

# Sternoclavicular joint tuberculosis: A series of conservatively managed sixteen cases

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## ABSTRACT

**Introduction:** Sternoclavicular joint tuberculosis is rare with non-specific signs and symptoms thus making correct clinical diagnosis difficult. Delay in diagnosis results in destruction of osteo-ligamentous structures, spread of abscess to deeper planes as well as bursting through skin resulting in joint instability and scar formation.

**Material and methods:** All the cases of sternoclavicular joint tuberculosis presented to the orthopaedic outdoor between 2004 and 2017 were evaluated clinico-radiologically along with cyto-histopathological and/or microbiological tests to ascertain the diagnosis before initiation of treatment.

**Results:** There were 11 males and 5 females patients aged 11–65 years (mean, 35 years). Aspiration or curettage of the swelling was performed, and the diagnosis was confirmed in 12 cases by cytology, AFB stain, TB polymerase chain reaction, culture or a combination of these. In 4 patients, anti-tubercular treatment was initiated on clinical suspicion.

**Conclusion:** Diagnosing sternoclavicular tuberculosis requires multimodal approach. A strong clinical suspicion is required as the presentation is often atypical. Early detection of disease and with conservative treatment resulted in complete remission and minimal long term disability.

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## 1. Introduction

Sternoclavicular joint (SCJ) is a true diarthrodial synovial articulation between the upper limb and the axial skeleton. Sternoclavicular joint is infected by pyogenic organisms more often than by the tubercular bacillus. Skeletal tuberculosis comprises 10% of extra-pulmonary cases.<sup>1</sup> Tuberculosis of SCJ (SCJ TB) is extremely rare and accounts for 1–2% of tubercular arthritis.<sup>2</sup> There is limited information on SCJ TB even in developing countries and is largely based on case reports and a few clinical studies.

SCJ TB is mostly misdiagnosed leading to chronic disability, increased morbidity and delay in proper treatment. The most common clinical presentation of SCJ TB is swelling, pain in the area of the SCJ with mild fever.<sup>3</sup> The localization of the symptoms to the joint is usually clinically obvious, but due to the lack of knowledge about the differential diagnosis, nonspecific symptoms, difficulty in interpreting early stage radiographs; the diagnosis of SCJ TB is usually delayed or, at times, even missed. The extensive osteo-

cartilaginous destruction caused at the SCJ can result in joint instability. The surgical treatment of SCJ TB is associated with poor results and the potentially catastrophic complications due to the proximity of great vessels, phrenic nerve, and superior mediastinal structures to the joint.<sup>4</sup> The worldwide resurgence of extrapulmonary tuberculosis has made this a topic of interest for orthopaedic surgeons from developing and developed nations. In this retrospective study, we sought to determine the clinico-radiological findings and role of nonoperative management in patients with SCJ tuberculosis.

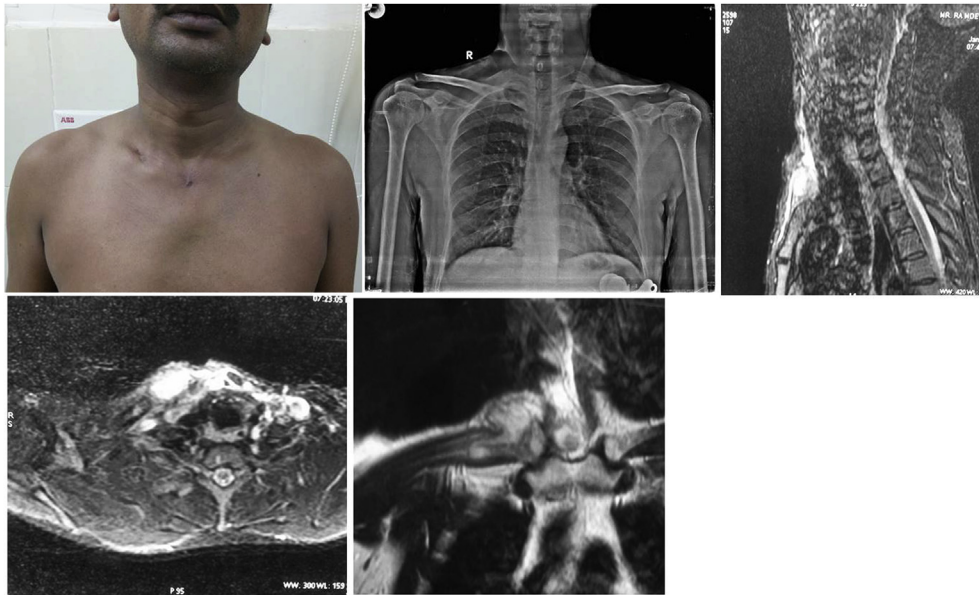
## 2. Material and methods

From January 2004 to December 2017, we have treated 16 patients with tubercular arthritis of SCJ (Figs. 1–4). There were 11 male and 5 female patients aged 11–65 years (mean, 35 years) who presented with tuberculosis of the right (n = 11) or left (n = 3) and two cases with bilateral SCJ were reviewed.

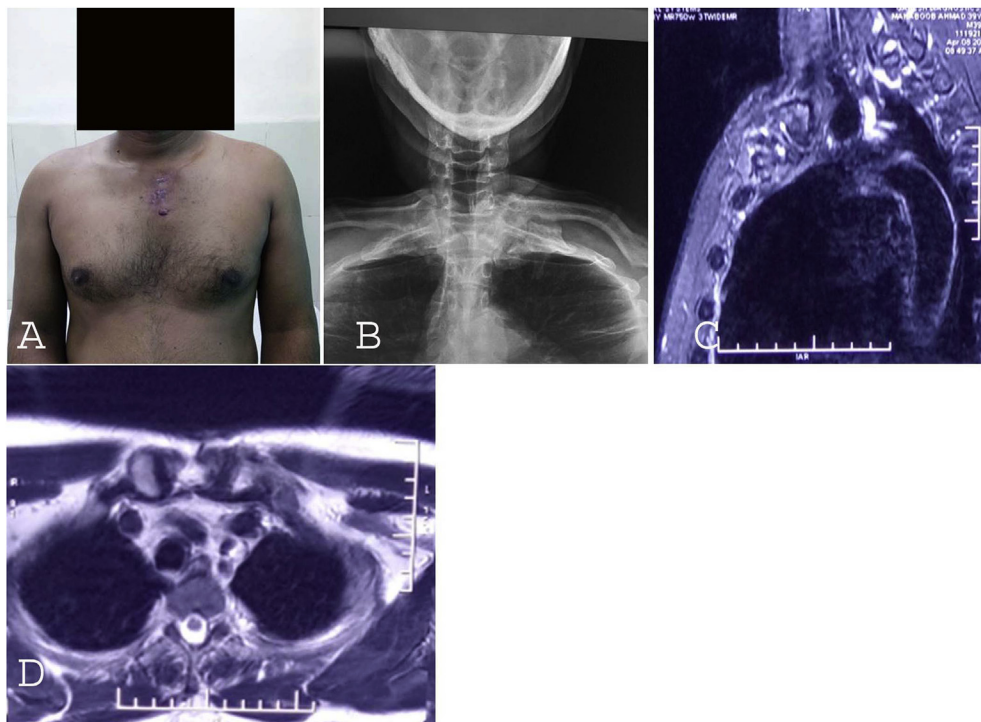
Patients included in this series had histopathological and/or aspiration cytology and/or microbiological findings suggestive of tuberculosis and those suspected to have TB with improvement on anti-tubercular treatment (ATT) despite negative pathology and/or

