Intensive Care Med (1998) 24: 190–193


BRIEF REPORT

**M. Loscar**
**G. Schelling**
**M. Haller**
**J. Polasek**
**C. Stoll**
**U. Kreimeier**
**U. Finsterer**
**H. O. Steitz**
**R. Baumeister**
**R. Kimmig**
**B. Grabein**
**J. Briegel**

# Group A streptococcal toxic shock syndrome with severe necrotizing fasciitis following hysterectomy – a case report

Received: 18 July 1997
Accepted: 11 November 1997

M. Loscar (✉) · G. Schelling · M. Haller · J. Polasek · C. Stoll · U. Kreimeier · U. Finsterer · J. Briegel
Institut für Anästhesiologie der Ludwig-Maximilians-Universität, Klinikum Großhadern, D-81366 München, Germany

H. O. Steitz · R. Baumeister
Chirurgische Klinik der Ludwig-Maximilians-Universität, Klinikum Großhadern, D-81366 München, Germany

R. Kimmig
Frauenklinik der Ludwig-Maximilians-Universität, Klinikum Großhadern, D-81366 München, Germany

B. Grabein
Max von Pettenkofer-Institut der Ludwig-Maximilians-Universität, D-81366 München, Germany

**Abstract** In the last 10 years an increasing number of cases of group A streptococcal toxic shock syndrome have appeared in various clinical settings. The manifestation of this syndrome includes rapidly progressive multiorgan failure and soft-tissue necrosis.

This report presents a case of streptococcal toxic shock syndrome caused by *Streptococcus pyogenes* with severe necrotizing fasciitis of the abdominal wall following hysterectomy. Aggressive surgical intervention with debridement of all necrotic tissue necessitated resection of the complete abdominal wall (skin, subcutaneous tissue, muscle and peritoneum). The abdominal wall defect was covered with free myocutaneous flaps and split-skin grafts. Optimal treatment, including adequate antibiotic therapy and radical surgical intervention, is an indispensable prerequisite of successful outcome.

**Key words** *Streptococcus pyogenes* · Septic shock · Toxic shock syndrome · Fasciitis · Surgical flaps · Hysterectomy

## Introduction

*Streptococcus pyogenes* (group A streptococcus) are ubiquitous organisms, causing a wide spectrum of diseases, ranging from mild oropharyngeal and skin infections, scarlet fever, pneumonia or meningitis, to severe, life-threatening illnesses such as necrotizing fasciitis, myositis, septicemia, puerperal sepsis and toxic shock syndrome associated with multiorgan failure.

Invasive and often fatal infections due to group A streptococci have been increasing in frequency throughout the United States, Canada, Australia and Europe since the late 1980s [1, 2]. Streptococcal toxic shock syndrome (STSS) was first described by Cone et al. [3] in 1987. A large number of additional cases presenting signs of toxicity with early onset of shock and multiple organ failure have been reported in the last 10 years [1, 4].

The following report describes a case of group A streptococcal toxic shock syndrome with severe necrotizing fasciitis after hysterectomy. The successful outcome was made possible by early, ultra-aggressive surgical debridement with resection of the abdominal wall, accompanied by antibiotic therapy.

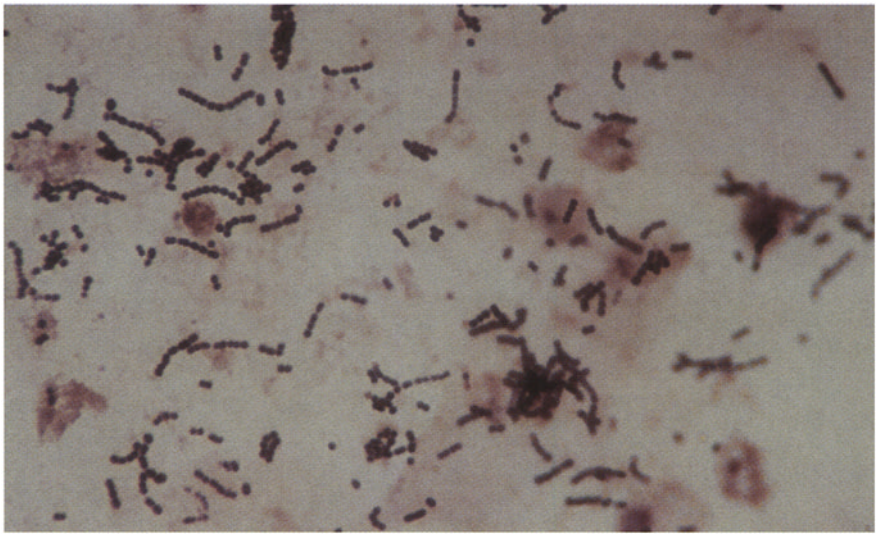

**Fig. 1** Muscle swab with gram-positive cocci (Gram stain)

## Case report

A 46-year-old woman underwent an abdominal hysterectomy following a 3-year history of uterine myoma (139 mm × 124 mm × 101 mm). Surgery was completed without difficulties and no prophylactic antibiotics were given. The initial postoperative course was uneventful. After 2 h in the recovery room the patient was transferred to her ward. In the evening her body temperature rose (39 °C), early next morning (day 1 after hysterectomy) she appeared to be in a state of circulatory shock, hypotensive with a blood pressure of 80/35 mm Hg and tachycardic with a heart rate of 110/min.

