



Calvarial Tuberculosis: Shifting Paradigm from Surgical to Conservative Approach

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Abstract

Background Tuberculosis (TB) is an endemic disease in developing countries like India. However, incidence of calvarial TB is very low and it presents in varied forms posing a diagnostic dilemma and delay in management.

Objectives This article reports a case series of 15 patients with varied presentations of calvarial TB from a tertiary care superspecialty center of Haryana state in India.

Material and Methods Study is a retrospective analysis of 15 patients with calvarial TB treated between 2018 and 2021 in a tertiary care hospital. Clinical features, radiological findings, surgical and medical management, and outcomes were reviewed.

Results Of the 15 patients, 9 were males and age ranged between 12 and 45 years. Mean duration of symptoms was 2.9 months (range 1–5 months). The most common presenting symptoms were scalp swelling, discharging sinus, and pain. Four patients were treatment defaulters of pulmonary TB and two patients were found human immunodeficiency virus positive. Brain imaging showed peripherally enhancing extradural collection with bone erosions in most cases. Eleven patients were managed conservatively with fine-needle aspiration cytology (FNAC) or local debridement/sinus excision. Four patients were managed surgically with drainage of collection, excision of necrotic bone, followed by antitubercular therapy. One patient needed cerebrospinal fluid diversion for associated hydrocephalous with tubercular meningitis which could not recover and succumbed.

Conclusion Calvarial TB is a rare occurrence of common prevalent diseases. Conservative management with FNAC and sinus excision followed by antitubercular treatment are the mainstay of treatment. Surgery should be reserved for extensive lesion or lesion with mass effect.

Keywords

- ▶ calvarial tuberculosis
- ▶ antitubercular therapy

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Introduction

Mycobacterium tuberculosis (TB) is an endemic disease in developing countries because of overcrowding, poor sanitation, undernutrition, and lack of proper health care system. The incidence of TB is also increasing in developed countries with emergence of human immunodeficiency virus (HIV) infections. Primary skull involvement along with pulmonary disease is relatively rare form of skeletal TB with few studies offering insights.^{1,2}

The reported incidence of TB skull is 0.2 to 1.3% of all cases of skeletal TB. Calvarial TB occurs commonly in young people although rarely seen in infancy because of small amount of cancellous bone in the skull.^{3,4} We report a series of 15 cases of calvarial TB and present the clinical features, radiology, histopathology, and operative findings.

Material and Methods

This retrospective descriptive study was conducted in the Neurosurgery Department of Pt. B. D. Sharma Post Graduate Institute of Medical Sciences (PGIMS) Rohtak, Rohtak, Haryana, India from 2018 to 2021. Medical records of all the patients treated for calvarial TB were reviewed after taking permission from competent authorities. Information regarding patients' demographic variations, type of presentation, symptoms, physical examination, radiological, surgical findings, and histopathological evaluation was collected. Computed tomography (CT) scan and magnetic resonance imaging (MRI) brain were done in all cases. Fine-needle aspiration cytology (FNAC) and local excision were done as per standard protocol.

Results

The age range of patients in the study was 12 to 42 years and mean age was 27. Out of 15 patients, 9 were males. The duration of symptoms ranged from 1 to 5 months with mean duration of 2.8 months. Eight patients presented with scalp swelling and five patients with swelling and discharging sinus (►Table 1). Two patients had nonhealing discharging sinus without any swelling (►Fig. 1).

Nine patients had history of pulmonary TB, out of which four were treatment defaulters, three had completed antitubercular therapy, two had active pulmonary TB, and two patients had another focus in spine. Five patients had family history of pulmonary TB and two patients were found to be HIV positive. One patient had hydrocephalous with TB meningitis along with calvarial TB.

All the patients had raised erythrocyte sedimentation rate (ESR). Mantoux test was found positive in 13 patients and inconclusive in 2 patients, who were found to be HIV positive. Nine patients gave history of low-grade fever and cough was present in six patients. Chest radiographs revealed Koch's lesion in nine patients.

