Cerebral Abscess Caused by *Streptococcus spp* in a Patient with Chronic Suppurative Otitis Media (CSOM)

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Abstract Chronic suppurative otitis media (CSOM) is a clinical condition where a patient suffers from external and middle ear infection caused mostly by bacteria or by fungi resulting in ear discharge. Identification of the causative microorganism and initiation of appropriate antimicrobial chemotherapy is needed in patients suffering from CSOM. Infections of the ear if happen to be chronic in nature have the tendency to leak in to the adjacent areas of the central nervous system causing severe complications.

Keywords: *Streptococcus spp*, chronic suppurative otitis media (CSOM) and cerebral abscess

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1. Introduction

Ear infections are among the most common causes necessitating hospital visits usually in the paediatric age population. Infections of the ear may be presenting either as acute or chronic. Otitis media results from the infection mostly due to a pyogenic bacterium or a fungus. The inflammatory process mediated by the infection in the middle ear often spreads in to the endocranium through direct damage of the middle ear bone walls. Etiology of otogenic cerebral abscess is complex that may involve pyogenic aerobic bacteria (*Streptococci spp*, *Staphylococcus aureus*, *E coli*, *Klebsiella spp*, *Pseudomonas spp* and others) and anaerobic pathogens (*Bacteroides spp*, *Fusobacterium spp*) and fungi (*Aspergillus spp* and *Candida spp*) [1,2,3,4,5]. Clinical and microbiological diagnosis of ear infections and the treatment with appropriate antimicrobial agents is necessary to avoid intracranial spread and resultant serious complications. People living in the developing nations are predisposed to frequent infections (skin infections, respiratory tract infections, ear infections) attributed usually to overcrowding, mal nutrition and poor hygiene. We discuss a case of cerebral abscess caused by *Streptococcus spp* in an immunocompetent adult who complained of chronic ear infection since childhood.

2. Case Presentation

A 29-year-old male patient presented to the emergency department of Prathima Institute of Medical Sciences with

symptoms of nausea, vomiting, severe head ache, giddiness, difficulty in ingesting food and difficulty in walking. Patient gave history of ear discharge since one month. Patient was apparently healthy one month back. The ear discharge was from the left ear and was whitish in colour and foul smelling. Patient revealed that he had on and off ear infections since childhood. The patient was a non-smoker and occasional alcoholic. There was no history of diabetes mellitus, hypertension, asthma and tuberculosis. Patient was non-reactive for human immunodeficiency virus (HIV), Hepatitis B virus (HBV) and Hepatitis C Virus (HCV). CT scan 5mm slice thick was taken in 128 slices without intravenous catheterization. CT scan of brain revealed evidence of hypo dense lesion with surrounding peri-lesional oedema in left cerebellar region. CT scan also showed evidence of erosion of sigmoid plate with extension of collection of middle ear in to intracranial cavity (Figure 1, Figure 2 and Figure 3). MRI was performed for a better study of brain which confirmed left CSOM with extension in to the left cerebellum with peri-lesional oedema causing compression of pons, 4th ventricle aqueduct and minimal middle line shift of right side. MRI also showed evidence of T1 hypointense and T2 hyperintense lesion in left mastoidal cells, left external ear and middle ear cavity with extension to lateral part of left cerebellum. Perilesional oedema surrounding left cerebellum and verms causing mass effect in the form of compression of 4th ventricle aqueduct and pons with a minimal midline shift towards right side was confirmed. Rest of the brain tissue was found normal. Based on the clinical symptoms and results of the imaging studies a diagnosis of otogenic cerebellar abscess was made. Computer guided Aspiration of the abscess pus was performed and was sent for microbiological

analysis. Gram's stain of the pus showed occasional gram positive cocci in singles and pairs. Acid-fast staining for tubercle bacilli was negative. The aspirated pus showed no growth of anaerobic bacteria. Culture for fungus was negative. Aerobic culture revealed growth of pin point semitranslucent non-hemolytic bacteria on blood agar which on gram's staining are confirmed as gram positive cocci in pairs and chains (Figure 4 and Figure 5). There was no growth on macConkey's agar. The bacteria were non-sporing, non-motile, oxidase negative, catalase negative and non-acid fast. Based on the biochemical and

cultural characters, the bacterium was identified as *Streptococcus spp.* The antimicrobial susceptibility testing of the bacteria revealed sensitivity to linazolid, gentamicin, ofloxacin, clindamycin, co-trimoxazole, amoxycillin-clavulanic acid, azithromycin and imipenem. The isolated bacterium was resistant to ceftriaxime, cefepime and ceftriaxone (Figure 6). Due to the unavailability of antisera, the *Streptococcus* isolated was not identified to the species level. The patient was treated with Linazolid and metronidazole and the patient had an uneventful recovery.