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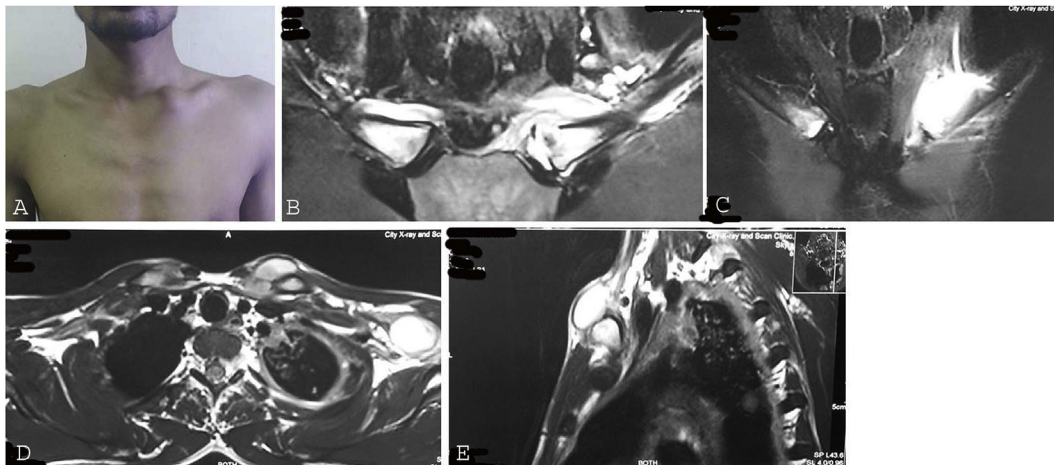
**Fig. 1.** A: Clinical picture showing healed scar. 1B: Chest radiograph with lucency in medial end of clavicle on right side. 1C: Axial section of MRI showing abscess. 1D: Sagittal section of MRI showing collection at medial end of clavicle. 1E: Coronal MRI section showing abscess.



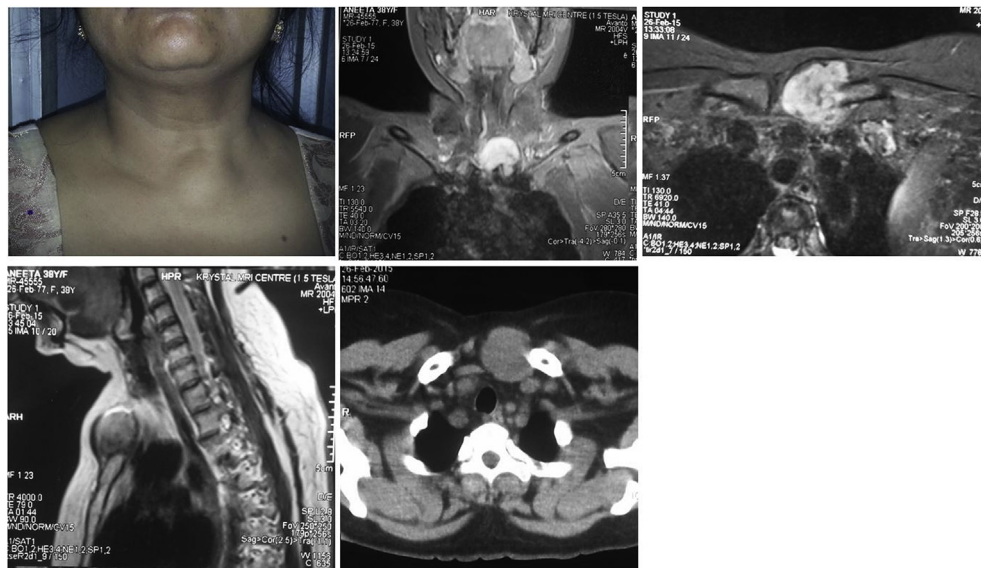
**Fig. 2.** A: Clinical picture showing healed scar. 2B: Chest radiograph with destruction of left sternoclavicular joint. 2C&2D: Sagittal and axial section of MRI showing joint destruction.

microbiology results. Radiological studies included chest radiograph and magnetic resonance imaging (MRI). Computed tomography (CT) scan was performed in some cases in which the MRI was inconclusive. Contrast material was not used in any of the patients. Chest x-ray was evaluated for the site of involvement, rarefaction, lytic changes, bony destruction and changes in the joint space and joint margins. Ultrasonography (USG) was also done in few cases to see the collection and for subsequent guided aspiration. Magnetic

resonance imaging (MRI) was evaluated for site involved, marrow changes, bony destruction, joint effusion and soft tissue changes. Bone scan was done in one patient with multifocal disease. Aspiration was done in all cases, either blindly or under USG guidance and samples were sent for gram stain, Zeihl-Neelsen (ZN) stain, culture, TB polymerase chain reaction (TB-PCR) and cytological evaluation. Samples were sent for histopathological evaluation in the case where debridement was done. Antitubercular treatment



**Fig. 3.** A: Clinical picture showing swelling at left sternoclavicular joint. 3B & 3C: Coronal section of MRI showing collection on left side. 3D & 3E: Axial and Sagittal sections of MRI showing abscess.



**Fig. 4.** A: Clinical picture showing swelling at left sternoclavicular joint. 3B: Coronal section of MRI showing collection on left side. 3C: Axial section of MRI. 3D: Sagittal MRI section showing abscess. 4E: NCCT axial section showing affected side with soft tissue component.

(ATT) was started and continued till 12 months wherever possible. MRI was again done at 12 months, which if did not show complete resolution, the ATT was continued for longer duration with maximum of up to 18 months.

