

(CASE REPORT)



Septicemia and meningitis caused by group A streptococcus: A case report and literature review

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International Journal of Life Science Research Archive, 2023, 04(01), 017–020

Publication history: Received on 22 November 2022; revised on 02 January 2023; accepted on 04 January 2023

Article DOI: <https://doi.org/10.53771/ijlsra.2023.4.1.0156>

Abstract

The invasive diseases due to *Streptococcus pyogenes* are pretty rare infections especially in pediatrics. We present to you a case of a 13-year-old who was admitted in pediatric's intensive care for a polytrauma, on his 4th day of hospitalization he developed a fever for which he had a cytobacteriological assay of the spinal fluid who was in favor of a bacterial meningitis with 61 white cells predominantly neutrophilic 81% and a positive direct examination and culture after 24-hour incubation. The blood cultures from 3 sets (5 bottles) were also positive after 24h incubation and all pointed out to β hemolytic colonies in favor of streptococcus that was identified afterwards with serogrouping and on an automaton proving the incrimination of streptococcus group A. A review of literature was then conducted to enlighten clinicians on this unusual but equally dangerous bacteria.

Keywords: *Streptococcus pyogenes*; Sptreptococcus group A; Meningitis; Septicemia

1 Introduction

Invasive streptococcal infections are responsible for morbidity and mortality in children, especially infants. Group A streptococcus is exceptionally responsible for meningitis, usually by contamination of a contiguous site infection such as sinusitis, otitis or mastoiditis. We present a clinical case of a 13-year-old child who presented with group A pyogenic streptococcal meningitis and septicemia.

2 Case report

The 13-year-old child A.Y presented to the emergency department for a polytraumatism due to a fall from the 3rd floor with cranial, facial, thoracic and abdominal point of impact. His GCS score was between 6 and 7 and he was directly taken care of with intubation, sedation and conditioning then transferred to the pediatric intensive care unit where he stayed and benefited from an injury assessment finding a fracture of the internal and inferior wall of the left orbit associated with a double simple fracture of the nasal bones and a right pneumothorax for which he benefited from a chest drain. On the fourth day of hospitalization, he presented with a fever, which led to a complete workup to find the source of infection, including lumbar puncture, blood cultures, urine culture, and chest x-ray and blood workup.

The blood test showed a hyperleukocytosis of 15630 white blood cells/mm³, neutrophils of 14240/mm³ with a C reactive protein (CRP) of 313 mg/l associated with a procalcitonin of 7,1 ng/ml, the cyto-bacteriological exam of the urine was negative and the chest X-ray was normal.

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The lumbar puncture came back positive with a cytobacteriological study of 61 cells/mm³ (81% neutrophils), proteins of 6g/l and glucose of 0,02 g/l, making the diagnosis of purulent meningitis. The direct examination showed a gram positive cocci in chain with a positive culture after 24 hours for β hemolytic colonies in favor of a *Streptococcus pyogenes* sensitive to penicillin (figure 1).

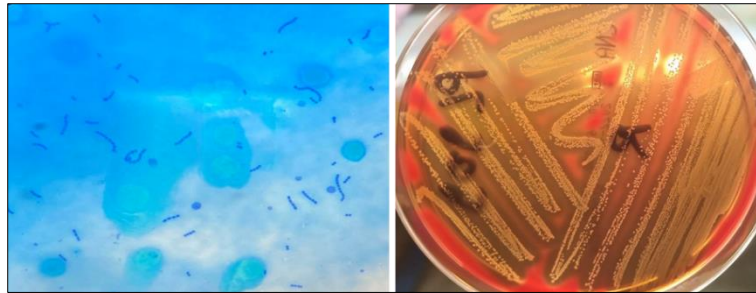


Figure 1 The left image shows direct examination of lumbar puncture of gram-positive cocci in chains. The right image shows β -hemolytic colonies on the culture of the lumbar puncture

In the meantime, the department had sent five bottles of blood cultures of three different sets which were positive after 24 hours each to streptococcus with characteristic β -hemolytic colonies. The patient was put on Third-generation cephalosporins just after the lumbar puncture with a good clinical evolution of his infectious syndrome. The identification of the bacteria was performed by serogrouping using the Streptococcal grouping kit^R (oxid; thermo fisher diagnostics) (figure 2) and on the BD PhoenixTM 100 automaton which both came back in favor of group A pyogenic streptococcus with an antimicrobial susceptibility testing that proved sensible to penicillin and only resistant to trimethoprim/sulfamethoxazole.

