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CASE REPORT

Streptococcal Shock Syndrome

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ABSTRACT

There appears to be a worldwide resurgence of invasive Group A streptococcal infections. We report a 41-year old male who presented with septic shock and multi-organ failure, secondary to Streptococcus *pyogenes* infection. We have reviewed the current knowledge on toxic streptococcal syndrome and the basis for the therapeutic recommendations of combination antibiotic therapy. Adjunct therapy with immunoglobulins may improve survival, possibly by enhancing neutralisation of bacterial exotoxins.

Key words: toxic strep syndrome, septicaemia, streptococcal infections

Key messages:

1. Shock related to Streptococcus pyogenes infection appears to be on the increase worldwide.
2. Combination antibiotic therapy with penicillin and clindamycin appears logical, based on in vitro studies.

Introduction

Invasive S. *pyogenes* infections, once considered a thing of the past, have re-emerged over the last 2 decades. The spectrum of clinical manifestations of *S. pyogenes,* includes skin and soft tissue infections such as impetigo and necrotising fasciitis, to pneumonia and septicaemia [1], [2].

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We report a patient who presented with clinical and laboratory features, consistent with a diagnosis of streptococcal shock syndrome.

Case history

A 41-year old man with hepatitis-C related liver disease and previous drug abuse, presented with a 3-day history of fever and haematuria. He was febrile (38.4^{o}C) and toxic, with a thready pulse (120 beats/minute), hypotension (97/54), and tachypnea (50 breaths/minute). His cardiorespiratory examination was normal. Abdominal examination revealed a palpable liver and left iliac fossa tenderness, but no signs of peritonitis. Baseline investigations are summarised in the [Table/Fig 1]. Admission chest radiograph was normal. Broad-spectrum antibiotic therapy comprising imipenem, vancomycin and gentamicin, was commenced

after cultures. Following resuscitation and intubation, he was transferred to the intensive care unit (ICU) with a provisional diagnosis of multi-organ failure, secondary to septic shock, severe metabolic acidosis, and possible disseminated intravascular coagulation. The post intubation radiograph showed bi-basal alveolar opacities. He subsequently developed bilateral large pleural effusions. His blood culture grew *Streptococcus pyogenes*. He gradually improved from his shock, metabolic acidosis, and coagulopathy, with supportive therapy, ventilation and antibiotics, and was weaned off respiratory and cardiovascular supports.

Following recovery from his critical illness, his stay in hospital was complicated by myocardial infarction, as well as an episode of hepatic encephalopathy, secondary to severe decompensation of his liver disease. Two months after the initial episode, he succumbed, following an episode of nosocomial Klebsiella pneumonia.

Discussion

Invasive S. *pyogenes* infections, once considered a thing of the past, have re-emerged over the last 2 decades. A proportion of patients present with a syndrome of shock, and designated Toxic Streptococcal Syndrome (TSS) that is *exotoxin* mediated [1]. This syndrome is usually seen in patients presenting with necrotising fasciitis (48%), and is associated with a mortality of 30-60% [1]. The bacteraemic form without a septic focus is seen only in about 14% of patients presenting with TSS [2]. A recent report from Canada showed an increase in the proportion of patients presenting with S. *pyogenes* pneumonia from <1% in the early 1980s, to >10% in the late 1990s. The development of TSS in these patients was associated with a significant risk (odds ratio 19) of death [3]. In addition to necrotising fasciitis, pneumonia, and bacteremia, S. *pyogenes* has been reported to be the causative organism in surgical site infections, septic arthritis, osteomyelitis, meningitis, thrombophlebitis, peritonitis, pelvic infections, central venous line bacteraemia, endocarditis, urinary tract infection, endophthalmitis etc. [4].

Several risk factors predispose to the development of invasive group A Streptococcal infections, and include human immunodeficiency virus, cancer, diabetes, alcohol abuse, and chickenpox [2]. It is likely that the patient's chronic liver disease and alcohol abuse, known risk factors for streptococcal shock syndrome, pre-disposed him to the development of S. *pyogenes* septicaemia, as well as the second episode of pneumonia. There was no evidence of any other immuno-compromised state.