Contrast-enhanced CT (CECT) head revealed subgaleal collection with bone erosion in 10 cases, followed by lytic destruction of bone with epidural collection in 4 patients and

epidural collection with hydrocephalous in 1 patient. Frontal bone was most commonly involved (53.3%), followed by the parietal bone (26.6%) and temporal bone (13.3%), one patient had involvement of occipital bone also (►Fig. 2).

CE-MRI revealed T2 hyperintense peripherally enhancing epidural collection showing restriction in diffusion-weighted images with bone erosions (►Fig. 3).

Demonstration of acid-fast bacilli was seen in only two patients. Histopathology revealed plasma cells and lymphocytic infiltration with Langhans giant cells and caseous necrosis.

Surgical intervention was done in four patients to remove thick extradural granulation tissue, necrotic bone, intracranial extensions, and large collections of caseous material causing mass effect.

Conservative approach with sinus excision and FNAC from localized swelling was done in 11 patients.

Antitubercular therapy was given for at 12 to 18 months and monitored with clinical examination, liver function test (LFT), ESR, and CECT scan. Radiological evidence of healing was seen nearly after 2 months of antitubercular therapy with new bone formation at the edges of lesion.

Discussion

Calvarial TB constitutes a rare incidence even with communities with high prevalence of TB. It was first described by Reid in 1842.⁴ Nonavailability of data from endemic areas has been attributed to chronic indolent asymptomatic cases and decreased awareness of the entity. Unlike our observation, affection of both genders seems equal probably because our sample size is too small to consider the evaluation.

Limited literature is available because of the rarity of calvarial TB. Strauss in 1993 reviewed 220 cases and added 3 cases of his own.⁵ In 1942, Meng and Wu reported 40 cases,⁶ followed by 22 cases of Mohanty et al in 1981.⁷ A search of the available English literature through December 2000 revealed 365 reported cases of calvarial TB.⁸

Most cases occur secondary to pulmonary TB; however, we also had evidence of extracranial extrapulmonary TB, that is, of spine involvement in two patients. Lymphatic spread from primary focus seems to explain the rarity of calvarial TB as the skull is deficient in lymphatic supply. Mycobacteriae lodge in cancellous and diploe-rich spaces which seem to be the reason of involvement of frontal and parietal bone. Disease progression depends on virulence of bacteria and host resistance. Capillary obliteration occurs followed by replacement of bony trabeculae with granulation tissue. Dura mater is resistant to their penetration as evident from our study.⁸

Some studies have implicated trauma as cause of skeletal TB. It is postulated that inflammation at the site of trauma may harbor or attract mycobacterium-rich inflammatory cells initiating the lesion.^{9,10} However, according to the study conducted by Gupta et al role of trauma is more coincidental than causal.¹¹

In our study, painless fluctuant swelling was the most common mode of presentation, followed by sinus formation,

Table 1 Description of patients with calvarial TB

Sl. no.	Age/sex	Presenting complaints and history	Systemic features (fever, cough, weight loss)	Radiological features	Blood investigations ESR and CRP	Intervention
1	12/M	Right frontal discharging sinus and swelling for 3 months	Present	Peripherally enhancing collection with erosion of frontal bone	ESR and CRP raised. Mantoux positive	Sinus excised with local debridement and ATT
2	20/F	Right postauricular swelling for 2 months H/O pulmonary TB on ATT for 4 months	Present	Extradural collection communicating with subgaleal collection in right temporal region	ESR and CRP raised Mantoux positive	FNAC followed by ATT
3	15/F	Left parietal swelling Family H/O TB	Present	Left parietal bone erosion with small subgaleal collection with diffusion restriction on DWI	ESR and CRP raised. Mantoux positive	Conservative management with FNAC and ATT
4	42/M	Occipital swelling for 2 months. HIV positive	Present	Peripherally enhancing collection with erosion of occipital bone	ESR and CRP raised. Mantoux inconclusive	Local debridement followed by ATT and ART
5	25/F	Left frontal swelling for 1 month, H/O pulmonary TB, and treatment defaulter	Present	Extradural large collection communicating with subgaleal collection in lt. frontal region. diffusion restriction on DWI	ESR and CRP raised. Mantoux positive	Craniotomy with drainage of collection and ATT
6	30/M	Right supraorbital swelling with discharging sinus. Fever, vomiting, neck rigidity Active pulmonary TB on ATT for 3 months	Present	Right frontal extradural collection with extensive bony metastasis communicating with subgaleal collection, meningeal enhancement and hydrocephalous	ESR and CRP raised. Mantoux positive	Craniotomy with drainage of collection, external ventricular drain placement, ATT
7	40/M	Left parietal swelling, backache for 6 months H/O pulmonary TB and treatment defaulter	Present	Peripherally enhancing erosion of left parietal bone. Tubercular focus in D6D7 spine with paraspinial collection	ESR and CRP raised. Mantoux positive	Craniotomy with drainage of collection and ATT (cat 2)
8	38/M	Left frontal swelling for 12 months, backache, paraparesis for 10 days, seizure H/O pulmonary TB and treatment defaulter HIV positive	Present	Extradural large collection communicating with subgaleal collection in left frontal region. Diffusion restriction on DWI D2D3 Potts spine with epidural collection	ESR and CRP raised Mantoux inconclusive	Craniotomy with drainage of collection ATT, ART. Dorsal spine decompression and drainage

