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Case report

Tubercular skull base osteomyelitis – A case report

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ABSTRACT

Skull base osteomyelitis (SBO) is a complex and fatal clinical entity caused by infections in the structures surrounding the skull base. It is mainly seen in immune compromised individuals. We report one such rare case of an atypical skull base osteomyelitis in a young, immune-competent female child of 12 years of age, who presented in the ER with misleading symptoms of stroke and was diagnosed incidentally to have SBO on imaging. Adding to the uniqueness of the case is the causative organism, which was identified as Mycobacterium Tuberculosis, an unusual cause of SBO.

Introduction

Skull base osteomyelitis was first described and identified in 1959, by Meltzer and Keleman [1]. Skull base osteomyelitis (SBO) is an infection of the temporal, sphenoid or occipital bones that is caused as a complication of otogenic, sinonasal, odontogenic and rhinogenic infections especially in immune compromised conditions [2].

Skull base osteomyelitis (SBO) is often misdiagnosed for malignancy [3]. SBO can be either classified as typical due to concomitant infection of the temporal bone or atypical/central due to due to direct infection of the occipital or sphenoid bones [4]. It presents with a plethora of symptoms like headache, cranial nerve palsies, meningitis, signs of raised intra cranial pressure, intracranial abscesses, venous thrombosis and rarely with cerebro-vascular accidents [5]. Symptoms are usually fulminant both in onset and in progress. Causes of SBO are due to bacterial or fungal infections, the former being more common [2]. Though with the advent of anti-biotics the incidence has reduced, SBO is a diagnosis of great significance pertaining to its association of severe morbidity and mortality. Amongst bacteria, Gram Negative bacteria gaining access either through external ear infections or hematogenous route is the commonest cause of SBO, tubercular affection is unheard of [2]. In such cases (Mycobacterium Tuberculosis - MTB as the causative agent) the SBO is surprisingly silent and presents as an indolent infection [6].

A high degree of suspicion and minimal investigations mainly radiological are necessary to exclude this uncommon diagnosis and start prompt therapy. Especially in a developing country like ours where TB is a leading health problem, this rare clinical presentation of the infection should not be missed.

We present in this article such a rare presentation of MTB causing skull base osteomyelitis in a immune-competent child with masquerading symptoms reinstating the fact that a physician should have an eagle's eye to diagnose this disease.

Case presentation

A 12-year-old female child came to emergency department of our hospital with complaints of sudden onset weakness with numbness of right side of the body with deviation of angle of mouth to left side since morning. Patient was apparently alright till morning, when after waking she noticed that was not able to lift her right arm and stumbled with multiple episodes of falls to the right side while performing her daily activities. Also, her relatives noticed that patient's mouth deviated to the left side while talking. The patient was taken to private practitioner who then after general examination referred the patient to our hospital for further evaluation and management. Patient was admitted and evaluated. She had no other symptoms other than the weakness. On probing further, she gave a history of trivial headaches and pain in the neck in the last 1 month which resolved after taking pain killers. There was no history of fever, altered sensorium, loss of consciousness, convulsions, vomiting, blurring or loss of vision, or difficulties in hearing. She also did not report history of weight loss, night sweats, or loss of appetite. There was not any significant history. She was born of a consanguineous marriage. There was no history of any developmental delay or late achievement of milestones or any evidence of cognitive

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impairment. There was no prior history contributing to a possible young stroke like past cardiovascular events, trauma, metabolic syndrome, use of any medications/illicit use of drugs, failure to thrive during the period of infancy or later, metabolic syndrome, seizure disorders, or blood transfusions or history of anemia.

On general examination patient had reddish pink colored birthmark on left cheek – Port wine stain, no other abnormality was detected. Vitals and other hemodynamic parameters were normal for her age. Examination of the nervous system revealed complete hemiparesis of the right side of the body - purely an upper motor neuron type of weakness with right upper motor neuron type of facial palsy. Power was 3/5 in right arm and 4(-) /5 in right leg. All reflexes were brisk over the right side of the body as compared to the left half. Plantar was extensor on the right and flexor on left. Patient's sensory system, autonomic system, cerebellar system, bladder, and bowel sensations were all intact with absence of meningeal signs and involuntary movements. Patient was able to walk without support, but she had hemiplegic type of gait while walking. Other systems examination – Cardiovascular, Respiratory and Gastrointestinal were unremarkable.