### 3. Results

Local symptoms included pain ( $n = 16$ ) swelling ( $n = 14$ ) and discharging sinus ( $n = 1$ ). The mean duration of symptoms was 14 (range, 3–36) weeks. Nine patients presented with systemic symptoms including malaise, fever, or loss of weight/appetite. Six patients had multifocal involvement of the lung ( $n = 4$ ), and lymph node ( $n = 2$ ), with pleural effusion ( $n = 3$ ). All 16 patients had a raised erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP) at presentation. Fifteen patients were evaluated by MRI. Aspiration (in all cases), curettage (in 1 out of 16 cases) of the swelling was performed, and the diagnosis was confirmed by

cytology, AFB stain, TB-PCR or culture. In one case, where debridement was done, histopathology was suggestive of tuberculosis. To aggregate, 4 cases were diagnosed with a combination of cytological and microbiological findings, 6 with microbiological findings only (AFB, culture or TB-PCR) and 2 with cytological findings only. In 4 cases, diagnosis was based on clinical suspicion even when the diagnostic tests were negative. All patients received a standard regimen of ATT. In one patient, SCJ was surgically debrided as it was not responding to conservative management after 4 months of ATT. Post operatively ATT also was given in this patient. In all the cases, the total duration of ATT was 4–18 months and at final follow-up all lesions healed. Observations have been compiled in [Table 1](#).

### 4. Discussion

SCJ is a plane synovial joint between medial end of clavicle and

**Table 1**

Compilation of all the cases of tuberculosis of sternoclavicular joint.

Cases	Age sex	Site	Clinical features	Duration of symptoms	Radiology	Histology/ cytology/ESR/ CRP	AFB	Culture	TB-PCR	Treatment	Follow-up	Associated TB	Remark
1	21/ M	B/L	Painful swelling, wt loss, loss of appetite	6 months	MRI- bilateral lytic area with bone marrow edema with collection Lt SCJ; Chest xray- left pleural effusion; Bone scan- multifocal disease	USG guided aspiration showed pus ESR-30	+	+	NA	ATT for 8 months	8 months, symptoms improved and then lost to follow-up	Lung, Spine D5 and D7, Left sided pleural effusion	Multifocal TB
2	38/F	Lt	Painful swelling, fever	9 months	MRI- bone marrow edema and cortical erosion with collection; USG- collection in Lt SCJ	Cytology -Chronic Granulomatous pathology; Histopath- Chronic Granulomatous pathology; Mantoux- ESR 28	+	-	NA	ATT for 4 months, surgical debridement and ATT continued for 4 months	8 months, symptom free	None	Misdiagnosed as strain of SCJ and treated conservatively
3	64/F	Rt	Pain	4 months	MRI- bone marrow edema Rt SCJ	ESR-25	-	NA	-	ATT for 12 months	1 year	None	Initially diagnosed as SCJ osteoarthritis Conservative treatment from quack
4	29/ M	Rt	Painful swelling	4 months	MRI- erosion of articular margin with synovial thickening and collections with mild subluxation and widening of space	USG guided aspiration; ESR-23	-	-	+	ATT for 18 months	2 years	TB lymphadenitis for 5 months ATT	Initially diagnosed as SCJ osteoarthritis
5	56/F	Rt	Painful swelling	5 months	MRI- marrow edema with periarticular collection	USG guided FNA- granulomatous pathology; ESR-40	NA	-	+	ATT for 12 months	16 months	None	Initially diagnosed as SCJ osteoarthritis
6	30/ M	Rt	Painful swelling; history of indirect trauma	5 months	MRI- marrow edema in medial aspect of clavicle with collection in Lt SCJ	Aspiration- granulomatous pathology; ESR-34	-	-	NA	ATT for 12 months	2 year, then lost to follow-up	None	Traumatic SCJ
7	40/ M	Rt	Pain, weight loss, cough, fever	2 months	Discovered incidentally on chest CT	Cytology -chronic granulomatous pathology; ESR-22	NA	+	NA	ATT for 6 months	6 months	chest TB, pleural effusion, TB lymphadenitis	Multifocal
8	27/F	Rt	Painful swelling	3 months	MRI- marrow edema with periarticular collection	ESR-31	+	+	NA	ATT for 12 months	13 years	None	With pregnancy
9	42/F	B/L	Painful swelling	6 months	MRI- bone marrow edema and cortical erosion with collection	Cytology -chronic granulomatous pathology; ESR-29	NA	NA	+	ATT for 12 months	2.5 years	None	Recurrent Rheumatoid arthritis
10	11/ M	Lt	Painful swelling	2 months	MRI- marrow edema in medial aspect of clavicle with collection in left SCJ	ESR-17; CRP-9	NA	NA	+	ATT for 6 months	6 months	Pleural effusion	
11	65/ M	Rt	Painful swelling	3 weeks	CT chest - erosion over both SCJ	Cytology -chronic granulomatous pathology; ESR-37	-	-	NA	ATT for 4 months	Lost to follow-up after 4 months	Known c/o CKD	
12	30/ M	Lt	Painful swelling, discharging sinus	2 months	MRI- erosion in left SCJ with collection; CT scan- showed destruction involving Lt SCJ	ESR-70; CRP-49 Montoux -	-	NA	-	ATT for 5 months	5 months	Cough and on and off fever with history of weight loss	
13	38/ M	Rt	Painful swelling	1 month	MRI- signal intensity changes over medial aspect of clavicle with erosions and small collections	Aspiration; ESR-17 CRP>10.	NA	+	+	ATT for 12 months	19 months	None	
14	19/ M	Rt	Painful swelling	1 month	MRI- collection in SCJ with bone marrow edema	ESR-41; CRP-20	NA	-	+	ATT for 12 months	18 months	None	
15	20/ M	Rt	Painful swelling	2 months	MRI- bilateral SCJ marrow edema With Rt effusion	ESR-32	-	-	-	ATT for 9 months	9 months	None	
16	30/ M	Rt	Painful swelling	6 weeks	MRI- collection in SCJ with bone marrow edema	ESR-29	-	-	-	ATT for 12 months	12 months	None	

Abbreviations: M-Male, F-Female, Rt- Right side, Lt- Left side, NA- Not available, ATT- Anti-tubercular therapy, CKD- Chronic kidney disease, SCJ- Sternoclavicular joint, '+' is positive, '-' is negative.