(Continued)

Table 1 (Continued)

Sl. no.	Age/sex	Presenting complaints and history	Systemic features (fever, cough, weight loss)	Radiological features	Blood investigations ESR and CRP	Intervention
9	14/F	Right frontal discharging sinus and swelling for 3 months	Present	Peripherally enhancing collection with erosion of frontal bone	ESR and CRP raised. Mantoux positive	Sinus excised with local debridement and ATT
10	15/F	Left parietal swelling H/O pulmonary TB completed 6 months DOTS regimen	Present	Left parietal bone erosion with subgaleal collection with diffusion restriction on DWI	ESR and CRP raised. Mantoux positive	Conservative management with FNAC and ATT
11	26/M	Right frontal discharging sinus	Present	Extradural collection communicating with subgaleal collection in right frontal region	ESR and CRP raised. Mantoux positive	Sinus excision, local debridement followed by FNAC
12	15/F	Left parietotemporal swelling, seizure Family H/O TB	Present	Left parietal bone erosion with subgaleal collection communicating with extradural collection with diffusion restriction on DWI	ESR and CRP raised. Mantoux positive	FNAC followed by ATT
13	22/M	Right frontal discharging sinus and swelling for 3 months	Present	Peripherally enhancing collection with erosion of frontal bone	ESR and CRP raised. Mantoux positive	FNAC followed by ATT
14	38/M	Left supraorbital discharging sinus and swelling for 2 months H/O pulmonary TB, treatment defaulter	Present	Peripherally enhancing collection with erosion of frontal bone	ESR and CRP raised. Mantoux positive	Local debridement followed by ATT
15	18/F	Left parietal swelling with discharging sinus Completed 6 months DOTS regimen for pulmonary TB Family H/O TB	Present	Left parietal bone erosion with subgaleal collection with diffusion restriction on DWI	ESR and CRP raised. Mantoux positive	FNAC followed by ATT

Abbreviations: ART, antiretroviral therapy; ATT, antitubercular therapy; CRP, C-reactive protein; DOTS, directly observed treatment short-course; DWI, diffusion-weighted image; ESR, erythrocyte sedimentation rate; F, female; FNAC, fine-needle aspiration cytology; HIV, human immunodeficiency virus; H/O, history of; M, male; TB, tuberculosis.

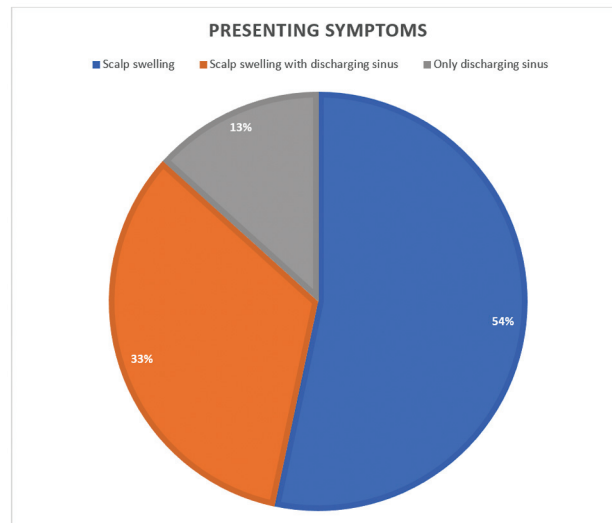


Fig. 1 Distribution of study subjects according to presenting symptoms.