Figure 1. Computed tomography (CT) of the brain revealing evidence of erosion of sigmoid plate with extension of collection of middle ear in to intracranial cavity

Figure 2. Computed tomography (CT) of the brain revealing evidence of erosion of sigmoid plate with extension of collection of middle ear in to intracranial cavity

3. Discussion

Streptococci are a group of facultative anaerobic gram positive cocci arranged in single, pairs and long chains belonging to the family *Streptococcaceae*. Members of *Streptococci* are present as a normal flora in human and animals and are recognized as potential pathogens in

human. Laboratory identification of *Streptococci* depends mainly on the type of the haemolysis they produce in sheep blood agar and the Lancefield serogrouping (A-V except I and J). *Streptococci* have been most commonly associated with sore throat, pharyngitis and tonsillitis (Group A *Streptococcus*/*Streptococcus pyogenes*). Skin infections (pyoderma- abscess, erysipelas, impetigo, cellulitis etc), urinary tract infections, wound infections,

endocarditis, pneumonia, polyarthritis, septicaemia and meningitis are other infections caused by various *Streptococcus spp.* Predisposing factors for infections with *Streptococci* include cardiovascular diseases, diabetes mellitus, liver and kidney diseases and chronic infections [6,7]. Microbiology of brain abscess is complex which

may involve a single microbe (bacteria, fungi, and parasite) or poly microbial involving anaerobic bacteria. Aetiology of brain abscess although involves anaerobic bacteria, most of the clinical microbiology laboratories in developing nations fail to isolate them due to lack of facilities available for anaerobic culture.

Figure 3. Computed tomography (CT) of the brain revealing evidence of erosion of sigmoid plate with extension of collection of middle ear in to intracranial cavity

Figure 4. *Streptococcus* spp isolated on blood agar showing semi-translucent non-haemolytic colonies

Figure 5. Gram's stain of the *Streptococcus* spp showing gram positive cocci in chains

Figure 6. Antimicrobial susceptibility of streptococcus spp performed by disk diffusion method on blood agar

Otogenic cerebral infections have been noted both in immunocompetent and immunocompromised individuals [8]. The predisposing conditions for otogenic cerebral abscess include repeated recurrent respiratory tract infections, sinusitis, chronic suppurative otitis media, trauma, solid organ transplant recipients, acquired immunodeficiency syndrome (AIDS) patients, dental manipulations/infections and post neurosurgical procedures. Depending on the primary infection site, the type of central nervous system (CNS) involvement can be understood. Ethmoidal and sphenoid sinusitis results in infection of frontal lobe and temporal lobe infection of brain respectively. Infection of the middle ear and mastoids may spread to CNS involving mostly the cerebellum and temporal lobes. Hematogenous spread of infection from primary sites to CNS like the dental infections, lung abscess and other solid organ infections has been reported in literature [9]. Brain abscess involves four stages where in the first stage the bacteria invades in to the brain tissue resulting in neutrophil, astrocytes and microglial cell activation, oedema and tissue necrosis. Second stage involves spread of the infection to adjacent brain tissue and further invasion of macrophages, lymphocytes and resultant necrosis. The third stage is characterized by the development of a vascularised capsule surrounding the lesion that appears on CT scan as a ring enhancing lesion. The final stage of a brain infection results in immune response resulting in the destruction of capsule and further involvement of surrounding healthy brain parenchymal cells. The pathogenesis of brain infection, clinical presentations and effective management of patients depends on the immune

status of the patient, type/virulence of microbe involved and the use of antimicrobial agents [9-14].

4. Conclusion

The present case report and from the available literature it is evident that chronic suppurative otitis media and other middle ear infections can predispose a person to intracranial complications including cerebral abscess. Prompt clinical diagnosis, identification of the etiological agent and initiation of effective antimicrobial chemotherapy will ensure in reducing the resultant morbidity

Ethical Issues

An informed consent was obtained from the patient.

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