CASE REPORT

Toxic shock syndrome related to *Streptococcus equi* subsp *zooepidemicus*

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SUMMARY

We describe a documented streptococcal toxic shock syndrome linked to horse-to-man transmission of *Streptococcus equi* subsp *zooepidemicus*. The patient was treated successfully with respiratory and haemodynamic support in conjunction with antibiotic treatment associated with polyvalent human immunoglobulin and high-volume venovenous haemofiltration.

BACKGROUND

Streptococcus equi subsp *zooepidemicus* is an uncommon human pathogen that belongs to the Lancefield group C streptococci. This bacteria causes many diseases in animals.¹ Human infections including meningitis,² vascular infection,³ pneumonia and disseminated infection⁴ have been recently reported. Horse-to-man transmission has been recently documented.⁴ Patients surviving toxic shock syndrome related to *S equi* subsp *zooepidemicus* have never been reported since only one fatal case has been published.⁵ We described a severe toxic shock syndrome in a horse keeper related to *S equi* subsp. *zooepidemicus* which had a favourable outcome.

CASE PRESENTATION

We present the case of a 57-year-old man with a medical history of type 2 diabetes mellitus and coronary heart disease associated with arterial hypertension. He worked as a horse keeper in a farm.

The patient presented 3 days before hospital admission with an acute viral-like illness manifested by fever, diffuse myalgia and generalised weakness. He presented on the day of hospital admission with severe acute respiratory failure associated with chest X-ray abnormalities but with severe dyspnoea and confusion.

His central body temperature was 38°C, arterial blood pressure was 150/90 mm Hg, pulse rate was 150 bpm, breath rate was 45 breaths/min, pulse oximetry indicated an oxygen saturation value of 85% despite oxygen flow rate set at 15 L/min using a reservoir mask. Urine output was <400 mL/day.

A pulmonary examination showed little bilateral diffuse fine crackles.

The cardiovascular examination showed rapid and regular heart rate.

Livedo was noted on both legs.

No skin eruption was noted.

Because of the severe acute respiratory failure respiratory support with mechanical ventilation was instaurated shortly after admission.

Arterial blood pressure fell rapidly to 75/40 mm Hg.

INVESTIGATIONS

In ICU and after mechanical ventilation arterial blood gases under FIO₂ 1 showed: pH 7.19, PaO₂ 76 mm Hg, PaCO₂ 65 mm Hg, base excess -11, SaO₂ 88%. White cell count was normal with initial value of 10 000 mm³ but it reached 23 000 mm³ the next day. The patient showed acute renal failure with a serum creatine value of 160 µmol/L.

Blood chemistry showed no liver function abnormalities but rhabdomyolysis was evident as creatine kinase level was 1200 UI/L (normal value <250).

There was no biological evidence of coagulopathy.

Chest X-rays (figure 1) showed moderate bilateral alveolar lung opacities especially in the upper lung fields.

Our team relied upon lung ultrasound in the management of acute respiratory failure. The patient's lung ultrasound showed large bilateral retrodiaphragmatic lung hepatisation associated with diffuse bilateral anterior pulmonary oedema consistent with adult respiratory distress syndrome (ARDS).

Figure 1 Chest X-rays following mechanical ventilation. Note bilateral alveolar and interstitial opacities especially in the upper fields.

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Right-sided bronchoscopy showed haemorrhagic secretions and bronchoalveolar lavage showed numerous gram positive cocci which were then identified as *Streptococcus equi* subsp. *zooepidemicus* (100 000 cfu/mL).

Blood and urine cultures remained negative.

Pneumococcal and legionella urinary soluble antigens were negative.

No other pathogen was identified in the initial bronchoalveolar lavage specimen.

Right heart catheter showed high cardiac output failure consistent with septic shock.

Pulmonary artery occlusion pressure was 8 mm Hg, pulmonary artery pressure was 40/25 mm Hg.

TREATMENT

Initial treatment included respiratory support by adequate mechanical ventilation and haemodynamic support using norepinephrine in conjunction with antibiotic treatment by linezolid which was then switched to ceftriaxone and clindamycin for 10 days.

Once bacterial identification was made, we added on the second day of admission a dose of 2 g/kg of human polyvalent immunoglobulins and we used high-volume venovenous haemofiltration because the patient developed severe multiorgan failure.

OUTCOME AND FOLLOW-UP

The patient had a good response to initial treatment strategy and recovered within 42 days.

He had severe residual neuromyopathy which needed 2 months of rehabilitation.

He returned home and is doing well 6 months after discharge.

DISCUSSION

To our knowledge only one fatal case of toxic shock syndrome related to *S equi* subsp. *zooepidemicus* was reported.⁵

The gain of superantigens by *S equi* subsp. *zooepidemicus* has been recently documented and is associated with increased virulence.⁶ Although earlier reports of human infection of *S equi* subsp. *zooepidemicus* have been made more than 30 years ago,⁷ this human pathogen seems to be an extremely rare cause of toxic shock syndrome.

Only one fatal case of toxic shock syndrome has been linked to superantigen production by this agent.⁵

Our patient fulfilled clinical and microbiological criteria for Streptococcal toxic shock syndrome according to the established criteria.⁸

Treatment strategy was based on antibiotic treatment which consisted of a combination of a third-generation cephalosporin and clindamycin associated with two non-standardised therapeutic interventions.

Intravenous immunoglobulins' use has been associated with better outcome in streptococcal toxic shock syndrome in two comparative studies.^{9–10} The mechanism of action of intravenous human immunoglobulins has been demonstrated by its neutralising action on the superantigenic activity studied on sampled patients sera.^{9–10} However, in the only reported case of *S equi* subsp. *zooepidemicus*-related toxic shock syndrome, the use of immunoglobulins did not seem to be of any benefit since the patient died.

The absence of benefit could be related to late administration of immunoglobulins.

High-volume venovenous haemofiltration demonstrated a significant benefit of survival in patients with post-resuscitation syndrome following cardiac arrest.¹¹ In the context of other severe acute inflammatory conditions especially in septic shock

it has been associated with more rapid reversal of organ failures.^{12–13} Enhanced clearance of pro-inflammatory cytokines like endothelin-1 might explain such beneficial effect.¹¹

The level of evidence concerning the use of polyvalent human immunoglobulins and high venovenous haemofiltration in treating severe sepsis and particularly streptococcal toxic shock syndrome is weak.

Disease rarity could explain the absence of controlled randomised large scale studies concerning streptococcal toxic shock syndrome.

Nevertheless in the presence of such a fatal condition one must consider non-conventional therapeutic interventions.

Beside potential benefit for patients, such an attitude might contribute to confirm or to reject the beneficial use of such therapies by reporting similar cases.

Learning points

- ▶ *Streptococcus equi* subsp. *zooepidemicus* may be a cause of toxic shock syndrome in humans in contact with horses.
- ▶ Early diagnosis is needed for appropriate management.
- ▶ Intravenous human immunoglobulins and high-volume venovenous haemofiltration may contribute to neutralisation and elimination of bacterial toxins harbouring the superantigenic activity.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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