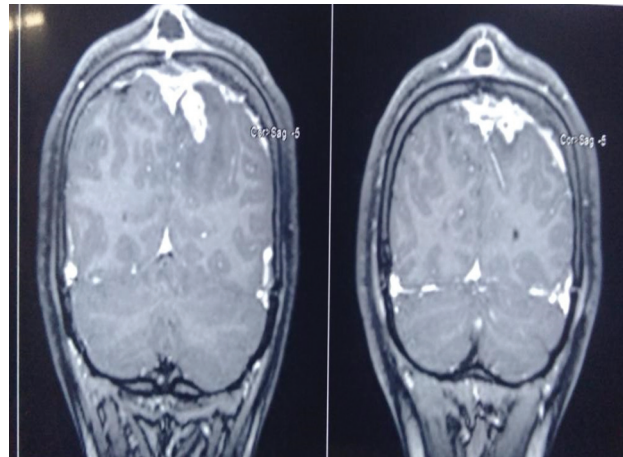


Fig. 2 (A) Magnetic resonance (MR) coronal images showing parenchymal enhancement with bony changes and overlying soft tissue collection. (B) MR sagittal ($T_1 + C$) showing calvarial bony changes and adjacent external with extradural collections. (C) MR sagittal (T_2) showing calvarial bony changes and adjacent external with extradural collections. (D) MR axial ($T_1 + C$) showing left frontal enhancement with bony changes and marked collection. (E) Computed tomography (CT) contrast axial showing left frontal epidural collection with enhancement as well as overlying soft tissue collection.

skin discolorations, and seizure. Systemic manifestations such as fever, anorexia, and weight loss were associated symptoms in all cases. Two patients presented with seizure episode in our study.

CT scan proved to be a useful domain of provisional radiological diagnosis and definitive diagnosis can only be made after demonstration of acid-fast bacilli in excised tissue which is seen in only two cases in our study. Evidence of lymphocytic and plasma cell infiltration with Langhans giant cells and caseous necrosis strongly supports the diagnosis of TB.

FNAC is a useful tool in diagnosing calvarial TB. Patient is usually exempted from surgical intervention, these swelling reduce in size after a course and antitubercular drugs. Early surgical treatment is indicated for large epidural collection or progressive growing collection, formation of fresh sinus

tracts, nonresponse to treatment, and development of multidrug resistance. Prognosis depends upon the gravity of associated tubercular lesions and extent of local disease, which is generally good with complete resolution of lesion.¹²

Follow-up was done at 3, 8, and 12 months. Clinical examination, laboratory investigations (routine blood investigations, LFT), and noncontrast CT head was done at every follow-up visit.

Conclusion

Calvarial TB is an uncommon disease, even in countries with endemic TB.¹³ It generally afflicts the younger age group and incidence may increase with the rise of HIV cases. There are no pathognomonic clinico-radiological features of this