manubrium sterni. It is the only joint through which the upper limb is attached to the axial skeleton. It has no isolated movements but it moves secondary to movements of scapula and glenohumeral joint. The SCJ is vulnerable to the same pathological conditions as other synovial joints; the most common of these are subluxation or dislocation due to injury, age related osteoarthritis, infections and inflammatory arthritis. Osteoarthritis is the most common cause of pain in SCJ. Septic arthritis of the sternoclavicular joint is infrequent in healthy adults, accounts for less than 0.5% of bone and joint infections. Staphylococcus aureus accounts for 49% cases, pseudomonas aeruginosa for 10% and mycobacterium tuberculosis for 3%. Pseudomonas infection most frequently affects immunocompromised hosts. SCJ TB accounts for 1–2% of all the peripheral tubercular arthritis.<sup>2</sup> SCJ TB is insidious in onset; therefore, a high degree of suspicion is necessary to make the diagnosis. We have extensively searched the literature for all the reported cases from search engines such as Google, PubMed using the terms, “tuberculosis AND sternoclavicular”. References from these results were also screened and found 29 publications in various journals, published from 1982 to 2019. Twenty six papers were in English,<sup>2–8,10–13,15–31</sup> one in French<sup>9</sup> and two in Japanese<sup>14,16</sup> (Table 2). About half of these reports were from India, which is an endemic region for tuberculosis. These case series were much larger than any other parts of the world. A total number of 86 patients were reported in which more than half of the patients were males. All, but the two cases had unilateral involvement of the joint. There was no specific predilection for a particular age group. On review, the chief presenting complaints were swelling, pain, fever, discharging sinuses or a combination of these. Swelling was the most common complaint with 25 patients presenting with swelling over the SCJ. Clinically, patients with SCJ TB presented with cystic and globular swelling. Because of a subcutaneous position of SCJ; the swelling of the joint was apparent at an early stage of the disease. The swelling was not just localized to SCJ but was diffuse in many patients. Pain was the second most common complaint. Pain was not significant in early stages of the disease. On examination, the joint is usually minimally tender in early stages with non-pulsatile swelling without raised temperature of the skin. Fever was present in 7 cases which was much less than the expected. Discharging sinuses were an uncommon symptom with only two cases presented with it.

In the present study also, it was observed that pain and swelling are the most common symptoms. Only one of our patients had swelling without pain and two patients had pain without any obvious swelling. Shah et al.<sup>3</sup> reported 8 cases of SCJ TB, in which they noticed pain, swelling and fever to be the most common symptom combination (6 out of 8). Dhillon et al.,<sup>12</sup> in their study of 9 cases, also reported pain and swelling as common symptoms. Jain et al.,<sup>27</sup> reported fever and swelling as the most common constellation. The review of literature showed; the concomitant TB in other organs, commonly of the lung, was present in 15 patients. These cases may mimic metastatic bone disease in some patients leading to a diagnostic dilemma.<sup>32</sup> Past history of TB was present in 8 cases. HIV was found in 4 patients. Other foci of TB were noticed in four of our patients. (Table 2) Shows the observations made by various authors on SCJ TB.

Radiological investigations mentioned in literature were plain radiographs, CT scans, MRI, Tc<sup>99m</sup> scan, arthrogram and fistulogram. On compilation of review finding, 45% patients in previous studies had findings in a plain radiograph which ranged from localized osteopenia to the gross destruction of medial end of clavicle and sternum, although most authors are of the opinion that plain radiographs are not helpful unless there is marked destruction or subluxation of the joint, which also, could be missed because of the confluence of many structures. CT scan is better than plain radiographs for identifying bony lesions around the sternum as it

precisely picks up bony erosions. CT scans better delineate damaged osteoarticular parts of the joint with the extent of the disease.<sup>23</sup> Over one-third of patients had notable changes in CT scan, including bone and cartilage destruction, diffuse enhancement and calcification, soft tissue masses crossing anatomical planes with involvement of underlying viscera.<sup>2,3</sup> An MRI was done in 29% cases which had changed such as signal intensity alterations, soft tissue mass, abscess, distended joint and areas of cortical destruction. There was communication between the lung and sternoclavicular joint in the arthrogram that was done in only one case.<sup>7</sup> Abnormal uptake was noted in Tc<sup>99m</sup> scan, performed in two cases.<sup>7</sup> Other features of SCJ TB include soft tissue masses crossing fascial planes, with abscess and calcification as well as underlying pleuro-parenchymal tubercular involvement.<sup>3</sup> MRI gives effective soft tissue delineation with sensitivity of 88% and a specificity of 93%. It shows bone marrow edema and collection in the vicinity of the joint. Ultrasonography also detects collection around SCJ. The USG can be used for aspiration; as many vital structures are in the vicinity of the joint. Shah et al.<sup>3</sup> suggested that all modalities complement each other though MRI is better in detecting marrow and soft tissue involvement.

ESR and CRP are usually elevated in every patient. The review suggests a biopsy showed caseous granulomas in 74.4% cases. AFB were seen in 12.7% cases and the same percentage of cases had a positive MTB culture. TB-PCR was positive in 30% cases. As osteoarticular TB is paucibacillary pathology hence microbiological evaluation is mostly negative. Histopathology can show chronic granulomatous inflammation. TB-PCR is a good tool as it can detect even traces of MTB DNA. Any single investigation is not sufficient for diagnosis. It is the combined approach which is required for the correct diagnosis. In 4 patients, we could not demonstrate MTB in ZN staining, culture or TB-PCR nor do there be any evidence of granulomatous inflammation on histopathological examination. In these patients, we started ATT on clinical suspicion and found clinical improvement in 4–6 months.

Differential diagnosis of SCJ TB includes osteoarthritis, low grade pyogenic infection, rheumatoid arthritis, Friedrich's disease, secondary deposits and osteitis condensans. Osteoarthritis is typically present in elderly patients with sclerotic joint surfaces, osteophytes and reduced joint space. Rheumatoid arthritis is usually polyarticular with morning stiffness, affecting the small joints of hand and feet. Positive rheumatoid factor and anti-CCP clinches the diagnosis. Septic arthritis will have systemic signs of sepsis, elevated infection markers and purulent aspirate. On local examination, swelling with inflammation will be present. Osteitis condensans affects younger women and shows expansion of the medial end clavicle and medullary obliteration on radiographs. Friedrich's disease is an aseptic osteonecrosis of the medial end of the clavicle which can have cystic changes on X-ray and often resembles osteomyelitis or tumor. Sometimes the symptoms and signs overlap between the above mentioned pathologies where histopathological and microbiological evaluation should be considered to reach an accurate diagnosis. Fig. 5 showed clinical decision making process for diagnosing sternoclavicular joint tuberculosis.

