

Case Report

***Haemophilus influenzae*: a cause of peritonitis in peritoneal dialysis**

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Introduction

Peritonitis, a major complication of peritoneal dialysis (PD), is usually caused by coagulase-negative staphylococci, *Staphylococcus aureus* and streptococci [1,2]. Although infections with *Haemophilus influenzae* are common in children, peritonitis due to this pathogen is rare [3–5]. We report the first child on PD with a peritonitis due to *H. influenzae*, a fastidious organism requiring adequate culture media for growth.

Case report

The patient was a 27-month-old child with the Denys-Drash syndrome (triad of Wilms' tumour, diffuse mesangial sclerosis, and male pseudohermaphroditism) [6]. At birth the phenotype was unequivocally female; thus the child was raised as a girl. At the age of 16 months she presented with a right-sided Wilms' tumour stage I and proteinuria. Unilateral nephrectomy was performed, followed by chemotherapy for 4 months. Extratumorous renal tissue showed diffuse mesangial sclerosis. Chromosome analysis revealed a male karyotype 46,XY and a constitutional mutation in the WT1 locus. Ultrasound and computing tomography showed an infantile uterus; however, the gonads could not be classified, even at laparotomy.

End-stage renal failure occurred at the age of 21 months. The second kidney was removed, and automated continuous cycling peritoneal dialysis (CCPD) during the night (PAC-Xtra cyler, Baxter) was commenced. After 1 month the child developed a tunnel infection, without concomitant peritonitis, due to *Pseudomonas aeruginosa*, which was successfully treated with a 10-day course of intraperitoneal ceftazidime.

At the age of 24 months the child presented afebrile with cloudy dialysate and slight abdominal pain. There

was neither a tunnel nor an exit-site infection. Microscopy of the dialysate showed $6700 \times 10^6/l$ white cells. Gram staining was negative. After taking samples of dialysate and blood, intraperitoneal gentamicin and cefazolin were administered. Within 48 h, the dialysate became clear and the white cell count normalized ($5-15 \times 10^6/l$).

For bacterial cultures, sediment from 50 ml high-speed centrifuged dialysate was plated onto sheep blood and MacConkey agar plates. In addition uncentrifuged dialysate was instilled into four haemoculture bottles (10 ml each; Bactec Plus, Becton Dickinson, Basel, Switzerland), which were immediately enriched with hemin (X factor) and nicotinamide adenine dinucleotide (NAD, V factor) (Bactec[®]-FOS[™], Becton Dickinson). Dialysate cultures in these bottles grew non-groupable *H. influenzae* biotype 2, sensitive to both administered antimicrobials. In contrast, the agar plates remained sterile. Haemocultures and a nasal swab (also cultured on chocolate agar) showed no growth. Gentamicin was discontinued and the patient was treated for 10 days with cefazolin, and has been well since.

Discussion

Haemophilus influenzae is an important pathogen in children. Peritonitis due to this organism has rarely been found in previously healthy [3,4] and in nephrotic children [5]. PD peritonitis due to *H. influenzae* has not been described in children, in contrast to occasional reports from adults [7–10]. The source of infection in our patient is unclear. Tunnel, exit-site, and surrounding skin of the Tenckhoff catheter were unremarkable and there were no signs of upper respiratory tract infection. Peritonitis rate in children on PD is higher than in adults [2]. Since 1979 we have treated 27 children with end-stage renal failure with ambulatory PD. The rate of peritonitis has declined with improving techniques to one episode per 20 months since 1989.

Cultures of peritoneal fluids from patients with PD peritonitis (defined as $> 100 \times 10^6/l$ white cells) have been reported as negative in up to 50% of all episodes [1,2]. Relevant reasons include low concentrations of micro-organisms, intracellular survival of and surface tension between bacteria, and presence of antibiotics [1]. Another reason may be the lack of specific growth

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factors in the culture media. *Haemophilus* spp. are nutritionally fastidious and require either exogenous hemin (X factor) or NAD (V factor) or both. Chocolate agar but not conventional sheep blood agar contains X and V factor in sufficient amounts. Whereas both factors are provided in haemocultures from the patient's blood, they need to be added to the media when culturing dialysate. Thus the use of chocolate agar should routinely be introduced for cultures of dialysate. Direct instillation of (even uncentrifuged) dialysate into haemoculture bottles containing X and V factor-enriched medium, as done in the present case, may optimize detection of *Haemophilus* spp.

We conclude that (1) *Haemophilus* spp. peritonitis does occur in children, and (2) may be missed if bacterial cultures of dialysate are not done with adequate media for the growth of these pathogens.

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