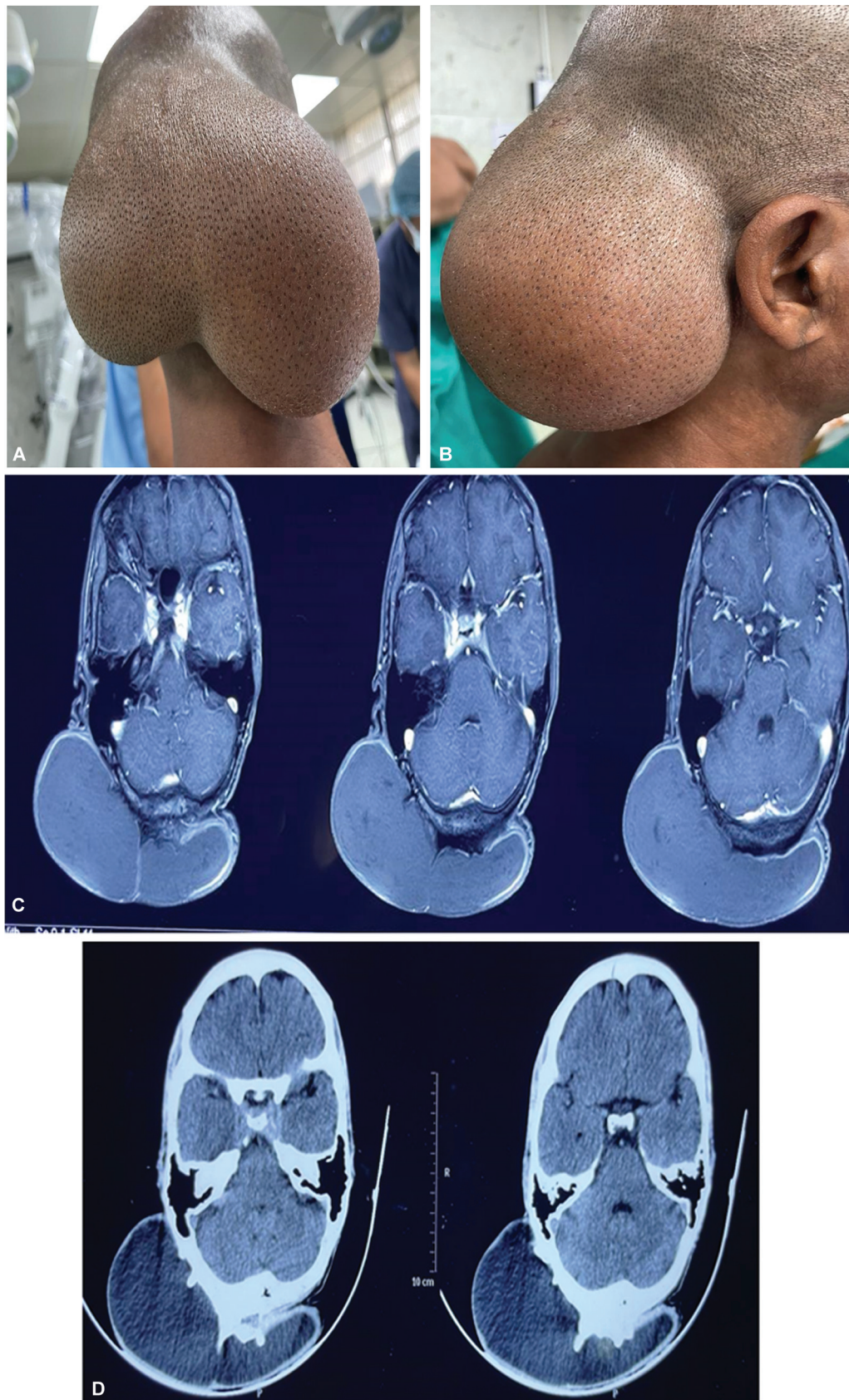


Fig. 3 (A, B) Image showing huge collection in occipital region. (C) Magnetic resonance (MR) axial ($T_1 + C$) showing extensive soft tissue collection and bone marrow changes in occipital region. (D) Computed tomography (CT) image showing soft tissue collection and hypertrophy of underline bone in occipital region.