ATT was given in all reported patients in the literature. Debridement was done in 8 cases. The medical treatment usually was continued from 6 to 18 months. Long-term treatment for 12–18 months, usually resolves the problems of recurrence and relapse.<sup>33</sup> ATT results in better outcome as pain and swelling subsided in all but one of our patients at 6 months. Dhillon et al.<sup>12</sup> noted that there were better results when surgical debridement was done at the time of open biopsy. Sahu<sup>15</sup> mentioned *en-bloc* resection in cases where infection extends beyond the joint on imaging. According to our opinion, surgery is not necessary in all

**Table 2**  
Cases of sternoclavicular joint tuberculosis reported in world literature.

Author,Year, Language, number of SCJ TB patients	Presentation	Radiology	Biopsy/FNAC	TB-PCR	Treatment	Follow-up	Outcome	Comment/Co-morbidities
Simon GL, Worthington MC <sup>5</sup> 1982 English 1 patient	46/M Soft tissue mass adherent to the medial aspect of the left clavicle for 3 months	Xray- defect at the medial end of the left clavicle; CT- defect involving the medial clavicle and SCJ with diffuse sclerosis of the adjoining bone	Necrotic material with caseating granuloma; AFB+; culture +	NA	Isoniazid and Ethambutol	Lost to follow-up	Not known	Past history of alcoholic hepatitis, TB epididymitis
Martini M <sup>6</sup> (out of 74 cases of TB, one was SCJ TB) 1986 English 1 patient	Lt SCJ involvement	NA	NA	NA	NA	NA	NA	NA
Bezza et al. <sup>2</sup> 1998 English 2 patients	38/M Swelling 46/F Swelling	Erosion on CT	Histopathology +	NA	6 months ATT	8 months	Favourable	
Yasuda et al. <sup>7</sup> 1995 English 3 patients	71/M Painless swelling Rt SCJ for 9 months 54/M Painless swelling Rt SCJ for 9 months Painless swelling Lt SCJ with discharging sinus, decreased shoulder movement	Xray- lytic lesion clavicle; CT and MRI- soft tissue mass; Gallium scan-abnormal isotope accumulation Xray- erosion clavicle and first rib; Arthogram- communication between lung and SCJ Xray- partial destruction clavicle and sternum; CT- soft tissue swelling and erosion clavicle; Tc99- abnormal uptake Fistulogram- track to SCJ	Open biopsy showed MTB			2 year		Pulmonary TB
Fang et al. <sup>8</sup> 1997 English 1 patient	34/F painless mass Lt SCJ 3 months	Xray chest- resorption of proximal clavicle; CT- heterogeneous enhanced tumor with erosion of clavicle and sternum; Bone scan- a focal area of increased uptake	Biopsy- caseating granuloma	-	Total resection of mass with ATT	NA	NA	On hemodialysis, anaemic
Shah J <sup>3</sup> 2000 English 8 patients	36/F Lt SCJ Swelling, fever 28/F Rt SCJ Painless swelling, fever 78/M Rt SCJ Painful swelling, fever 60/M Lt SCJ Painful swelling, fever 62/M Lt SCJ Painless swelling, fever 66/M Lt SCJ Painless swelling, fever, 53/M Rt SCJ Painful swelling, fever 58/F Rt SCJ Painful swelling	Xray- Normal; MRI- destruction with signal intensity in clavicle and soft tissue mass Xray- articular erosion clavicle; MRI- destruction with signal intensity in clavicle and soft tissue mass Xray- articular erosion clavicle; MRI and CT- destruction with signal intensity over clavicle and soft tissue mass Xray- articular destruction of clavicle; MRI- signal intensity of clavicle and sternum, soft tissue mass Xray- normal CT- soft tissue mass extension CT- SCJ, clavicular destruction, normal sternum, large extrapleural abscess Xray- normal; CT- Rt SCJ, clavicular, manubrium and body of sternum (ant. and post. cortex) destruction, soft tissue mass extension CT- Rt SCJ shows increased joint space, minimal sternal destruction, soft tissue mass extension	Biopsy confirmed TB Sputum for AFB +; Biopsy + Culture for MTB +; Biopsy + sputum AFB+; Culture for MTB +; Biopsy + Histopathology + Culture for MTB +; Biopsy + Culture for MTB +; Biopsy + Culture for MTB +; Biopsy +	NA NA NA NA NA NA NA	NA NA NA NA NA NA NA	NA NA NA NA NA NA NA	NA NA NA NA NA NA NA	Pulmonary TB Pulmonary TB Diabetic hypertensive Diabetic; H/O Pulmonary TB Cirrhosis of liver, TB of wrist and L2 vertebra Gall bladder calculi; HIV+; Pulmonary and mediastinal TB

Table 2 (continued)

