A case of bilateral empyema with pericardial effusion caused by *streptococcus intermedius* in an immunocompetent patient

Hitender Gautam[1], Arkendu Basu[2], Sarita Mohapatra[1], Seema Sood[3], Arti Kapil[3], Bimal Kumar Das[3]

From [1]Assistant Professor, [2]Pursuing, [3]Professor, Department of Microbiology, All India Institute of Medical Sciences, Sri Aurobindo Marg, Ansari Nagar, Delhi, New Delhi, India.

Correspondence to: Dr. Bimal Kumar Das, Department of Microbiology, All India Institute of Medical Sciences, Sri Aurobindo Marg, Ansari Nagar, Delhi - 110029, New Delhi, India. E-mail: tezpur.bimal@gmail.com

Received - 07 October 2019 Initial Review - 25 October 2019 Accepted - 08 November 2019

ABSTRACT

Streptococcus intermedius, a member of the *Streptococcus anginosus* group and a part of the human oropharyngeal microbiome, is a recognised pathogen, mostly in immunocompromised patients or post gastrointestinal surgery, known to cause suppurative metastatic abscesses. We present an unusual case of bilateral empyema with pericardial effusion caused by *Streptococcus intermedius* in a healthy 30-year-old adult male patient with no known predisposing factors.This case report illustrates the ability of *S. intermedius* to produce life-threatening empyema in a healthy adult without any predisposing factors.

Keywords: *Bilateral empyema, Pericardial effusion, Streptococcus intermedius.*

Streptococcus anginosus group (SAG), which were previously called as "*Streptococcus milleri* group" up to 1996, consists of three distinct species, *S. anginosus*, *S. constellatus*, and *S. intermedius*. These organisms are part of the human oropharyngeal commensal flora and may be isolated from the throat, the nasopharynx, and the gingival crevices. They are known for their tendency to cause intra-abdominal infections (liver abscesses), intracranial and intraspinal abscesses, and in septic lesions of these and other internal organs [1]. In rare cases, it may cause meningitis [2], arthritis [3], endocarditis [4], purulent pericarditis [5] and primary purulent mediastinitis [6].

If bacteremia occurs, it is usually due to a focus of infection within the gastrointestinal and upper respiratory tract. Pulmonary infections can result from aspiration of oropharyngeal contents, leading to pneumonia, which may be complicated by empyema and lung abscesses. Anginosus group bacteria have also been isolated from sputum specimens of cystic fibrosis patients in association with disease exacerbations and clinical deterioration [7].

Virulence factors of the *Streptococcus anginosus* group are diverse, viz., presence of capsule on some strains, production of a partially characterised immunosuppressive protein, hydrolytic and glycosaminoglycan degrading enzymes, like Neuraminidase, DNAse, Chondroitin sulphate depolymerase and Hyaluronidase, inhibition of polymorphonuclear leukocyte chemotaxis and Staphylococcal leucocidin-like toxin called Intermedilysin (produced by *Streptococcus intermedius*). This report describes a case of bilateral empyema with pericardial effusion caused by *Streptococcus intermedius.*

CASE REPORT

A 30-year-old male patient, resident of New Delhi, India, with no known comorbidities or history of immunosuppression, presented to the Emergency of our hospital with acute shortness of breath. He complained of fever for the last 7 days, associated with shortness of breath, chest pain worsening on deep inspiration and non-productive cough. There was no significant family history.

At the Emergency, the patient was found to have a toxic appearance with evident signs of dehydration. Examination of the respiratory system revealed bilateral diminished breath sounds and dullness on percussion. In view of low arterial oxygen saturation, as depicted in Arterial Blood Gas (ABG) analysis and hypotension, the patient was put on non-invasive ventilator support using BiPaP and the intravenous fluid replacement was started.

Chest X-ray done on admission showed enlarged cardiac silhouette with bilateral pleural effusion (right more than left). Evidence of an air-fluid level was noted in the left paravertebral region in the upper and middle zone. The medial part of the cavity noted in the retro-aortic area. The lower margin of the cavity was indistinct (Fig. 1). High resolution Computed Tomography (CT) of chest corroborated with the chest x-ray findings, with evidence of pericardial effusion and the left-sided gross pleural thickening (Fig. 2). However, pneumonitis and esophageal perforation were ruled out (the most common source of *Streptococcus anginosus* group in case of primary purulent mediastinitis).