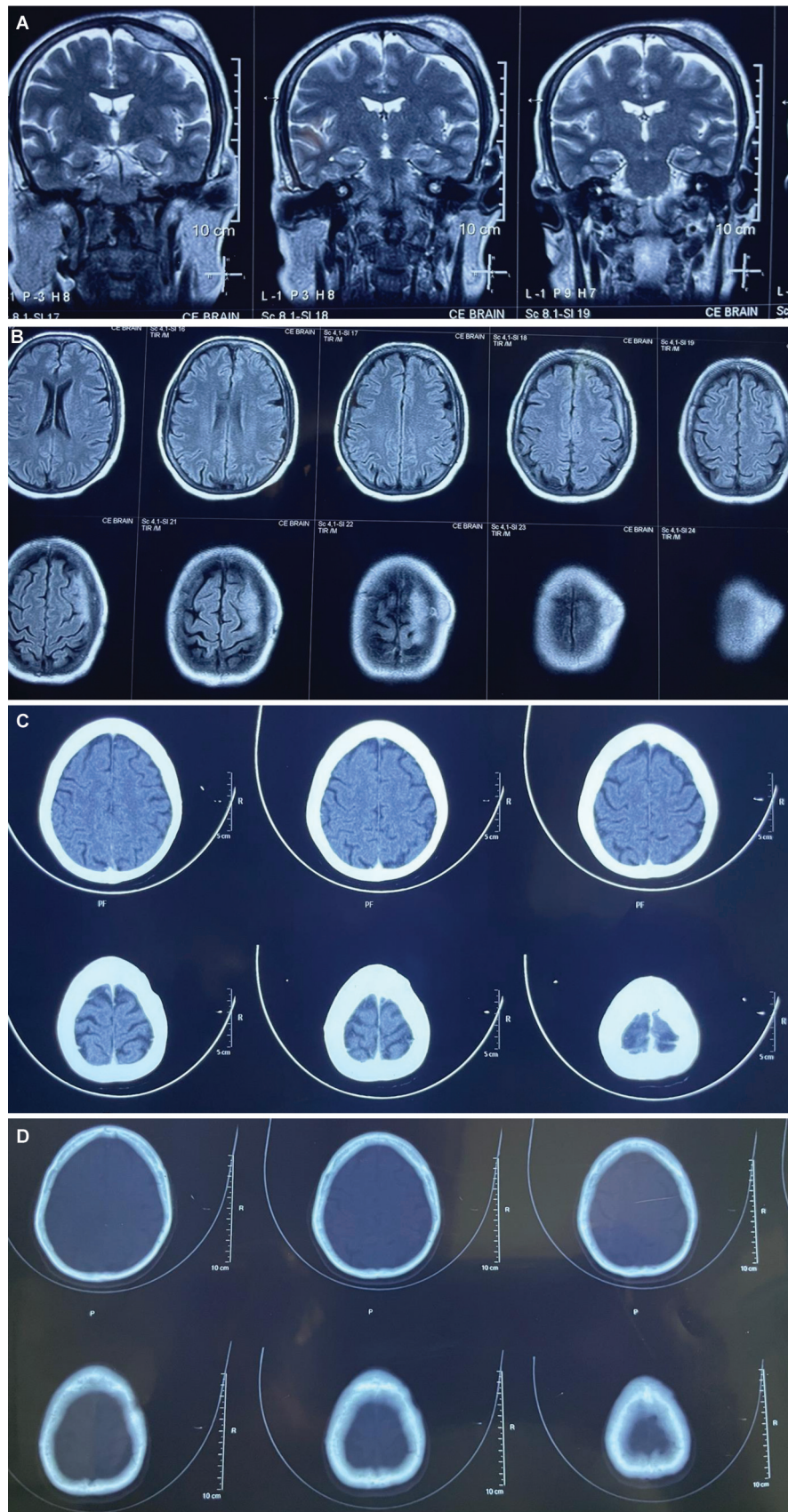


Fig. 4 (A, B) Magnetic resonance (MR) images (coronal and axial) showing epidural as well as soft tissue collection in left frontal region. (C, D) Computed tomography (CT) images of same patient showing complete resolution of tubercular collection after completion of antitubercular therapy (ATT).

disease. The difficulty in diagnosis may be compounded by secondary bacterial infection. Effort should be made to isolate mycobacteria before surgery by the use of FNAC. Antitubercular therapy may obviate the need for surgery (►Fig. 4). Surgery should be reserved for extensive lesion or collection with mass effect.

Authors' Contributions

V.A., G.K., and I.S. made significant contributions to the conception and design of the study. V. was responsible for the acquisition of data, as well as the analysis and interpretation of the data. P.S.H. also contributed to the acquisition of data and participated in the analysis and interpretation of the data.

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Conflict of Interest

None declared.

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