Case Report

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Spondylodiscitis and paraspinal abscess caused by β -haemolytic group G streptococci spreading from infected leg ulcers

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We report a case of spondylodiscitis due to *Streptococcus dysgalactiae* subsp. *equisimilis* spreading from infected leg ulcers. The route of infection could be unequivocally demonstrated by culturing identical isolates from leg wounds, blood culture and intra-surgery specimens from the spine. The present case illustrates the pathogenic potential of group G streptococci also for non-diabetic adults.

Case report

In January 2006, a 59-year-old male patient was admitted to the Department of Orthopaedics of the Rostock University Hospital with extreme lower back pain. He had been suffering from increasing back pain for about 3 months and had experienced three to four episodes of fever up to 40 °C lasting 1–2 days within the last 6 months. He had lost 40 kg of weight without intention during the previous year.

Careful history taking revealed a history of coronary heart disease, a myelodysplastic syndrome with refractive anaemia, chronic recurrent pancreatitis and a seminoma (relapse-free for 14 years). The patient had also suffered from leg ulcers for about 9 months due to circulatory disturbances of both legs and a post-thrombotic syndrome after a pelvic vein thrombosis years ago.

On admission, we saw a critically ill, moderately obese patient (89 kg/173 cm) who was alert and fully oriented. Body temperature was slightly elevated (37.4 °C). The blood pressure was normal at 105/60 mmHg. The heart sounds, skin aspect and nails beds as signs for endocarditis as well as results from transthoracic echocardiography were unremarkable. Arterial pulses were palpable except for the Aa. dorsalis pedis on both sides. There were leg ulcers on both legs with clinical signs of bacterial infection such as inflamed rims, pus, smear and odour (Fig. 1). The microbiological cultures from superficial swab material

taken from both legs grew β -haemolytic group G streptococci (GGS; *Streptococcus dysgalactiae* subsp. *equisimilis*) and *Staphylococcus aureus*. Other parameters of the physical examination were unremarkable.

The lower spine was sensitive to percussion. Symmetrical radicular pain was reported to reach from the rear side of the thighs to the knees concordant with dermatomes L5 being affected. The deep tendon reflexes of the legs were slowly releasable equally on both sides. Motor strength and sensory function were normal. The patient was continent.

On admission, the white blood cell count was slightly elevated with 12.4×10^9 cells l^{-1} (normal range $4\text{--}9 \times 10^9$ cells l^{-1}). Other infection parameters such as C-reactive protein (241 mg l^{-1} ; normal <5 mg l^{-1}), procalcitonin (2.42 ng ml^{-1} ; normal <0.5 ng ml^{-1}) and erythrocyte sedimentation rate (105 mm h^{-1}) were remarkably elevated.

The red blood cell count showed a normocytic anaemia with decreased values for haemoglobin (4.5 mmol l^{-1} ; normal range 8.6–12 mmol l^{-1}) and haematocrit (23%; normal range 40–51%); thrombocytes were normal (334×10^9 cells l^{-1}). Liver enzymes were within the normal range except for an elevated alkaline phosphatase (182 U l^{-1} ; normal range 38–126 U l^{-1}). A diminished creatinine clearance (0.43 ml s^{-1} ; normal range 1.63–2.66 ml s^{-1}) was associated with an elevated serum creatinine (245 μ mol l^{-1} ; normal range 62–106 μ mol l^{-1}) and potassium (5.8 mmol l^{-1} ; normal range 3.6–5.1) level. Glucose levels were normal upon repeated measurements with no evidence of diabetes mellitus. All other laboratory parameters obtained were normal. A peripheral blood culture performed on admission grew large colony forming GGS.

The X-ray of the spine showed destruction at the level of L4/5 suggestive of severe spondylodiscitis. Magnetic resonance imaging (MRI) of the spine confirmed a

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Abbreviations: GGS, group G streptococci; MRI, magnetic resonance imaging.

A supplementary figure showing the confirmation of the identity of the three group G streptococcal isolates by PFGE is available with the online version of this paper.

Fig. 1. Aspect of probable portal of entry – leg ulcer on the right leg with clinical signs of bacterial infection (inflamed rims, pus and smear).

spondylodiscitis and additionally showed a paraspinal subfascial abscess on the left side (Fig. 2).

The patient was transferred to the department of neurosurgery, where an immediate surgical relief was performed. The abscess was drained and the spine was stabilized by a fixateur interne from L4 to S1. The infected disc was removed via a ventral approach and the intervertebral space was stabilized with a lordotic-shaped carbon-cage.