Basic laboratory investigations like complete blood count, renal function tests and liver function tests, serum electrolytes, urine routine-microscopy, serum lipid profile, blood sugars, chest x ray and ECG were within normal limits. Patient was screened for immune compromised status, she tested negative for diabetes mellitus and HIV infection. Thrombophilia profile was negative ruling out the possible cause of hyper-coagulable states. 2D – ECHO study was normal.

To identify the region of brain involved, a computed tomography (contrast enhanced) imaging was undertaken and it incidentally revealed extensive erosion in anterior and posterior clinoid process and occipital protuberances with adjacent ill-defined peripherally enhancing soft tissue in the pre clinoid region. Multiple necrotic lymph nodes were seen in bilateral posterior triangle of neck. A forming abscess of size 1.5 × 2.7 cm was seen in cervical lymph nodes on the right at level IV. Findings were suggestive of infective etiology – Tuberculosis lymphadenopathy with TB osteomyelitis of skull base involving clivus. Also, there was evidence of suspicious non hemorrhagic infarct in left half of pons, likely vasculitic infarct.

Patient's lumbar puncture and cerebrospinal fluid (CSF) examination was planned. CSF study showed raised proteins – 95 mg /dl, low sugar – 47 mg / dl and complete predominance of lymphocytic cells (Total nucleated cells TNCs - 12 cells – 100% lymphocytes), CSF bacterial culture no organism growth detected. CSF ADA levels were 1.9 Units/Litre. MTB was not detected in CSF Genexpert. ESR was 22 marginally raised and CRP was negative. CSF cultures did not show growth of any organism. A USG guided FNAC biopsy of the largest involved cervical lymph node was done. The FNAC samples were sent for cultures and genexpert testing. Histopathological examination of the biopsy showed chronic granulomatous inflammation with necrosis,although no Acid fast bacilli were detected on staining. The genexpert and culture showed presence of Mycobacterium tuberculosis which was sensitive to 1st line Anti tubercular drugs. Drug susceptibility testing showed the organism sensitive to both 1st and 2nd line anti-tubercular drugs.

Based on the confirmatory findings of lymphnode biopsy and corroborating the imaging with general CSF examination findings, we concluded that the patient was suffering from a rare case of TB affection. Also unlike other fulminant bacterial disease processes, the clinical presentation was largely silent despite the extensive pathological involvement as usually seen in TB infections. Also, in addition, the epidemiology had to be considered, as the patient was hailing from a region with significant TB burden. The patient was started on 1st line anti- Kochs therapy in concordance with the culture reports of lymphnode biopsy and injectable steroids for extensive extra pulmonary tuberculosis infection involving skull base and the resulting vasculitic infarct. Anti-Kochs therapy was based on the RNTCP (Revised National Tuberculosis Control Programme) guidelines and the patient was started on weight based Fixed Drug Combination (FDC) – 2 FDC per day in the intensive phase each tablet consisting of Isoniazid 75 mg, Rifampicin 150 mg, Pyrazinamide 400 mg and Ethambutol 275 mg. For, the neurological deficits patient was advised to undergo physiotherapy. Patient did not have any fresh complaints during course of her hospital stay and was discharged on oral medications with a strict advice to follow up regularly. The patient tolerated the therapy well and in a span of 4 weeks showed remarkable improvement in her symptoms. Her weakness had near completely resolved in that time span. Steroids were tapered and stopped in 8 weeks. Serial cranial imaging after 3 months showed resolving changes in the skull base. The patient was advised to continue AKT as per the RNTCP guidelines and told to follow up in opd services every month until the complete course of her treatment.

Discussion

Skull base osteomyelitis (SBO) is a serious, life-threatening condition. Etiology may result from trauma, bone surgery, bacteremia, or a contiguous infectious focus and is further influenced by diseases that affect the vascularity of bone, as well as by systemic diseases that produce an alteration of host defenses [1,2]. Systemic diseases that reduce host defenses and cause an immunocompromised state include diabetes, anemia, radiation, malignancy, and malnutrition, old age, infections like HIV and so on [3].

