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Rate and Causative Flora of the Peritoneal Infections in Patients Treated by Peritoneal Dialysis (PD) in "Aleksandrovska" University Hospital, Sofia, Bulgaria

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Abstract

Introduction. In peritoneal dyalisis the crucil problem may be the rate of peritonitis. The aim of the following study is to ascertain the rate, causative flora, clinical results and impact of peritoneal infections in the group of patients treated by continuous ambulatory peritoneal dialysis (CAPD) and automated peritoneal dialysis (APD) in our clinic.
Methods. The period of the retrospective study was 40 months, in which 39 patients (21 female and 18 male) received PD treatment in the Dialysis clinic of University hospital "Aleksandrovska" in Sofia. Mean age of the group was 56.5 years (from 19 to 83 years).
Results. In 12 of all cases, peritoneal dialysis was the first modality of treatment in stage 5 CKD. The average duration of preceding hemodialysis treatment for the rest of the group was 13 months (from 1 to 84). The total peritonitis episodes were 46 (1 episode per 18.4 patient/months or 0.65 episodes/year of PD). In 9 episodes of clinically manifested peritonitis microbiology was negative (19.5%). From the remaining 37 microbiologically proven peritoneal infections, in 2 cases more than one causative agent was isolated (5.4%). Twenty ninth peritonitis episodes (78.4%) were due to Gram-positive flora-different Staphylococcus strains, Enterococcus faecalis and Corynebacterium. In 6 cases Gram- negative flora was isolated-Escherichia coli, Enterococcus cloacae, Pseudomonas fluorescens and Acinetobacter (16.2%).
Conclusions. Although lethal exit due to peritonitis as in two of our cases is still a threatening complication of this therapy, the rate of peritoneal infections observed in our clinic shows a decline compared to previous studies in Bulgaria.

Keywords: Chronic kidney disease (CKD), peritoneal dialysis (PD) treatment, complications, peritonitis, microbiological agents

Introduction

Continuous ambulatory peritoneal dialysis (CAPD) had Its` first application in Bulgaria during 1984 and APD treatment started in the next decade [1,2]. The most often experienced complication of PD treatment is the peritoneal infection, although different strategies for reducing microbial contamination are proposed [3]. The causative organisms in the predominant part of the infections are Gram stain-positive bacteria, followed by Gram stain-negative and fungi in 3-6% of the cases [4-6]. The hypothesis of virus genesis of the peritonitis in PD treated patients is almost rejected, but it is considered, that a viral infection can act as a predisposing factor [7]. The aim of this investigation is to ascertain the rate of peritonitis in the treated cohort of PD patients, causative agents of the infections and the consequences of the infections on the outcome of the therapy.

Material and Methods

For the period of the study, which was 40 months (January 2009-April 2012) a total of 39 patients-32 on CAPD and 7 on APD were treated in the dialysis clinic. Mean age of the group was 56.5 years (from 19 to 83 years). In 12 patients peritoneal dialysis was the first treatment modality in stage 5 CKD, while in the rest of the group, the average time of preceding hemodialysis treatment was 13 months (from 1 to 84).
The primary kidney diseases leading to CKD were as follows: chronic glomerulonephritis in 10 cases; chronic pyelonephritis in 7 patients; diabetic nephropathy-7 cases; hypertensive nephrosclerosis in 5 patients; polycystic kidney disease-4 patients; gout nephropathy in 3 cases; 2 patients with nephropathy due to systemic lupus erythematodes and one patient with congenital anomalies of the renal system. The CAPD system used in all patients on continuous ambulatory peritoneal dialysis was "Baxter Twin Bag" with PD4 Dianeal and Physioneal 1.36%, 2.27% and 3.86%, Extraneal and Nutrineal in 2 000 ml. bags. The number of daily exchanges, quantity and type of solutions were prescribed according to individual needs of clearance parameters, ultrafiltration, nutritional status, social and labor activities and varied between patients. All APD patients used "Baxter Home Choice" system and the infused solutions during the night exchanges had glucose content of 1.36% and 2.27% in 5 000 and 2 000 ml. bags. The number and duration of the cycles in APD and addi-