Author,Year, Language, number of SCJ TB patients	Presentation	Radiology	Biopsy/FNAC	TB-PCR	Treatment	Follow-up	Outcome	Comment/Co-morbidities
Sy et al. <sup>9</sup> 2000 French 1 patient	Painless swelling, 4 months	Xray- Increased joint space with lytic lesion of sternum	Aspiration- AFB+			9 month healing, died after 2 month (unrelated cause)	NA	HIV +
Dhillon et al. <sup>10</sup> 2000 English 1 patient	28/M Painful either side, 3 months	Xray- normal; CT- destruction of sternum, clavicle and first rib	Rt side open biopsy- granuloma	NA	16 months ATT	NA	Healed	
Fukawasaki et al. <sup>11</sup> 2001 English 1 patient	Lt SCJ Painless mass, 10 months	CT- heterogenously enhanced mass lesion, which expanded over the Lt SCJ and the surrounding soft tissues	FNAC -granulomatous; Culture +			1 year; symptoms improved		Malignancy or metastatic tumor; diabetes mellitus; hemodialysis; no response to antibiotics
Dhillon et al. <sup>12</sup> 2001 English 8 cases	28/M Bilateral pain and swelling 18/M Lt Pain and swelling for 9 months 41/M Rt, Painful swelling with constitutional symptoms for 11 months 29/F Rt Discharging sinus, 10 months 39/M 32 month, Rt Pain and swelling 50/F 8 month, Lt Swelling 37/M 12 month, Lt Pain and swelling 22/M 14 month, Rt Swelling 34/M 12 month, Rt Pain and swelling	Xray- normal Xray- cystic lesion Xray- normal Xray- normal Xray- normal Xray- normal Xray- normal	FNAC/Biopsy-granulomatous pathology FNAC/Biopsy-granulomatous pathology FNAC/Biopsy-granulomatous pathology FNAC/Biopsy-granulomatous pathology FNAC/Biopsy-granulomatous pathology FNAC/Biopsy-granulomatous pathology FNAC/Biopsy-granulomatous pathology	NA NA NA NA NA NA NA	18months ATT 16 months ATT 15 months ATT 16 months ATT 16 months ATT 14 months ATT 15 months ATT 16 months ATT 16 months ATT	48 months 90 months 78 months 72 months 50 months 35 months 28 months 64 months 18 months	Healed Healed Healed Healed Healed Healed Healed Healed Healed	
Khan et al. <sup>13</sup> 2003 English 1 patient	13/F Lt SCJ pain and swelling for 11 months	Xray- well defined lytic area in medial end of clavicle	FNAC- granuloma; AFB+; Culture+	NA	12 months ATT	18 months	Healed	
Kawasaki et al. <sup>14</sup> 2007 Japanese 1 patient	70/F Rt SCJ swelling	CT- destruction of Rt SCJ	Biopsy+	+	ATT and debridement when not healed at 3 months	NA	Healed	Past history of pulmonary TB
Sahu S <sup>15</sup> 2008 English 1 patient	38/M Pain and swelling for 2 months	Xray- moth-eaten appearance on medial end of clavicle, mild sclerosis of articular surface of manubrium; CT scan- lytic lesion involving Lt SCJ	FNAC- tubercular abscess	NA	12 months ATT	NA	Healed	
Amano et al. <sup>16</sup> 2009 Japanese 1 patient	79/M Lt precordial swelling	CT- destruction of Lt SCJ	Needle biopsy- AFB seen	NA	ATT	NA	Improved	Renal failure due to rifampicin
Aggarwal et al. <sup>17</sup> 2009 English 1 patient	22/M Rt Painful, swelling 4 month	Xray- lytic lesion on Rt medial clavicle CT scan- erosion and fragmentation of medial clavicle	FNAC- tubercular abscess	NA	12 months ATT	12 months	Healed	TB of wrist and bilateral sacroiliac joint.

(continued on next page)

Table 2 (continued)

Author, Year, Language, number of SCJ TB patients	Presentation	Radiology	Biopsy/FNAC	TB-PCR	Treatment	Follow-up	Outcome	Comment/Co-morbidities
Pandita et al. <sup>18</sup> 2010 English 1 patient	62/F Swelling of both SCJ	CT- fluid collections with erosion both ends	FNAC granuloma	NA	12 months ATT	NA	Healed	Pleural effusion.
Shrivastav et al. <sup>19</sup> 2010 English 1 patient	12/M Swelling Lt SCJ for 2 months	Normal radiograph	FNAC- tubercular abscess; Culture- negative	NA	NA	NA	Healed	
Grover et al. <sup>20</sup> 2011 English 2 patients	53/M Pain and swelling Rt SCJ for 6 months	Xray- osteolytic lesion; CT scan- expansion of clavicle with multiple erosions	Curettage- granulomas	NA	NA	NA	NA	Pulmonary TB
	23/F Pain and swelling Lt SCJ for 2 months	Xray- Lt SCJ dense sclerosis; CT -erosions of its articular surface with dense sclerosis	CT guided aspiration- granulomas	NA	NA	NA	NA	Sputum for AFB+; Pulmonary TB
Khare et al. <sup>21</sup> 2011 English 1 patient	32/M Pain and swelling Lt SCJ	Chest Xray- lytic lesion with sclerosis over medial aspect of clavicle	AFB +	NA	12 months ATT	NA	Healed	
Kelderman et al. <sup>22</sup> 2012 English 1 patient	24/F Swelling on medial aspect of Rt clavicle	Normal radiograph	NA	+	ATT	NA	Healed	
Metanat M, Alavi-Naeini R <sup>23</sup> 2012 English 1 patient	63Y/F Pain and swelling Lt SCJ for 7 months	Xray- destruction of SCJ	FNAC- tubercular abscess; Culture- negative	NA	ATT	NA	Healed	
Koshy S <sup>24</sup> 2014 English 1 patient	28/F Pain Rt SCJ 10 months with multiple sinuses	MRI - periosteal inflammatory condition	Culture + Resistance for INH	NA	ATT	NA	At fifth month of ATT her sinuses reduced from 7 to 1	Initially treated as bacterial infection
Saibaba et al. <sup>25</sup> 2014 English 1 patient	24/F Painful swelling Rt SCJ of 2 months	Xray- destruction and sclerosis of medial end of Rt clavicle	FNAC - caseating granuloma; AFB +	NA	18 months ATT	2 years	Healed	Pulmonary TB and spine TB
Walid et al. <sup>26</sup> 2015 English 1 patient	63/M Swelling over Rt SCJ for 3 months	Normal radiograph; CT- heterogeneously enhanced mass over Rt SCJ with widening of joint space and subchondral sclerosis of sternum	Histopathology+; Culture-	NA	12 months ATT	4 years	Healed	
Jain et al. <sup>27</sup> 2015 English 13 patients	29/F Swelling for 2 months	Xray- normal	Histopathology +; + Culture -		12 months ATT	17 months	Healed	4 out of 13 patients had other site involvement(not specified which ones)
	34/F Painful swelling for 1 month	Xray- normal	Histopathology +; - Culture -		12 months ATT	13 months	Healed	
	44/M Discharging sinus for 3 months	Xray- lytic lesion at clavicle	Histopathology -; + Culture -		18 months ATT	21 months	Healed	Required immunomodulation; CD4:CD8 ratio-low
	47/M Swelling for 7 months	Xray- normal	Histopathology +; - Culture -		12 months ATT	12 month	Healed	
	29/M Painful swelling for 4 months	Xray- normal	Histopathology +; - Culture -		12 months ATT	14 months	Healed	
	37/M Discharging sinus for 3 months	Xray- normal	Histopathology -; - Culture -		12 months ATT	14 months	Healed	
	41/M Swelling for 1 month	Xray- normal	Histopathology +; - Culture +		12 months ATT	19 months	Healed	
		Xray- normal		-	12 months ATT	23 months	Healed	



Table 2 (continued)