No evidence of bleeding was found during the immediate abdominal examination in the operating room. There was ascites, which indicated the onset of peritonitis. Laboratory analysis showed the following values: leukocytes $1.9 \times 10^9$/l, platelets $94 \times 10^9$/l, thromboplastin time 23 %, partial thromboplastin time 76 s, AT III 21 %, serum creatinine 201 µmol/l; lactate 10.8 mmol/l, base excess − 18 mmol/l and pH 7.06 (arterial blood). Due to low central venous pressure and hypovolemia, the patient received volume substitution (1500 ml colloids, 4500 ml crystalloids). During the course of surgery, a small strip of the M. rectus abdominis revealed macroscopically visible signs of edematous swelling. This part of the rectus muscle near the skin incision in the lower abdomen was resected, a specimen of the abdominal muscle was taken for Gram stain, which showed abundant gram-positive cocci in chains (Fig. 1). Antibiotic therapy was initiated with intravenous penicillin G, imipenem and amoxicillin with clavulanic acid. After admission to the Intensive Care Unit (ICU) postoperatively, the patient was treated with vasopressors and remained on mechanical ventilation. She was placed on penicillin G, imipenem and clindamycin. In addition, she received hydrocortisone (0.18 mg/kg per h) as part of a protocol-guided treatment of septic shock [5, 6].

Within a few hours the clinical status deteriorated dramatically. Circulation had to be supported with noradrenalin and dopexamine. Laboratory evaluations showed not only renal impairment and coagulopathy, but also increasing signs of rhabdomyolysis (serum creatine kinase activity 263 U/l, myoglobin 1706 ng/ml). In addition to this, a rapidly spreading, foul-smelling abdominal wall erythema with palpable crepitation was observed, extending from the skin incision to the upper abdomen and the right and left flanks. The erythema darkened, changing from red to purple to blue. Five hours after the first examination she was returned urgently to the operating theater with a diagnosis of necrotizing fasciitis with rhabdomyonecrosis. By this time the whole abdominal wall (skin, subcutaneous tissue, fascia, muscle and peritoneum) appeared to have become infected by gas-forming microbial agents and was therefore completely resected, from the suprapubic area to the costal arch and flanks (Fig. 2). In the histological analysis samples of skin, subcutaneous tissue, fascia and muscle showed gram-positive cocci and partly expanded necroses with only a minor, acute inflammatory reaction. Muscle swabs yielded *Streptococcus pyogenes* (M-type 1) sensitive to the antibiotic regimen. All blood cultures were negative.

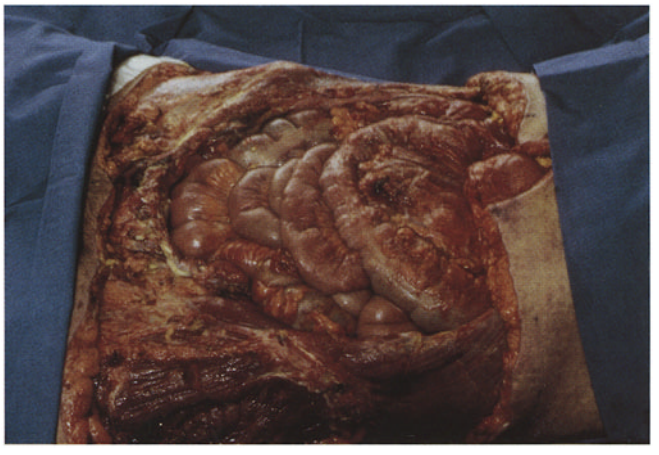

**Fig. 2** Appearance following the aggressive debridement with resection of the abdominal wall (skin, subcutaneous tissue, muscle and peritoneum)

Extremely high levels of serum creatinkinase activity (554 U/l), myoglobin (2649 ng/ml) and lactate (11.2 mmol/l) were present after surgery. Disseminated intravascular coagulation (DIC) resulted in massive bleeding after the extensive necrosectomy. The patient developed a severe purpura as a cutaneous manifestation of DIC with thrombocytopenia. Packed red blood cells (22 units), platelets

(1 unit) and fresh frozen plasma (47 units) had to be transfused within 24 h. Reptilase clotting time developed a peak level of 28 s (day 5 after hysterectomy) and d-dimer of 13.7 μg/ml (day 4).

