CASE REPORT

Streptococcus intermedius causing brain abscess in a child with acyanotic congenital heart defect

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ABSTRACT

Streptococcus intermedius (*S. intermedius*) belongs to the *Streptococcus anginosus* group (SAG) along with *Streptococcus anginosus* (*S. anginosus*) and *Streptococcus constellatus* (*S. constellatus*). Though all the members of SAG have a propensity to cause deep-seated abscesses at a wide range of sites, when it comes to brain abscesses, it is *S. intermedius* that is most often implicated. Paediatric population with congenital cyanotic heart disease are especially at risk for developing brain abscess. However, it is a rare occurrence in acyanotic congenital heart diseases. Here, we report a case of frontal brain abscess caused by *S. intermedius* in a child with a clinically silent atrial septal defect (ASD). However, an echocardiogram revealed a patent foramen ovale (PFO) accompanying the ASD. The child recovered, following burr hole aspiration and 21 days of antibiotic therapy. We report this case to highlight the importance of this pathogen in the aetiology of the brain abscess and due to the rarity of the case.

Key words: Atrial septal defect (ASD), brain abscess, patent foramen ovale (PFO), *Streptococcus intermedius* (*S. intermedius*)

INTRODUCTION

Streptococcus intermedius (*S. intermedius*) is a member of the *Streptococcus anginosus* group (SAG), earlier known as the *Streptococcus milleri* group. The group that also includes *Streptococcus anginosus* (*S. anginosus*) and *Streptococcus constellatus* (*S. constellatus*) is one of the five groups collectively termed viridans group streptococci. In spite of constituting the normal human oropharyngeal, gastrointestinal and genitourinary flora, the SAG is notable for its capacity to produce abscesses, particularly in the liver and the brain.[1] They may or may not be haemolytic on sheep blood agar (SBA) and may carry Lancefield group antigens (group A, C, F or G).[2]

S. intermedius is suggested to be the most pathogenic species within SAG with its affinity for brain tissue. The known risk factors for the development of brain abscess include congenital heart disease, sinusitis, otitis media and dental caries. Patients with cyanotic heart diseases are at an increased risk because the septic emboli pass to the brain through the right-to-left shunt and the hypoxic brain provides a fertile ground for the pathogen.[3,4] Here we describe a rare case scenario, wherein a child with minimal, acyanotic atrial septal defect (ASD) developed brain abscess due to *S. intermedius*.

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CASE REPORT

A 4-year-old male child was admitted with complaints of continuous high-grade fever and throbbing headache of a four-day duration accompanied by photophobia and two episodes of vomiting.

The child was detected to have a congenital heart lesion, at the age of 2 years, which was an ASD according to the parents. The lesion was detected incidentally during an

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episode of fever, the details of which were not available. The child was not on any prophylactic medication and was on routine follow-up at another hospital.

He had no history of recurrent infections or hospital admissions. He had no other congenital anomalies, no developmental delay and had an uneventful perinatal and postnatal period. He had adequate weight gain and was immunised for age. He had no history of sinusitis, otitis media or dental caries.

On examination, the child was conscious, oriented but irritable. Glasgow Coma Scale (GCS) was 15/15 and no focal neurologic deficits were noted. Apart from being febrile, his systemic examination, X-ray chest and electrocardiogram (ECG) revealed no detectable abnormality. Contrast magnetic resonance imaging (MRI) of the brain revealed solitary large rim-enhancing collection in the left frontal lobe, suggestive of abscess. Burr hole evacuation of the abscess was done and about 25 mL of pus was aspirated. The specimen was sent for culture and sensitivity testing and the patient was empirically started on parenteral Vancomycin 200 mg 6 hourly and Ceftriaxone 700 mg twice daily along with Metronidazole.

Microbiological investigations

Direct microscopy of the aspirate showed 10-15 pus cells/oil immersion field and plenty of gram-positive cocci in pairs and short chains [Figure 1]. The specimen was inoculated on to two sets of 5% SBA, Chocolate agar and MacConkey agar (MA) and was incubated under aerobic conditions and in the GasPak microaerophilic system. [Becton Dickinson India Private Limited (BD) diagnostics, India]. After overnight incubation at 37°C, the SBA plate incubated under aerobic atmosphere yielded a moderate, pure growth of minute, pinpoint colonies with a wide zone of beta (β) haemolysis. A more luxuriant growth was obtained from plates incubated in the GasPak jar. MA showed no growth. The isolate was catalase-negative, resistant to Bacitracin (0.04 U), sensitive to Co-trimoxazole and did not hydrolyse bile aesculin. VITEK 2 Compact System (bioMérieux, France) identified the organism as *S. intermedius* with 97% probability. Antibiotic sensitivity determined by Kirby-Bauer disc diffusion method and minimum inhibitory concentration (MIC) determined by VITEK 2 Compact System yielded similar results. The organism was sensitive to Penicillin, Ampicillin, Ceftriaxone, Cefotaxime, Vancomycin, Linezolid and resistant to Erythromycin. The details of the MIC are shown in Table 1. His blood and cerebrospinal fluid (CSF) cultures were sterile.