Author,Year, Language, number of SCJ TB patients	Presentation	Radiology	Biopsy/FNAC	TB-PCR	Treatment	Follow-up	Outcome	Comment/Co-morbidities
	33/F Painful swelling for 2 month		Histopathology -; Culture -					
	39/M Swelling for 2 months	Xray- normal	Histopathology -; + Culture -		12 months ATT	18 months	Healed	
	26/F Discharging sinus	Xray- normal	Histopathology +; - Culture -		18 months ATT	22 months	Healed	Required immunomodulation; CD4:CD8 ratio-low
	38/M Painful swelling for 2 months	Xray- normal	Histopathology +; - Culture -		12 months ATT	16 months	Healed	
	42/M Swelling for 1 month	Xray- normal	Histopathology -; + Culture -		12 months ATT	15 months	Healed	
	36/M Discharging sinus for 3 months	Xray- normal	Histopathology -; + Culture -		12 months ATT	17 months	Healed	
Akhtar et al. <sup>28</sup> 2015 English 1 patient	41/F Painful swelling Rt SCJ	Xray- normal; CT scan- sclerotic lesion on medial end of clavicle	FNAC- inconclusive; Culture-; AFB-	NA	9 months ATT	2 year	Healed	
Meena et al. <sup>29</sup> 2017 English 9 patient	53/M Painful swelling Rt SCJ for 5 months	Xray was normal in all except one who had doubtful cystic lesion at medial end clavicle and another had active disease in lung and spine	Biopsy- caseating granuloma	+	16 months ATT	NA	Healed	1 out of 9 patients had pulmonary and spine involvement
	24/M Painful swelling Rt SCJ for 2 months		AFB +	+	14 months ATT	NA	Healed	HIV+
	51/M Discharging sinus Lt SCJ for 4 months		AFB +	NA	18 months ATT with immunomodulation for HIV	NA	Healed	
	32/M Painful swelling for 7 months		Biopsy- caseating granuloma	+	Second line ATT for 18 months with immunomodulation for HIV	NA	Healed	HIV+
	58/F Painless swelling for 13 months		Biopsy- caseating granuloma	NA	18 months ATT	NA	Healed	Rheumatoid arthritis
	45/M Painful swelling for 6 months		Biopsy- caseating granuloma	NA	16 months ATT	NA	Healed	
	65/M Discharging sinus for 6 months		Biopsy- caseating granuloma	NA	12 months ATT	NA	Healed	
	33/F Painful swelling for 8 months		Biopsy- caseating granuloma	+	15 months ATT	NA	Healed	
	54/M Painful swelling for 5 months		AFB +	NA	18 months ATT	NA	Healed	
Jha et al. <sup>30</sup> 2018 English 3 cases	49/M Swelling in Lt SCJ and fever	CECT thorax- inflammatory lesion involving left SCJ with extension to mediastinum	NA	NA	9 months ATT	NA	Healed	
	45/F Swelling in Rt SCJ and fever	CECT thorax- cold abscess of Rt SCJ	FNAC- granuloma; AFB+	NA	9 months ATT	NA	Healed	
	36/F Swelling in Rt SCJ and fever	CECT thorax- necrotic soft tissue swelling of Lt SCJ	NA	NA	ATT	NA	NA	Pott's spine at D6- D8
Prakash et al. 2019 English 19 cases	14 of 19 were females. Pain in all patients	Xray- varied appearances including diffused thickening and honeycombing, eccentric expansile lytic lesions with osteopenia, or sequestration at medial end of clavicle not unlike pyogenic	Biopsy - caseating granuloma (all patients)	+ in 16 out of 19 patients	18 months ATT Curettage and debridement in 3 patients	NA	Healed	7 of 19 had past h/o pulmonary tuberculosis

(continued on next page)

Table 2 (continued)

Author, Year, Language, number of SCJ TB patients	Presentation	Radiology	Biopsy/FNAC	TB-PCR	Treatment	Follow-up	Outcome	Comment/Comorbidities
		infection. MRI- signal intensity changes, distended joint, granulation/abscess in the soft tissue. Few areas of cortical destruction						

Abbreviations: ATT- Anti-tubercular therapy; AFB- Acid fast bacilli; CT-computed tomography; FNAC- Fine needle aspiration cytology; F- female; Lt- Left; M-male; MRI - magnetic resonance imaging; MTB- *Mycobacterium tuberculosis*; NA-not available; Rt- Right; SCJ- sternoclavicular joint; TB-PCR- Tuberculosis polymerase chain reaction; - denotes negative; + denotes positive.

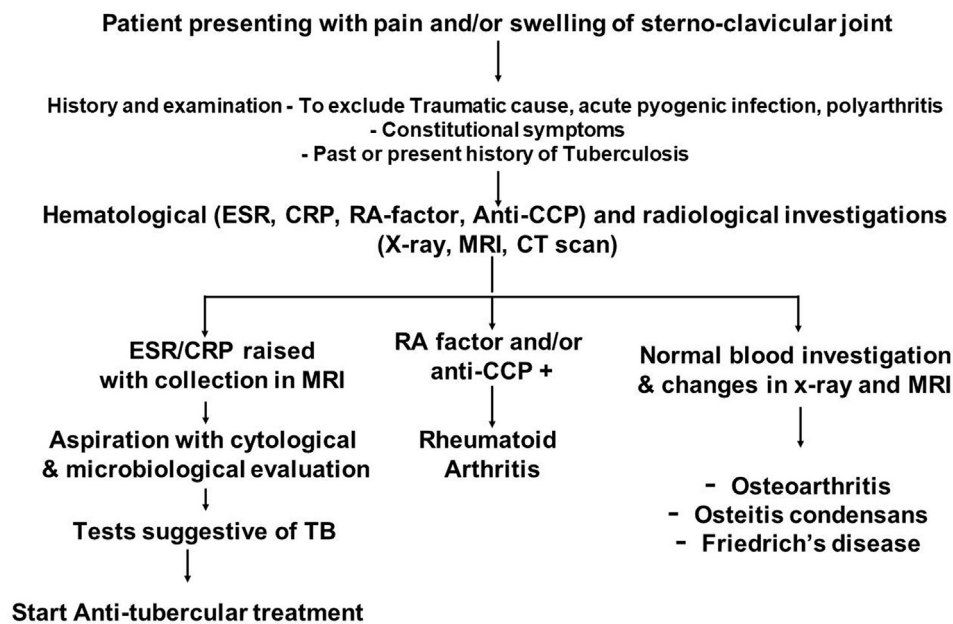


Fig. 5. Diagnostic algorithm showing clinical decision making process for diagnosing sternoclavicular joint tuberculosis.

the cases because the disease responds well to the anti-tubercular drugs. Moreover, surgery needs a bigger incision which is cosmetically unappealing at this exposed site of SCJ.

## 5. Conclusion

SCJ TB is commonly misdiagnosed as osteoarthritis or inflammatory arthritis or as a traumatic event. One should evaluate in a line of tuberculosis using modalities like MRI, cytology, histopathology, culture and TB-PCR, before labelling it as a non-tubercular arthritis. This leads to correct early diagnosis and commencement of ATT, reducing patient morbidity.