Bilateral intercostal drainage was put, and purulent fluid was obtained which was sent for microscopic and microbiological

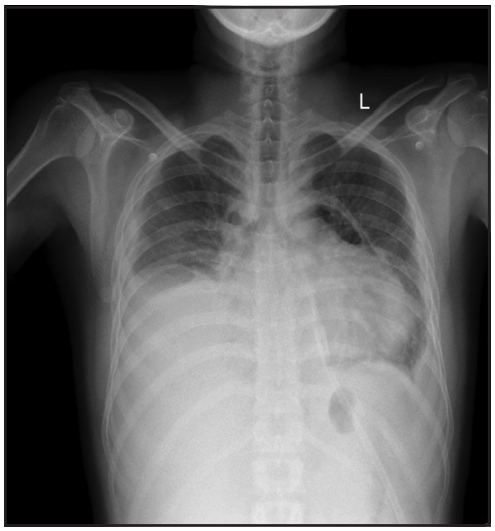

Figure 1: Chest X-Ray showing enlarged cardiac silhouette with bilateral pleural effusion (right more than left) and evidence of an air fluid level in the left paravertebral region in upper and middle zone.

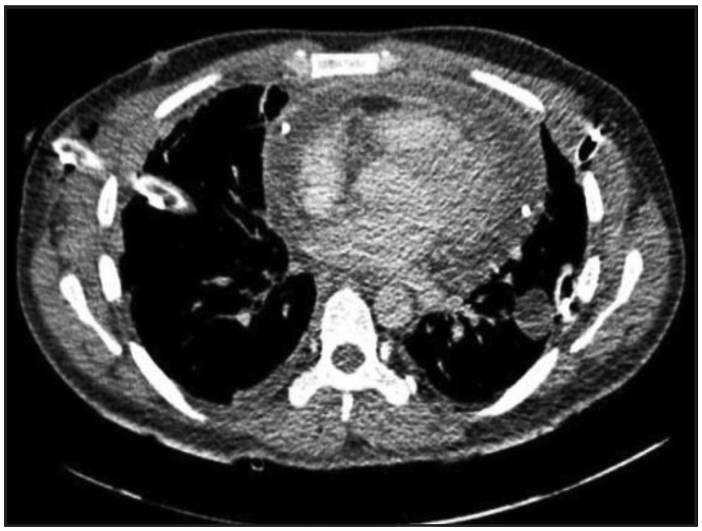

Figure 2: High resolution CT scan of chest showingevidence of pericardial effusion and left sided gross pleural thickening.

evaluation. The patient was started empirically on Pipericillin and Tazobactum 4.5 grams intravenous (IV) three times daily, Clindamycin 600 milligrams IV twice daily and Teicoplanin 400 milligrams IV twice daily for 1 day, followed by 400 mg once daily. Routine investigations revealed raised C - reactive protein, leucocytosis with neutrophilia and raised renal parameters.

Microscopic evaluation of pleural fluid showed the accumulation of polymorphonuclear cells and debris. Pleural fluid was negative for Acid Fast Bacilli by Zeihl Neelsen staining and GeneXpert was also negative. *Streptococcus intermedius* was isolated as pure culture in blood agar (α-hemolytic colonies) from pleural fluid. *Streptococcus intermedius* was identified by Matrix-assisted Laser Desorption Ionization-Time of Flight Mass Spectroscopy and was corroborated with phenotypic biochemical properties, which placed the organism in *Streptococcus anginosus* group (Table 1).

Antibiotic susceptibility was done using the disc diffusion method as per Clinical and Laboratory Standards Institute guidelines. The isolate was found to be susceptible to Clindamycin, Cefotaxime, Erythromycin, Penicillin, Vancomycin and Linezolid. A pericardial drain was put, but the pericardial fluid obtained showed no growth. The patient was continued on Clindamycin for 10 days as per susceptibility reports.

After 3 days of antibiotic therapy, the patient showed significant clinical improvement, which reflected in his laboratory parameters and was corroborated radiologically (Fig. 3). Intercostal drainage was omitted on day 4 after admission. The patient was weaned off non-invasive ventilator support as he started maintaining satisfactory oxygen saturation by day 3 after admission. The patient showed steady improvement with resolution of acute renal failure and other abnormal blood parameters and was finally discharged in hemodynamically and clinically stable condition on day 9 after admission. There was no further deterioration or new clinical symptom on follow-up.