Skull base osteomyelitis is broadly classified as: typical and atypical. Typical skull base osteomyelitis occurs secondary to uncontrolled infections of the temporal bone region, most often from necrotizing otitis externa. Atypical SBO (also known as central SBO) occurs in the absence of obvious temporal bone or external auditory canal infection involving the sphenoid and occipital bones, especially the clivus part of the latter [4–6]. Most cases of skull osteomyelitis are related to trauma [7,8]. In developing countries with limited access to antibiotics, the most common causes of cranial osteomyelitis are paranasal sinuses, direct head injuries, and scalp infections. In developed nations, postoperative craniotomy infections are the predominant source [7,8]. SBO is not common in children and osteomyelitis of skull bones especially atypical involving skull base has never been documented in children.

Most common organism isolated in skull base osteomyelitis is Pseudomonas aeruginosa though other bacteria and fungi have also been found as causative factors [3,9]. Skeletal tuberculosis constitutes 1% of the presentation of tuberculous infection and the incidence of tubercular skull osteomyelitis is thus less than a percent [10]. Even rarer is its involvement of the skull base [6].

Presenting symptoms of early SBO (headache, fever, nasal congestion/discharge, ear pain/discharge) are non-specific [3]. Diagnosis is often made when the disease is advanced and neurological deficits have occurred. Patients present with headache, cranial nerve palsies, meningitis, signs of raised intra cranial pressure, intracranial abscesses, venous thrombosis and rarely with cerebro-vascular accidents [3]. SBO is very rogue as a disease having very little window period between symptoms' onset and development of severe morbidity, even at times culminating in death of the patient unless appropriate anti-biotics are administered robustly. SBO is mainly identified on imaging [4,11]. CT is the best option for evaluating bone erosion and demineralization, MRI can help delineate the anatomic location and extent of disease, and nuclear imaging is useful for confirming bone infection with high sensitivity [4,10]. However, the standard diagnostic procedure for SBO is for patients to undergo repeated biopsies to rule out malignancy, with histo-pathologic

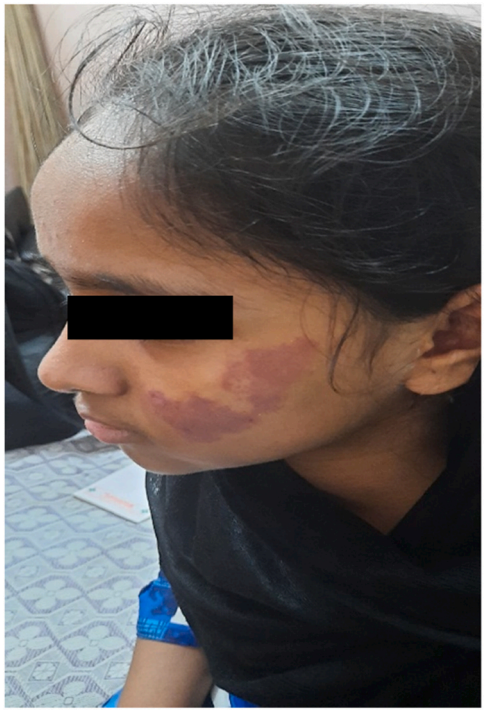

Fig. 1. Port wine stain.

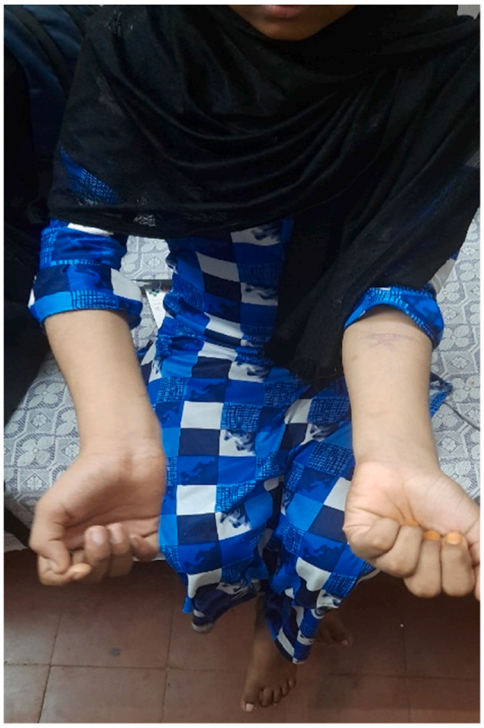

Fig. 2. UMN Type of paresis.