The Gram-stained smear from the surgical site showed Gram-positive cocci arranged in clusters and chains. Histological examination of tissue specimens confirmed an acute purulent, destructive and necrotizing spondylodiscitis without evidence of malignancy. Antibiotic treatment with clindamycin (600 mg three times daily) and penicillin (10 Mio IU three times daily) was immediately started and continued for 18 days.

Two days after surgery, large colony forming β -haemolytic Lancefield GGS were grown in pure culture from all specimens. All GGS isolates were subjected to biochemical identification by the commercial test system Rapid ID 32

Fig. 2. MRI scan of the lumbar spine showing a T2-weighted sagittal scan with increased signal in the L4/5 region, a T1-weighted sagittal scan with gadolinium enhancement and a T1-weighted axial scan with a small epidural empyema (arrows).

Strep (bioMérieux) and appeared as *Streptococcus dysgalactiae* subsp. *equisimilis* (code no. 45022041100).

Disc diffusion testing for determination of antibiotic resistance was performed and the isolates were found to be susceptible to penicillin, clindamycin, ciprofloxacin, erythromycin, vancomycin, tetracycline and linezolid according to the criteria of the CLSI/NCCLS (2006). Following genomic DNA preparation and digests with *Sma*I restriction endonuclease, an analysis of three GGS isolates from the leg ulcers, the blood culture and the intraspinal specimen by PFGE showed identical band patterns, thus strongly indicating the potential route of infection (Supplementary Fig. S1 available with the online version of this paper).

During the first days of antibiotic treatment, the patient recovered well and the infection parameters declined, i.e. C-reactive protein level dropped to 95 mg l⁻¹ on day 9 post-surgery. On day 13 after surgery, the wound healing seemed to be disturbed accompanied by a slight increase of the infection parameters. Repeat MRI of the lower spine confirmed an infection of the left facet joint L4/5 and retained material in the former paraspinal abscess in the same region. Subsequently the wound was revised via a dorsal approach and the abscess was drained. After this second procedure, the patient improved rapidly and infection parameters fell almost to baseline. The patient was mobilized and penicillin administration was reduced to 1 Mio IU three times daily on day 18 after the first surgery. Also the leg ulcers appeared to be healed at that time.

On day 27 after the first surgery, due to a decision by the surgical outpatient clinic the antibiotic therapy was changed to oral ciprofloxacin (500 mg two times daily) plus oral clindamycin (600 mg three times daily) for 4 additional weeks. The patient was discharged to 3 weeks neurological rehabilitation in a specialized hospital.

At the follow-up examination 1 year after surgery, the patient presented with a normal neurological status. He denied any further pain attacks of the lower back and did not experience further episodes of fever or unintended weight loss.

Discussion

Spondylodiscitis is a rare cause of chronic back pain with an incidence of 0.2–2 cases/100 000 per year. The majority of patients are male, 50–70 years of age and present with ongoing back pain as an isolated symptom. About 30 % of the patients additionally have neurological deficits; about 10 % suffer from fever and weight loss (Butler *et al.*, 2006).

Spondylodiscitis is predominantly caused by bacteria transported by the bloodstream as opposed to bacteria penetrating from neighbouring anatomical structures (e.g. from contamination after medical interventions). Due to the special blood supply of the spine, the two vertebrae and the linking intervertebral disc are normally affected. Skin

and soft tissue infections, urinary tract infections, endocarditis, respiratory tract infections and intravascular device-associated infections are common primary sources for the haematogenous route of infection (Huttner & Opravil, 2006).

Staphylococcus aureus is the major infective agent responsible for 50–75 % of all cases, followed by a wide range of rarer micro-organisms such as coagulase-negative staphylococci, Gram-negative rods and streptococci (Butler *et al.*, 2006). Depending on the geographical area, *Mycobacterium tuberculosis* and *Brucella* spp. could also have some aetiological importance. β -Haemolytic streptococci, predominantly group B streptococci, are occasionally described pathogens in spondylodiscitis patients with underlying diseases such as neoplasia, diabetes mellitus and heart disease, those that have undergone a splenectomy and in those receiving corticosteroid treatment (Falagas *et al.*, 2006; Narváez *et al.*, 2004).