Table 1: Results of biochemical investigations of the patient.

Biochemical test	Result
Catalase	Negative
Hemolysis on Sheep blood agar	Alpha-hemolysis
Bacitracin	Resistant
Sulphamethoxazole – trimethoprim	Susceptible
Optochin	Resistant
CAMP test	Negative
6.5% NaCl	No growth
Bile aesculin agar	No growth
Arginine dihydrolase	Positive
Aesculin hydrolysis	Positive
Voges Proskauer	Positive
Mannitol fermentation	Negative
Raffinose	Negative
Sorbitol	Negative
Starch	Negative
Urease	Negative

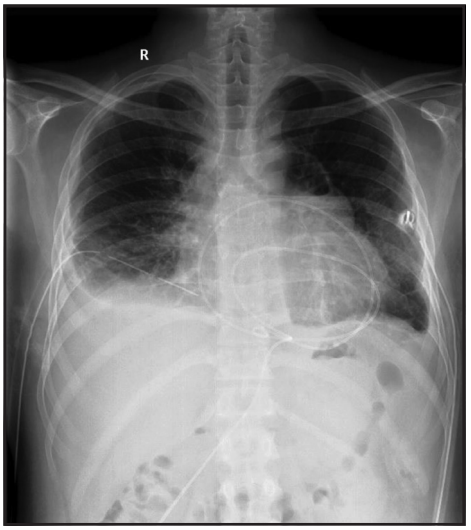

Figure 3: Significant improvement radiologically, which reflected in his clinical condition also.

DISCUSSION

Pulmonary infections caused by *Streptococcus anginosus* group are commonly secondary to aspiration of esophageal contents or a sequalae of esophageal perforation, in cystic fibrosis or immunosuppressed patients. Though pleural empyema caused by *Streptococcus intermedius* has been reported in the literature previously [8,9], no report of bilateral empyema with pericardial effusion in an immunocompetent adult could be found.

A study done in Vellore, a region in southern India showed a high incidence of severe human infections with β-hemolytic group C and G streptococci. Causative species in these infections were identified by 16S rRNA gene sequencing. *Streptococcus dysgalactiae* subsp. *equisimilis* (81%) and *S. anginosus* (19%) were the causative organisms in the 2-year study period (2006–2007) [10]. In another study on clinical and molecular epidemiology of beta-hemolytic streptococcal infections in India, done at AIIMS, New Delhi, Group A *Streptococcus* was the most common β-Haemolytic *Streptococcus* (71.5%), followed by Group G *Streptococcus* (21%). Among the Group G *Streptococcus*, 67% were identified as *S. dysgalactiae*, 15% as *S. anginosus*, 10% as *S. dysgalactiae subsp. Equisimilis*, and one isolate each as *S. porcinus*, *S. alactolyticus*, and *S. mitis* [11].

In one of the studies on *Streptococcus milleri* group (Earlier name of *Streptococcus anginosus* group), Penicillin G was the most active of the β-lactam antibiotics tested. As alternative antibiotics in the case of penicillin-allergic patients, erythromycin and clindamycin showed good activity. A high frequency of resistance to tetracycline was demonstrated. All the strains were sensitive to trimethoprim, vancomycin, and chloramphenicol [12].

In another study on 423 clinical "*Streptococcus* milleri" isolates, only 1.4% of the strains were of intermediate susceptibility to penicillin. None of the strains exhibited high-level resistance to gentamicin. Strains resistant to erythromycin, roxithromycin and clindamycin were found with a frequency of 2.6%, 2.4% and 2.4% respectively. All the strains were susceptible to cefotaxime, vancomycin and teicoplanin [13]. Some authors have expressed concern that clindamycin resistance in the *S. milleri* group is increasing [12,13]. However, our isolate was found to be susceptible to Clindamycin, as well as to Cefotaxime, Erythromycin, Penicillin, Vancomycin and Linezolid.