Subsequently, the open abdomen, covered only with sterile wet towels, was treated daily with surgical debridement and lavage (Ringer lactate solution). A wound closure device made from a polyethylene zip (Ethizip) was used for temporarily closing the abdominal wall (day 9). Free myocutaneous flaps (M. latissimus dorsi right and left) permitted final covering of the intraabdominal organs (day 12). The muscular areas of the flaps were temporarily covered initially with a synthetic skin substitute (Epigard) and later with a hydrophilic polyurethane dressing (Allevyn), which was changed twice a week until the patient received split-skin grafts for the final closure of the large skin defects (days 28 and 34).

After successful extubation (day 27) she was discharged from the ICU completely recovered from her severe multiple organ dysfunction, just 7 weeks after her initial debridement.

## Discussion

Necrotizing fasciitis is characterized by widespread, progressive destruction of subcutaneous tissue and usually begins with erythema, swelling and pain. Later bullae and dermal gangrene may appear. Bacterial enzymes, including hyaluronidase and lipase, impair fascia and fat. Although risk factors are diabetes mellitus, alcoholism, immunosuppressive therapy and peripheral vascular disease [7, 8], the destructive soft-tissue infection also occurs in young, previously healthy people in any part of the body. Necrotizing fasciitis of the abdominal wall is a rare postoperative complication of abdominal surgery [7, 8]. Giuliano et al. divided necrotizing fasciitis into two distinct groups [9]: type 1 is caused by non-group A Streptococci, anaerobes and/or facultative anaerobes, often in mixed culture including Enterobacteriaceae, type 2 by group A β-hemolytic Streptococci or Staphylococci. Group A streptococcal necrotizing fasciitis is a highly aggressive, rapidly spreading infection with a mortality rate of 30–60% [1].

This case also demonstrates features of myositis, which is much less common than fasciitis. Because the clinical signs of the two conditions overlap, patients may have evidence of both necrotizing fasciitis and myositis [1, 10]. The fatality rate for group A streptococcal myositis is between 80%–100% [1]. Distinguishing myositis caused by Streptococci from clostridial gas gangrene may be difficult. Evidence of crepitation or gas in the tissue would tend to indicate clostridial infection, but crepitus does not exclude Streptococci.

In the last 10 years increased frequency and severity of invasive group A streptococcal infections with an early coincidental onset of shock and organ failure have been documented. One cause may be the shift to more virulent serotypes. Individuals between 20 and 50 years of age, often without a predisposing underlying disease, are most commonly afflicted [1]. Skin or mucous membrane are the portals of streptococcal entry often associated with a minor local trauma or following surgical procedures (e.g. hysterectomy [1, 10, 11]). This clinical entity, known as streptococcal toxic shock syndrome (STSS), has a mortality rate of 30% [10]. A consensus definition was given by the Working Group on Severe Streptococcal Infections [4], which includes the following criteria: the isolation of group A Streptococci in a normally sterile site, hypotension (systolic pressure < 90 mm Hg in adults), and organ system involvement with at least two of the following symptoms (renal impairment, coagulopathy, liver involvement, adult respiratory distress syndrome, generalized erythematous rash and soft-tissue necrosis). Based on this definition, the patient presented in fact fulfils all the criteria of a STSS case.

Tissue damage and systemic toxicity of invasive group A Streptococci are believed to be due to several virulence factors, such as streptococcal M protein (inhibiting phagocytosis by leukocytes), hyaluronic acid capsule, various enzymes and exotoxins. In the majority of cases, streptococcal pyrogenic exotoxin A (SPEA) is found in invasive streptococcal infections, inducing synthesis of cytokines [1, 2, 12]. This exotoxin belongs to the family of superantigens, and their excessive T cell stimulation capacity is much greater than typical antigens [13]. Superantigens interact directly with both the relatively invariant regions of the histocompatibility complex of the antigen-presenting cells and the Vβ chain of the T cell receptor [14]. The effect of T cell stimulation by superantigens is excessive cytokine production (e.g. tumor necrosis factor α, interleukin-1, interleukin-6) inducing toxic shock [14, 15].