A thorough search of the literature (keywords: 'spondylodiscitis, spondylitis, discitis, spinal osteomyelitis or vertebral osteomyelitis' in combination with 'G streptococcus, Streptococcus dysgalactiae, Streptococcus equisimilis or streptococcal' in the NCBI and DIMDI databases) identified only five published cases of human spondylodiscitis involving GGS as causative agents (Tobias *et al.*, 1992; Castellarin *et al.*, 1993; Hall & Williams, 1993; Hayashi *et al.*, 2007). Three patients were male and two female. Except for one female, the patients were older than 50 years. Three of them had underlying malignancies as risk factors. Diagnoses were confirmed by fine needle biopsy of the spine or positive blood cultures. The route of infection remained unclear in all cases. Additionally, Kumar *et al.* (2005) reported three cases of spondylodiscitis caused by *Streptococcus dysgalactiae* subsp. *equisimilis* Lancefield group C. The three male patients had no known underlying diseases. In one, infective endocarditis was identified as the potential source for spondylodiscitis.

Using biochemical identification, large colony forming GGS can be classified as *Streptococcus dysgalactiae* subsp. *equisimilis* and *Streptococcus canis*. In addition, *Streptococcus dysgalactiae* subsp. *equisimilis* includes large colony forming Lancefield group C streptococci. Whereas *Streptococcus canis* is associated with ulcer infections in dog owners, *Streptococcus dysgalactiae* subsp. *equisimilis* apparently does not have an animal reservoir (Woo *et al.*, 2001). GGS share the same ecological niche with group A and C streptococci, exhibit considerable overlap in their disease profiles and share some pathogenicity factors such as M protein and extracellular enzymes, e.g. haemolysin.

GGS may colonize the human pharynx, skin, and intestinal and genitourinary tracts. They are well known as pathogens causing pharyngitis, possibly complicated by glomerulonephritis, lower respiratory tract infections, sepsis and, much less frequently, endocarditis and meningitis (Kaufhold & Ferrieri, 1993). Since most GGS patients with invasive infections have some underlying condition such as diabetes

mellitus, malignancy, cardiovascular disease, bone and joint diseases or liver cirrhosis, GGS are assumed to have a generally low pathogenic potential (Liu *et al.*, 1995). Since GGS still await full genome sequencing, the genetic differences from *Streptococcus pyogenes* which could explain the lower virulence remain obscure.

Although deep-seated infections at other anatomical sites as potential steps of the infectious process cannot formally be excluded, the present case demonstrated how a local skin infection with GGS could lead to a complicated spondylodiscitis. The genetic identity of the isolates from the leg ulcer, the blood culture and the spine confirmed the route of infection. Remarkably, the patient did not present any diabetes mellitus or consuming malignancies during the entire infection period and up to 1 year after the hospital admission. His myelodysplastic syndrome with refractive anaemia only involved the red blood cell line and did not progress. Generally, myelodysplastic syndrome patients suffer predominantly from viral infections. That corresponds to the findings of Kumar *et al.* (2005), who reported three spondylodiscitis cases without underlying diseases caused by *Streptococcus dysgalactiae* subsp. *equisimilis* (Lancefield group C).

On the whole, GGS are susceptible to penicillins, cephalosporins and vancomycin. Erythromycin resistance is only occasionally observed. Thus, in systemic GGS infections such as pyogenic spondylodiscitis, a conservative intravenous antibiotic therapy over 4–12 weeks leads to good results (Mueller *et al.*, 2004; Grados *et al.*, 2007). The drug of choice is penicillin. Combinations with gentamicin or clindamycin are recommended for life-threatening or specially located infections such as endocarditis and osteomyelitis. Identification of the responsible bacterium via needle biopsy sampling or blood cultures and subsequent susceptibility testing is essential for this strategy (Phadke *et al.*, 2001). Additional surgery is recommended in patients with neurological deficits, epidural abscesses, spinal deformity or a protracted course of disease (e.g. continuous rise of infection parameters under standard antibiotic therapy judged as effective by *in vitro* testing).

Because of the neurological deficit, our patient underwent immediate surgery and resurgery after persistently raised infection parameters and non-improved radiological imaging. This strategy led to an excellent clinical result after 1 year.

The current case demonstrates the risks especially for older (>60 years), predominantly male, patients of developing invasive disease upon exposure to *Streptococcus dysgalactiae* subsp. *equisimilis*, even if classical underlying diseases such as diabetes mellitus or actual known malignancies are absent. The pathogenic potential of GGS should not be underestimated, despite a commonly successful antibiotic therapy.

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