The diagnosis of streptococcal shock syndrome is made on the basis of (a) identification of S. *pyogenes,* and (b) clinical signs of severity – hypotension (systolic blood pressure of ≤ 90 mm Hg in the adult), along with two or more of the following signs; renal impairment, coagulopathy, liver involvement, acute respiratory distress syndrome, and generalised erythematous macular rash or soft tissue necrosis [4]. Streptococcal shock syndrome is thought to be mediated by streptococcal pyrogenic exotoxins and other antigens, which function as super-antigens [4].

Reports of invasive/fulminant S. *pyogenes* infections are sparse in Australian and Indian literature, and may reflect under-reporting rather than true absence of infection. A study from Melbourne showed increasing severity of S. *pyogenes* infections in children, from 1982 to 1993 [5]. There has also been renewed interest recently in Indian literature, with several publications of invasive group A streptococcal infections from Australia [6], the USA [7], and Denmark [8]. In Northern Queensland, Australia, the crude incidence rate was reported to be 82.5 per 100,000 per year in the indigenous population, and 10.3 per 100,000 per year in the non-indigenous patients [6]. Abuhammour et al [7], studying the incidence of invasive Group A streptococcal infections in children, identified more infections in the latter half of a 9 year audit.

Given the rapid progression of invasive streptococcal infection, as seen in our patient, early recognition and appropriate treatment is important. In experimental S. *pyogenes* myositis in a mouse model, penicillin was ineffective if treatment was commenced >2 hours after initiation of infection [1]. Recent in vitro studies have shown that clindamycin was superior to penicillin and ampicillin in

reducing the production of streptococcal pyrogenic exotoxins A and B [9]. Hence, combination therapy with penicillin and clindamycin is recommended for severe S. *pyogenes* infections.

Although Streptococcus *pyogenes* infections are not infrequently encountered by the clinician, this case-report is presented to highlight several features. (a) There appears to be a resurgence of Streptococcus *pyogenes* infections worldwide. It is possible that the magnitude of this problem is higher than is recognised or reported. (b) Although Streptococcus *pyogenes* septicaemia with shock is not very common [2], it should be remembered as an important aetiologic agent, especially in patients presenting with pneumonia or necrotising fasciitis. (c) Prompt treatment is crucial for successful outcomes. Contrary to common belief of the use of just penicillin, combination therapy with penicillin and clindamycin appears logical, given the results of in vitro studies. (d) Immunoglobulins may be considered as adjunct therapy in severe infections, given the benefits of toxin neutralisation [10, 11], mortality reduction [11], and reduced need for surgery [12], in cohorts of patients.

Conflict of interests

There is no conflict of interest or any financial support for this study, for any of the authors.

Table/Fig 1
Laboratory data

Variable	Value	Reference range
Haematologic		
Haemoglobin (g/dl)	15.3	11.5 – 15.5
White-cell count (x 10^9 /L)	37.1	4.0 – 11.0
Neutrophils (x 10^9 /L)	26.3	1.8 – 7.5
Platelets (x 10^9 /L)	96	150 - 400
International normalised ratio	2.1	0.8 – 1.2
Activated Partial thromboplastin time (sec)	63	24 - 37
Biochemical		
Sodium (mmol/l)	135	137 - 145
Potassium (mmol/l)	3.4	3.5 – 4.9
Chloride (mmol/l)	97	100 – 109
Bicarbonate (mmol/l)	6	22 - 32
Blood urea (mmol/l)	9	2.7 – 8.0
Creatinine (mmol/l)	0.23	0.05 – 0.120
Bilirubin (μmol/l)	35	6 - 24
Albumin (g/l)	19	34 - 48
GGT (U/l)	38	0 - 60
ALT (U/l)	104	0 - 55
ALP (U/l)	73	0 - 45
Arterial blood gas (on FiO_2 of 0.5)		
pH	7.11	7.35 - 7.45
PaO_2 (mm Hg)	125	83 - 108
$PaCO_2$ (mm Hg)	15.6	35 – 48
Bicarbonate (mmol/l)	4.8	22 - 32
Base Excess	- 24.3	- 2 to 2
Lactate (mmol/l)	18	0.5 – 1.6

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