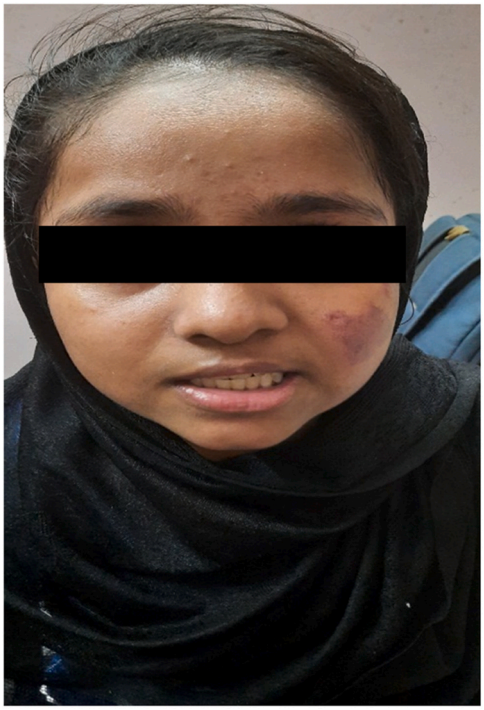

Fig. 3. UMN Type VII nerve palsy.

signs of infection and detection of microorganisms in the biopsied bone or soft tissue indicating SBO [6]. Identification of causative organism is challenging and not always feasible in skull base infections [12]. Biopsy of diseased bone is a herculean task in patients due to proximity to vital neurologic structures [11]. Isolation of causative organism and biopsy of disease bone is time consuming and would prove catastrophic if treatment were to be started after definitive diagnosis. Necrotic bone is avascular, resulting in reduced antibiotic delivery and necessitating long-treatment duration [11]. Hence, SBO poses a diagnostic and therapeutic challenge to clinicians [11]. Added therapeutic challenge would be when SBO is caused by uncommon organisms like MTB as empirical treatment of SBO does not involve the Anti Kochs Regimen.

Our patient was lucky enough to have very minimal clinical presentation despite having grave involvement. Strong suspicion of Mycobacterium Tuberculosis occurred after primary imaging which showed, in addition to SBO, necrotic lymphadenopathy and a vasculitic infarct [13]. Our patient did not have any frank symptom or sign of a dangerous infectious condition like SBO. Diagnosis of SBO was made only with the help of imaging findings. CSF examination and more importantly the lymph node biopsy findings showed a tubercular picture and suggested a probable central spread and so patient was immediately started on therapy as per RNTCP Guidelines [14–16]. Patient with any CNS parenchymal involvement usually show worst grievous outcomes. Fortunately, our patient showed partial recovery and regain of power within a few days of starting the treatment. This case has been reported to create awareness amongst physicians and pediatricians, especially in developing countries where Tuberculosis is a burden, of MTB as a common day to day cause for SBO especially in young immune competent patients and to consider it as one of the first differential causes [17].

Conclusion

There is a very high prevalence of Mycobacterium tuberculosis in developing nations. Skull base osteomyelitis is a diagnosis of exclusion for any patient who presents with symptoms of CNS involvement citing the presence of more common causes mimicking the disease clinically. Considering the facts that MTB is a common entity and skull base osteomyelitis is a dangerous condition requiring prompt treatment, it should be kept in mind while evaluating any patient with CNS affection (Figs. 1–8).

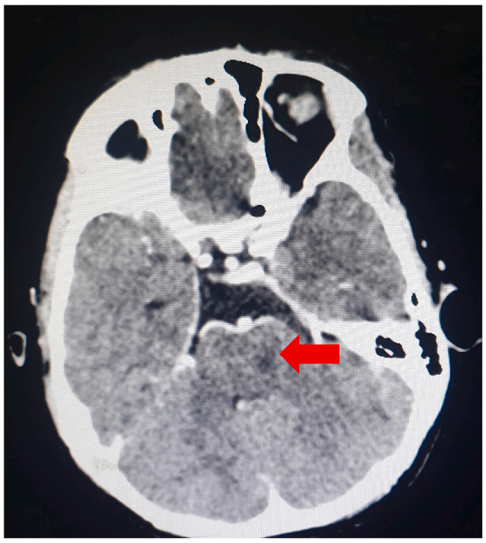

Fig. 4. Arrow showing suspected Pontine infarct manifesting as hypodense lesion.