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tional daily infusions of Nutrineal or/and Extraneal 2 000 ml were prescribed according to individual needs. The peritoneal catheters of curled "Tenckhoff" type were surgically implanted in the operation theatre of the clinic and the educational program of the patients was also carried out in the clinical setting. Transfer sets were changed every six months in asymptomatic patients and after the treatment of a peritoneal infection episode as advised by the producer.
The microbiological tests were performed in the microbiological clinic of the hospital with 10 ml. samples of the suspected effluent peritoneal dialysate injected in aerobic and aerobic/anaerobic culture bottles, which were then incubated and analyzed in a "Beckton-Dickinson" auto analyzer.

Results

For the period of 40 months observation, the whole group which included 32 patients on CAPD and 7 patients on APD had 849 months (70.75 years) of treatment. Sixteen patients (41%) died, eight were transferred to hemodialysis (20.5%), one patient received a kidney transplant (2.5%) and fourteen (36%) are still treated with peritoneal dialysis-10 on CAPD and 4 on APD.
The total number of peritonitis episodes was 46, i.e. 1 episode per 18.4 patient/months (or 0.65 episodes/year of PD). In 37 of them, causative flora was microbiologically ascertained (80.5%), while in 9 of clinically symptomatic cases

Table 1. Microbial flora of the peritoneal infections-the percentages of microorganisms are expressed as % of microorganisms identified

	Microbial flora of peritoneal infections (PI)	Microorganism identified (n)	%	Microorganism not identified (n)	%
1.	PI (46 in total)	37	80.5	9	19.5
2.	Gram-positive	29 (columns 3-6)	78.4		
3.	Staph. aureus	9	24.3		
4.	Staph. epiderm.	8	21.6		
5.	Other Staph.	10	27.1		
6.	Other G +	2	5.4		
7.	Gram-negative	6	16.2		
8.	Polymicrobial	2	5.4		

results were negative (19.5%). The isolated flora in culture positive peritonitis episodes is presented on table 1.
Two deaths could be directly attributed to the peritoneal infection and with a 5.1% mortality rate in the discussed patient's group, the peritonitis is still among the serious causes for the negative outcome of PD therapy.

Discussion

The total number of peritonitis episodes is one episode per 18.4 patient/months (or 0.65 episodes/year of PD), which figure shows a significant decrease in peritonitis rate in peritoneal dialysis patients compared to similar studies in our country in two previous decades [8,9]. Similar results for peritonitis rates are considered standard in the last update of ISPD recommendations on peritoneal infections [10] and were announced in large cohorts of patients on PD treatment for South-East Asia by Szeto and coworkers (or 0.68 episodes/year of PD) and by Kavanagh and coworkers in Scotland-1 episode per 19.2 patient/months [11,12].
In 37 of the clinically manifested peritonitis episodes, the microbiological tests were positive and in 9 cases (19.5%) causative microorganisms were not isolated, which as a percentage is considered by 2010 update of ISPD Peritoneal Dialysis-Related Infections Recommendations a result not exceeding the limit of culture negative specimens [10]. The latter most probably can reflect lapses in the microbiological procedures or theoretically in these cases chemical peritonitis on the basis of high glucose degradation products (GDP) content in PD solution can be hypothesized as did Tuncer and coworkers in a study with 21 demonstrated cases [13]. Similar to other authors rare case presentations, we consider, that in two of the microbiology negative cases, there were enough clinical and laboratory data to confirm the existence of a rare peritoneal dialysis complication, such as the chylous peritonitis [14].
Twenty ninth peritonitis episodes (78.4% of all culture positive) were due to Gram-positive flora. The predominant part of the causative agents in this group consisted of Staphylococcus aureus (9 cases) and Staphylococcus epidermidis (8 cases). 10 of these 17 microorganisms (60%) were from methicillin resistant strains. Clinically, with one exception, all peritoneal infections caused by Staphylococcus epidermidis had benign course with mild abdominal pain and peritoneal effluent regained transparency after first to second day applications of antibiotics. The only exception was a case, in which the patient with methicillin resistant Staph. epidermidis, after several preceding peritoneal infections developed an intestinal perforation and ended lethally. In general, the overall condition of the patients with Staphylococcus aureus peritonitis was more seriously affected by the peritoneal infection and the clinical symptoms more pronounced.
Other Staphylococcus species isolated were identified as Staph. cohnii, Staph. haemoliticus, Staph. vitulinus and Staphylococcus auricularis.
With one case of Enterococcus faecalis and one of Corynebacterium peritonitis, Gram-positive infections reached the total of 29.
There were two peritonitis cases with polymicrobial flora-one with Gram-positive (Staphylococcus aureus plus Streptococcus alpha) and one with Gram-negative (Proteus mirabilis plus Pseudomonas fluorescens) respectively. The latter was diagnosed in a female patient with polycystic kidney disease and very high incidence of peritoneal infections owing to the periodical ruptures of renal cysts. The catheter was not explanted and the peritonitis successfully treated with a third generation cephalosporins. The