The mechanism of dissemination of *S. intermedius* to the patient's pleural space, in absence of any predisposing factor, is unclear. It is possible that transient bacteremia from an oral or gastrointestinal source may have led to seeding of the pleural space. It is also possible that this particular *S. intermedius* isolate may have undergone some known *Streptococcus* genomic evolution pathway such as horizontal gene transfer as a mechanism of virulence factor acquisition resulting in an unusually hypervirulent *S. intermedius* strain [14].

CONCLUSION

This case report illustrates the ability of *S. intermedius* to produce life-threatening empyema in a healthy adult without any predisposing factors. This raises the question whether emergent *S. intermedius* strains have acquired some novel mechanism of pathogenesis resulting in increased virulence. Indiscriminate antibiotic use leads to selection pressure and subsequent development of antimicrobial resistance by various mechanisms like acquisition or transfer of genes. This carries an associated risk of plasmid-mediated transfer orgenomic co-acquisition of virulence factors. So, antimicrobial stewardship might prove to be an important cornerstone in the prevention of emergence of new hypervirulent strains, at least to some extent.

REFERENCES

1. Poole PM, Wilson G. *Streptococcus milleri* in the appendix. J Clin Pathol. 1977;30:937-42.
2. Wu CH, Tsung SH. Meningitis due to *Streptococcus milleri* (Streptococcus MG-intermedius). S Med J. 1983;76:1322-3.
3. Murray HW, Gross KC, Masur H, Roberts RH. Serious infections caused by *Streptococcus milleri.* Am J Med. 1978;64:759-64.
4. Levandowski RA: *Streptococcus milleri* endocarditis complicated by myocardial abscess. South Med J. 1985;78:892-3.
5. Denby KJ, Byrne RD, Gomez-Duarte OG. *Streptococcus intermedius*: An unusual case of purulent pericarditis. Case Rep Inf Dis. 2017;ID 5864694.
6. Shishido H, Watanabe K, Matsumoto K, Murakami K, Sato K: Primary purulent mediastinitis due to *Streptococcus milleri.* Respiration. 1998;64:313-5.
7. Grinwis ME, Sibley CD, Parkins MD,Eshaghurshan CS, Rabin HR, Surette MG. Characterization of *Streptococcus milleri* group isolates from expectorated sputum of adult patients with cystic fibrosis. J Clin Microbiol. 2010;48:395-401.
8. Noguchi S, Yatera K, Kawanami T, Yamasaki K, Fukuda K Naito K, *et al*. Pneumonia and empyema caused by *Streptococcus intermedius* that shows the diagnostic importance of evaluating the microbiota in the lower respiratory tract. Intern Med. 2014;53:47-50.
9. Iskandar SB, Al Hasan MA, Roy TM, Byrd RP Jr. *Streptococcus intermedius*: an unusual cause of a primary empyema. Tenn Med. 2006;99:37-9.
10. Reissmann S, Friedrichs C, Rajkumari R, Itzek A, Fulde M, Rodloff AC, *et al*. Contribution of *Streptococcus anginosus* to Infections Caused by Groups C and G Streptococci, Southern India. Emerg Infect Dis. 2010;16:656-63.
11. Mathur P, Bhardwaj N, Mathur K, Behera B, Gupta G, Kapil A, *et al*. Clinical and molecular epidemiology of beta-hemolytic streptococcal infections in India. J Infect Dev Ctries. 2014;8:297-30.
12. Gomez-Garces JL, Alos JI, and Cogollos R. Bacteriologic characteristics and antimicrobial susceptibility of 70 clinically significant isolates of *Streptococcus milleri* group. Diagn Microbiol Infect Dis. 1994; 19:69-73.
13. Jacobs JA, Stobberingh EE. In-vitro antimicrobial susceptibility of the "*Streptococcus* milleri' group (*Streptococcus anginosus*, *Streptococcus constellatus* and *Streptococcus intermedius*). J Antimicrob Chemother. 1996;37:371-5.
14. Andam CP, Hanage WP. Mechanisms of genome evolution of *Streptococcus*. Infect Genet Evol. 2015;33:334-42.

Funding: None; Conflict of Interest: None Stated.

How to cite this article: Gautam H, Basu A, Mohapatra S, Sood S, Kapil A, Das BK. A case of bilateral empyema with pericardial effusion caused by streptococcus intermedius in an immunocompetent patient. Indian J Case Reports. 2019;5(6):530-532.

Doi: 10.32677/IJCR.2019.v05.i06.008