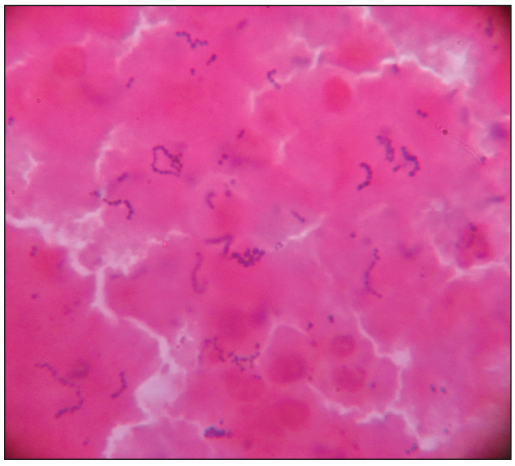

Figure 1: Gram's stain of the aspirate showing pus cells and gram-positive cocci in pairs and chains

Following the antibiotic sensitivity report, Vancomycin was stopped and Ceftriaxone and Metronidazole were continued. The child became afebrile and the postoperative period was uneventful. However, the relief was short-lived, because on the 7th postoperative day, the child complained of recurring symptoms of severe headache and projectile vomiting. A repeat computed tomography (CT) evaluation showed residual brain abscess that was subjected to repeat burr hole aspiration, this time yielding 15 mL of pus.

Direct microscopy showed scanty pus cells and very few gram-positive cocci in chains. The culture however, yielded no growth. Ceftriaxone and Metronidazole were continued for 14 more days. Meanwhile, an echocardiography performed, showed patent foramen ovale (PFO) and left-to-right-shunt of ASD. There were no obvious murmurs and no right ventricle/right atrium dilatation. It was suggested that the child probably had an episode of paradoxical embolism through the PFO. A transoesophageal echocardiography (TEE) was advised at a higher centre for further assessment of the PFO and ASD. The child remained asymptomatic till the day of discharge that was on the 21st day after admission, and remains well on follow-up. However, the TEE has not been performed to date, owing to financial constraints of the parent.

Table 1: Minimum inhibitory concentration (MIC) of the isolate

Antibiotic	MIC (μg/mL)	Interpretation
Ampicillin	≤0.25	Sensitive
Penicillin	≤0.06	Sensitive
Cefotaxime	0.25	Sensitive
Ceftriaxone	≤0.12	Sensitive
Vancomycin	0.5	Sensitive
Linezolid	≤2	Sensitive
Erythromycin	1	Resistant

DISCUSSION

Among the 50 different genera of bacteria involved in brain abscess, *Streptococcus* is the most frequent genus encountered. Several studies have noted that SAG accounts for a majority of these and have suggested that *S. intermedius* is the most pathogenic species within SAG, attributed to its unique virulence factors such as cytotoxin intermedilysin (ILY) and surface antigens I/II.[3,5,6] *S. intermedius* abscesses tend to be monomicrobial and the duration of symptoms are longer when compared to other organisms, as was seen in our case.[4] The fact that the isolate was quite hardy could be assumed from the reappearance of the symptoms even after 1 week of antibiotic therapy.

Though uniformly sensitive to all β lactams, decreasing susceptibility of *S. intermedius* to Penicillins and Cephalosporins has been noted. The British Society for Antimicrobial Chemotherapy (BSAC) recommends that *S. intermedius* brain abscess should be treated with Cefotaxime and Metronidazole for about 4 weeks.[3]

In view of the changing susceptibilities, significantly higher mortality and median length of hospital stay in patients infected with *S. intermedius*, it would be desirable to speciate the pathogen, especially when isolated from sterile body fluids. The routine biochemical identification and speciation of SAG streptococci is tedious and often unrewarding and laboratories should resort to automated identification systems, when the need arises.[4,5]

Brain abscess in a young child is usually associated with an underlying cyanotic congenital heart lesion or infection from a concomitant upper respiratory source. Our patient had no recent history of sinusitis, mastoiditis or otitis media and had satisfactory oral hygiene. Moreover, his ASD was clinically silent. There is a relative paucity of literature linking *S. intermedius* to acyanotic congenital heart lesions such as ASD and the few reports that are available pertain to cases with bidirectional shunt and other congenital anomalies along with ASD.[7] Our patient probably had paradoxical embolism through the PFO, though only a diagnosis of exclusion, could be a possible one. It has been suggested that a PFO with bidirectional shunt has a role in the development of paediatric brain abscess by helping dental flora gain access to brain vasculature.[8] A TEE is superior to routine thoracic echocardiography for evaluating the PFO and could suggest whether the PFO or the ASD served as the conduit for the embolus.[7,8]

CONCLUSION

In conclusion, isolation of *S. intermedius* from brain abscess is not to be taken lightly and should warrant further evaluation of patients in the absence of a definite underlying cause.

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Conflicts of interest
There are no conflicts of interest.

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