decision was taken to continue PD therapy, since all possibilities for a permanent vascular access (several fistulas, permanent catheters and A-V grafts) had been exhausted after 46 months of HD treatment.

Gram-negative flora was isolated in 6 cases of PD peritonitis (16.2% of all culture positive). In three cases Escherihia coli was isolated and in the rest Pseudomonas fluorescens, Enterobacter cloacae and Acinetobacter were the causative microorganisms.

There were two cases of clinical interest in female patients connected with Gram-negative infections. In the first one, unsuccessfully treated Escherihia coli peritonitis lead to reinfections, when an exacerbated Cholecystititis chronica calculosa was diagnosed, which most probably was also the primary origin for the peritoneal infection. Ultrasound proved intra abdominal pathology-a distended infected gall bladder and in order to prevent its` rupture with resulting billiary peritonitis it was surgically removed, catheter explanted and the patient transferred to HD. The second one-PD peritonitis with Escherihia coli lead to intestinal perforation and the patient died.

Mortality rate (5.1%)-two deaths directly attributed to the peritoneal infection in this retrospective study, was similar to that observed by other authors, which proves the thesis that PD peritonitis is still among the serious causes for the negative outcome of therapy in this patient group [15].

Starting empirical antibacterial (AB) treatment after collecting material for microbilogical tests and sending effluent peritoneal solution for express white cell count was applied at the earliest possible moment. According to the centre protocol, AB therapy was a combination of first generation cephalosporin (cephazolin) and aminoglycoside (gentamycin) with loading doses of 1 000 mg. and 80 mg respectively, administered intraperitoneally (i.p.). The treatment continued with application of the two antibiotics in doses 1 000 mg cephazolin every second bag and 40 mg. gentamycin once daily (80 mg. in a few large body size patients) until antibiotics resistance testing was available. In the cases, when Gram-positive organisms were isolated, treatment continued with i.p. vancomycin in doses 15-30 mg./kg./b.w. in intervals of 5-7 days to cover a total duration of no less than 14 days antibiotic therapy and gentamycin was discontinued. In Gram-negative peritoneal infections gentamycin therapy was extended (no more than 12 days course) and cephazolin was replaced either by i.p. ciprofloxacin 100 mg every second bag or by third generation cephalosporin. In most of the cases oral ketoconazole was added as prophylaxis of concomitant fungal infection.

Discussing the antibiotic treatment with vancomycin of PD related peritonitis, it must be mentioned, that Gram-positive flora resistance to vancomycin was first encountered and announced in 1999 [16]. Contrary to such observations, where different percentage of vancomycin resistance in the antibiograms was noted, in this study, all Gram-positive microorganisms were susceptible to vancomycin treatment. This probably can be attributed to the low level of application of this antibiotic in Bulgaria.

Conclusions

The rate of peritoneal infections observed in CAPD and APD patients in our clinic shows a decline compared to previous studies in Bulgaria. Lethal exit due to peritonitis in PD patients is still a threatening complication of this therapy. Microbial agents of Gram-positive specter are the predominant causes for these PD related infections. Owing to the high percentage of methicillin resistant strains in this study and lack of vancomycin resistance, a change of the protocol for the initial empirical therapy with vancomycin instead of first generation cephalosporin is justified.

Conflict of interest statement. None declared.

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