavage	Chronic Non-suppurative inflammation.	Positive

Figure 1:Skiagram left knee joint (AP & Lateral view) showing no bony involvement

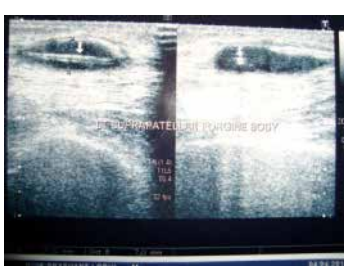

Figure 2: Ultrasound scan showing left suprapatellar foreign body (thorn,~ 2.0x0.7cm)

Figure 3: Excised granulomatous lesion with congested synovium and thorn

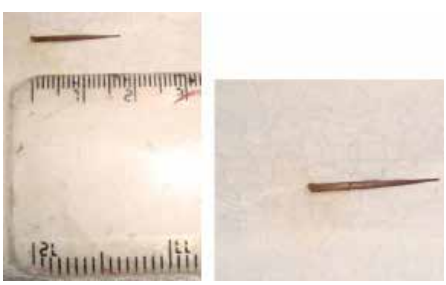

Figure 4: Removed thorn (~ 2.0 cm in length)

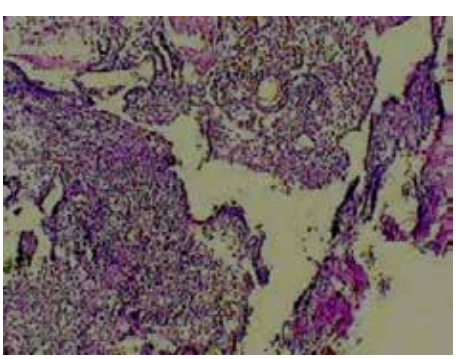

Figure 5 :section shows Hyperemic synovium (congested); synovial tissue composed of synovial lining with underlying zone showing chronic inflammatory cell infiltrate comprising of lymphocytes, plasma cells and macrophages. Few thin walled blood vessels are also s