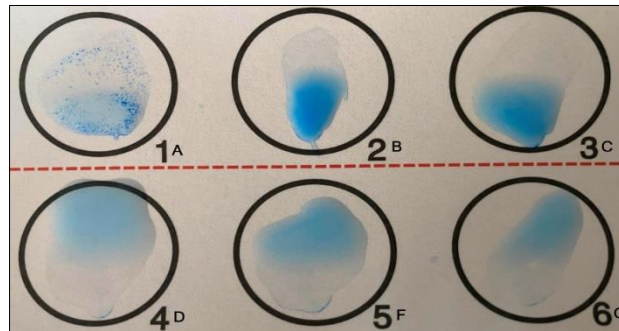


Figure 2 Group A streptococcal antigen agglutination using the Pastorex Strepto^R kit (BioRad)

3 Discussion

Group A streptococcus (GAS) is a strictly human pathogen and its virulence can vary from simple asymptomatic carriage to superficial infections and up to systemic infections. This germ usually colonizes the pharynx, anus and genital mucosa[1]. It causes up to 616 million cases of pharyngitis per year with a higher rate in developing countries[2]. Indeed, the respiratory tract being its primary entry point, about 25% of people, especially children, may have an asymptomatic carriage in the oropharynx [3].

The prevalence varies with age and children aged from 5 to 15 years are the most affected by GAS [4]. According to the latest WHO report, *S.pyogenes* is the ninth most common cause of infectious etiology responsible for mortality, the majority of these infections are due to invasive infections, more specifically in third world countries[5].

Invasive GAS infections are very rare in the general population and the most affected sites are skin tissue and soft tissue (e.g. necrotizing fasciitis) followed by pleuropulmonary tissue. In a Spanish study [6] conducted over a period of 6 years, skin and soft tissue was the most frequent site (26.9%), followed by pulmonary infections (26.9%), osteoarticular infections (23.1%), streptococcal toxic shock syndrome (19.2%), occult bacteremia (11.5%), meningitis (7.7%) and septicemia (3.8%).

Group A streptococcal meningitis is very rare and represents 1-3% of invasive group A streptococcal infections and it only represents 0.2% of all meningitis [7]. Meningitis caused by this microorganism is produced by a mechanism of contiguous extension from a source of infection [8], such as otitis, sinusitis or mastoiditis or even head trauma with asymptomatic carriage in the oropharynx as suspected in our patient.

Several cases have been reported in the literature, notably in Brazil [9] 2 clinical cases, the first of a 5-year-old patient admitted for fever with vomiting and meningeal stiffness associated with an otitis. The cerebrospinal fluid was in favor of purulent bacterial meningitis with a negative direct examination and negative blood cultures, but the CSF culture was positive for group A pyogenic streptococcus sensitive to penicillin with signs of mastoiditis on the CT scan; the patient progressed well on penicillin. The second patient was a 3-month-old infant admitted with hypotonia and bulging of the fontanelle. He underwent a lumbar puncture and one hour after his admission he developed a septic and cardiorespiratory shock complicated by an unrecovered cardiorespiratory arrest. the lumbar puncture was in favor of sensitive group A streptococcus.

A collection of different cases of pyogenic streptococcus made by Kjærgaard et al. [10] including 17 cases of positive CSF culture to group A pyogenic streptococcus, collected over a period of 18 years. Among these patients 47% had concomitant otitis, 30% mastoiditis, 18% sinusitis and 12% pneumonia. Of these 17 cases, 53% were admitted to the ICU and 41% had neurological symptoms. Bacteremia was identified in 88% of the patients, but according to the author it is impossible to affirm whether the ear nose and throat infections are responsible for the meningitis or whether sepsis is the culprit.

Another study conducted in China [11] on invasive pyogenic streptococcal infections over a period of 7 years collected 66 cases with an average age of 3 years (2 hours to 15 years), 89.4% of which were confirmed by positive blood cultures, but only 2 cases had a positive CSF culture for this germ. All strains of GAS were penicillin-susceptible but some strains were resistant to erythromycin (88.9%), clindamycin (81.4%), trimethoprim/sulfamethoxazole (72%) and tetracycline (81.5%).

These resistances depend on the geographical region; in Norway between 2010 and 2014 less than 4% of *S.pyogenes* strains are resistant to erythromycin[12], while in the United States they have a resistance that goes up to 12.7% for erythromycin[13].

S.pyogenes meningitis can cause significant complications as described in the case of Lee et al. [14] in a 7 year old child with meningitis and septicemia with positive CSF and blood cultures. The patient had progressed well on penicillin alone, but 16 days after hospitalization he had an audiology testing revealing a sensorineural hearing loss for which he received a cochlear implant.

Among the most important complications is streptococcal toxic shock syndrome, which is a rapidly progressive, life-threatening, systemic reaction to invasive infection caused by GAS. Group A streptococcal antigens are key mediators of this phenomenon because of their potent T-cell activation, which leads to a cytokine storm and consequent vascular shock, and multivisceral failure. In the series of Hua et al. [11] 22.7% developed this dreaded phenomenon with 53% of them dying as a result

4 Conclusion

Invasive *S. pyogenes* infections are very rare causes of meningitis and sepsis. Clinicians should be alerted if there is an association with a meningitis syndrome and any ear nose and throat infections; such as otitis, mastoiditis, and pharyngitis; because of the poor prognosis and the risk of transformation into streptococcal toxic shock syndrome especially in pediatric patients.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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