Treatment of STSS with necrotizing fasciitis requires antibiotic therapy, surgical debridement and supportive care. Before definite identification of the causative agents, an initial broad-spectrum antimicrobial regimen against gram-positive and gram-negative organisms, including anaerobes, should be started. After isolating group A Streptococci, penicillin, erythromycin, and clindamycin are the drugs of choice [1]. In severe infection, such as necrotizing fasciitis or myositis, the efficacy of penicillin is diminished. The success of clindamycin, which inhibits protein synthesis, can probably be attributed to the independence of the inoculum size or bacterial growth phase, the suppression of bacterial toxin synthesis, of bacterial M protein synthesis (facilitating phagocytosis of group A Streptococci), and of tumor necrosis factor α production by monocytes [1, 15]. Therapy of STSS with polyspecific intravenous immunoglobulin G suggests neutralization of circulating superantigens [12, 16] and inhibition of lymphokine production [17] and may thus be beneficial. In addition, a continuous infusion of hydrocortisone (0.18 mg/kg per h) in septic shock can decrease circulating interleukin-6 [5] and soluble interleukin-2 receptor.

In cases of severe necrotizing fasciitis early recognition and prompt, adequate surgical intervention with radical debridement of all necrotic tissue and fasciotomy improve the chances of survival [8]. Early diagnosis can be difficult, however delays in diagnosis and treatment correlate with a poor outcome [7]. A few reports have suggested the efficacy of hyperbaric-oxygen treatment in all types of necrotizing fasciitis [15], but controlled trials are still lacking.

In conclusion, early diagnosis, adequate antibiotic therapy and aggressive surgical procedure are crucial to the survival of patients suffering from STSS with severe, extended necrotizing fasciitis.

## References


1. Stevens DS (1992) Invasive group A streptococcus infection. Clin Infect Dis 14: 2–13
2. Demers B, Simor AE, Vellend H, Schlievert PM, Byrne S, Jamieson F, Walmsley S, Low DE (1993) Severe invasive group A streptococcal infections in Ontario, Canada: 1987–1991. Clin Infect Dis 16: 792–800
3. Cone LA, Woodard DR, Schlievert PM, Tomory GS (1987) Clinical and bacteriologic observations of a toxic shock-like syndrome due to Streptococcus pyogenes. N Engl J Med 317: 146–149
4. The Working Group on Severe Streptococcal Infections (1993) Defining the group A streptococcal toxic shock syndrome. JAMA 269: 390–391
5. Briegel J, Jochum M, Gippner-Steppert C, Kuprat G, Haller M, Peter K (1997) Effects of hydrocortisone on cytokine concentrations in hyperdynamic septic shock: results from a double-blind, randomized, placebo-controlled, single-center study. Shock 7 (Suppl): A 393
6. Briegel J, Haller M, Forst H, Schelling G, Kuprat G, Hemmer B, Peter K (1997) Effect of hydrocortisone on reversal of hyperdynamic septic shock: a randomized, double-blind, placebo-controlled, single-center study. Shock 7 (Suppl): A 656
7. McHenry CR, Piotrowski JJ, Petrinic D, Malangoni MA (1995) Determinants of mortality for necrotizing soft-tissue infections. Ann Surg 221: 558–565
8. Green RJ, Dafoe DC, Raffin TA (1996) Necrotizing fasciitis. Chest 110: 219–229
9. Giuliano A, Lewis F, Hadley K, Blaisdell FW (1977) Bacteriology of necrotizing fasciitis. Am J Surg 134: 52–57
10. Stevens DL, Tanner MH, Winship J, Swarts R, Ries KM, Schlievert PM, Kaplan E (1989) Severe group A streptococcal infections associated with a toxic shock-like syndrome and scarlet fever toxin A. N Engl J Med 321: 1–7
11. Golshani S, Simons AJ, Der R, Ortega AE (1996) Necrotizing fasciitis following laparoscopic surgery. Surg Endosc 10: 751–754
12. Norrby-Teglund A, Kaul R, Low DE, McGeer A, Andersson J, Andersson U, Kotb M (1996) Evidence for the presence of streptococcal superantigen-neutralizing antibodies in normal polyspecific immunoglobulin G. Infect Immun 64: 5395–5398
13. Kline JB, Collins CM (1996) Analysis of the superantigenic activity of mutant and allelic forms of streptococcal pyrogenic exotoxin A. Infect Immun 64: 861–869
14. Schlievert PM (1993) Role of superantigens in human disease. J Infect Dis 167: 997–1002
15. Bisno AL, Stevens DL (1996) Streptococcal infections of skin and soft tissue. N Engl J Med 334: 240–245
16. Norrby-Teglund A, Kaul R, Low DE, McGeer A, Newton DW, Andersson J, Andersson U, Kotb M (1996) Plasma from patients with severe invasive group A streptococcal infections treated with normal polyspecific IgG inhibits streptococcal superantigen-induced T cell proliferation and cytokine production. J Immunol 156: 3057–3064
17. Skansén-Saphir U, Andersson J, Björk L, Andersson U (1994) Lymphokine production induced by streptococcal pyrogenic exotoxin-A is selectively down-regulated by pooled human IgG. Eur J Immunol 24: 916–922