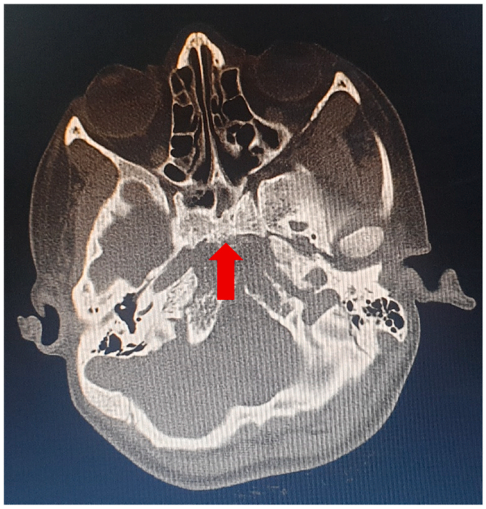

Fig. 5. Arrow showing erosion of clivus.

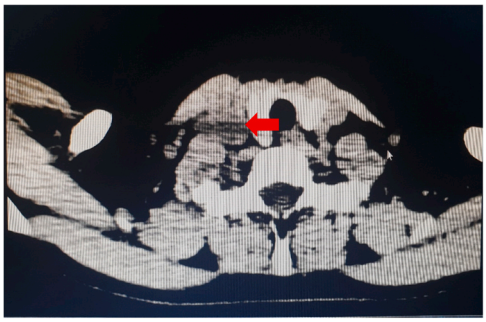

Fig. 6. Arrow showing forming abscess with necrosis in cervical lymphnode level iv right.

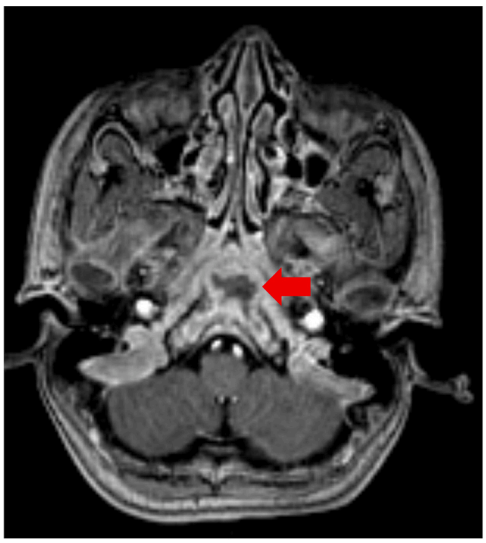

Fig. 7. MRI showing erosion of skull base (arrow).

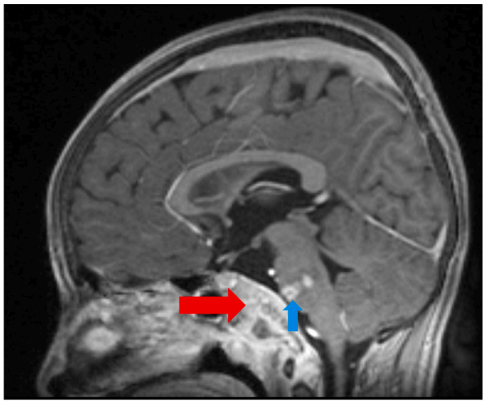

Fig. 8. Sagittal view showing ring enhancing lesion in pons with a small infarct as hypodense area. Skull base is hyperdense small hypodense foci within suggesting active disease activity with inflammation. Red arrow showing necrosed bone and blue arrow showing pontine ring enhancing lesion.

Ethical approval

Approved by Institutional Ethics Committee.

Consent

Obtained from the patient's guardian.

Author contribution

Dr Akshaya Sathyamurthy: Data collection, Writing, Dr Bramhadev Kute: Data collection, Dr Priya Patil: Study design, Dr Deepika Pandey: Study Design, Dr Bhavesh Shetty: Data collection.

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None.

Conflict of interest

No conflicts of interest.

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