## References

- Tuli SM. *Tuberculosis of Skeletal System: Bones, Joints, Spine and Bursal Sheaths*. New Delhi, India: Jaypee; 1993:121–123.
- Bezza A, Niamane R, Benbouazza K, el Maghraoui A, Lazrak N, et al. Tuberculosis of the sternoclavicular joint. Report of two cases. *Rev Rhum Engl Ed*. 1998;65(12):791–794.
- Shah J. Tuberculosis of sternum and clavicle: imaging findings in 15 patients. *Skeletal Radiol*. 2000;29:447–453.
- Robinson CM, Jenkins PJ, Markham PE, Beggs I. Disorders of the sternoclavicular joint. *J Bone Joint Surg Br*. 2008;90(6):685–696.
- Simon GL, Worthington MG. An unusual case of pleural, epididymal and sternoclavicular tuberculosis. *J Infect*. 1982;4(3):259–261.
- Martini M. *Tuberculosis of the Bones and Joints*. Berlin Heidelberg New York: Springer; 1988:149–150.
- Yasuda T, Trauma K, Fujiwara M. Tuberculous arthritis of the sternoclavicular joint – a report of three cases. *J Bone Joint Surg Am*. 1995;77:136–139.
- Fang JT, Huang CC, Liu HP. Apparent neoplasm of the clavicle of a dialysis patient, ultimately revealed as tuberculosis. *Nephrol Dial Transplant*. 1996;11:1380–1382.
- Sy MH, Konate I, Gassama A, Kane A, Seye SI. Monoarticular/sternoclavicular arthritic tuberculosis: a proposal and an observation. *Int J Tuberc Lung Dzs*. 2000;4:486–487.
- Dhillon MS, Gupta R, Rao KS, Nagi ON. Bilateral sternoclavicular joint tuberculosis. *Arch Orthop Trauma Surg*. 2000;120:363–365.
- Fukasawa H, Suzuki H, Kato A, Yamamoto T, Fuigaki Y, Yonemura K. Tuberculous arthritis mimicking neoplasm in a hemodialysis patient. *Am J Med Sci*. 2001;322(6):373–375.
- Dhillon MS, Gupta RK, Bahadur R, Nagi ON. Tuberculosis of the sternoclavicular joints. *Acta Orthop Scand*. 2001;72(5):514–517.
- Khan SA, Zahid M, Asif N, Hasan AS. Tuberculosis of the sternoclavicular joint. *Indian J Chest Dis Allied Sci*. 2002;44(4):271–273.
- Kawasaki T, Sasaki Y, Shinozaki A, et al. Tuberculosis of the sternoclavicular joint. *Kekkaku*. 2007;82(5):475–479.
- Sahu S. *Sternoclavicular Tuberculosis*. *Med J Armed Forces India*. 2008;64(4):373–374.
- Amano H, Takamori M, Fujita A, Sakashita K, Murata K, et al. A case of sternoclavicular joint tuberculosis with renal failure due to rifampicin. *Kekkaku*. 2009;84(8):591–595.
- Aggarwal AN, Dhammi IK, Singh AP, Kumar S, Goyal MK. Tubercular osteomyelitis of the clavicle: a report of four cases. *J Orthop Surg*. 2009;17(1):123–126.
- Pandita KK, Sharma R, Dogra S, Pandita S. Bilateral sternoclavicular joint tubercular cold abscess. *Ann Thorac Med*. 2010;5(1):56–57.
- Shrivastav A, Pal J, Karmakar PS, Debnath NB. Tuberculosis of sternoclavicular

- joint-uncommon manifestation of a common disease. *J Med.* 2010;11(1):102–104.
20. Grover SB, Jain M, Dumeer S, Sirari N, Bansal M, et al. Chest wall tuberculosis – a clinical and imaging experience. *Indian J Radiol Imag.* 2011;21(1):28–33.
  21. Khare P, Sharma V, Khare S. Tuberculosis of the sternoclavicular joint. *J Orthop Trauma Rehabil.* 2013;17(2):96–98.
  22. Kelderman S, Steenvoorde P, van der Valk PD. Sternoclavicular joint tuberculosis. *Ned Tijdschr Geneesk.* 2012;156(18):A3315.
  23. Metanat M, Alavi-Naeini R. Sternoclavicular joint tuberculosis with cold abscess. *Iran J Clin Infect Dis.* 2012;1:29–31.
  24. Koshy S. A rare case of sternoclavicular joint tubercular cold abscess. *Int J Prev Ther Med.* 2014;2:134–138.
  25. Saibaba B, Meena UK, Behera P, Meena RK. Multicentric spinal tuberculosis with sternoclavicular joint involvement: a rare presentation. *Case Rep Pulmonol.* 2014;2014:685406.
  26. Walid O, Amine TM, Hamdi K, Sonia J, et al. Tuberculosis arthritis of the sternoclavicular joint. *Open J Orthoped.* 2015;5:135–139.
  27. Jain A, Jajodia N, Aggarwal A, Singh J, Gupta S. Tuberculosis of the sternoclavicular joint. *J Orthop Surg.* 2015;23(3):315–318.
  28. Akhtar MN, Agarwal S, Athar R. Clinico-radiological approach to a rare case of early clavicle tuberculosis: a case discussion based review of differential diagnosis. *J Clin Diagn Res.* 2015;9(6):RE01–RE05.
  29. Meena UK, Saibaba B, Behera P, Meena RK. Sternoclavicular joint tuberculosis: a series of 9 cases. *Indian J Tubercul.* 2017;64(3):221–224.
  30. Jha AK, Jha AC, Mishra N. Tuberculosis of the sternoclavicular joint: report of three cases. *J Assoc Phys India.* 2018;66(10):96.
  31. Prakash J, Sareen A, Arora P, Chopra RK. Sternoclavicular tuberculosis: an atypical imitator of refractory shoulder pain. *Int Orthop.* 2020 Apr;44(4):693–698.
  32. Tsay MH, Chen MC, Jaung GY, Pang KK, Chen BF. Atypical skeletal tuberculosis mimicking tumor metastases: report of a case. *J Formos Med Assoc.* 1995;94:428–431.
  33. Tuli SM. Clinical features. In: Tuli SM, ed. *Tuberculosis of Skeletal System (Bones, Joints, Spine and Bursal Sheaths)*. fourth ed. vols. 54–55. New Delhi, India: Jaypee Brothers; 2010:62–64.