PROPHYLAXIS OF PERITONITIS IN CONTINUOUS AMBULATORY PERITONEAL DIALYSIS (CAPD) BY A SIMPLE MICROBIOLOGICAL PATIENT SELF-CHECK

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Summary

For prophylaxis of peritonitis a simple microbiological patient self-check method was developed. By regular twice daily cultivation of dialysate drainage in a tube with nutrient medium (= Dialysate-Digest Medium-tube method) a latent peritoneal infection can be detected before the symptoms of peritonitis appear. The outbreak of peritonitis can then be prevented by early antibiotic treatment. After the dialysate digest medium-tube method was introduced in our CAPD programme the incidence of peritonitis was reduced from 5.6 to 0.5 episodes per patient year.

Introduction

Peritonitis is still the most frequent and dangerous complication of CAPD [1,2]. In the first year of our CAPD-programme, there was a disappointingly high incidence of this complication; we were therefore looking for new ways of fighting it. Since the beginning of 1980 we have developed the Dialysate-Digest Medium-tube method (DDM-tube method) for early diagnosis of peritoneal infection. Since the first report [3] this method has been further improved and standardised.

Materials and methods

Patients and technique of CAPD

Between May 1979 and April 1981 we treated altogether 21 patients for 215 patient-months in our CAPD-programme. This was a high risk patient group with regard to the average age of 61.8 years (25–77 yrs). The usual CAPD technique has been used [4], except for a modification introduced for change of dialysate bags: the connection of the dialysate bag to the transfer set has since May 1980 been done in a basin under a layer of 0.1% chlorhexidine solution.
**DDM-tube method**

The purpose of the DDM-tube method is to detect a peritoneal infection before the outbreak of clinical peritonitis; peritonitis can then be prevented by immediate treatment with antibiotics. During their training for the CAPD the patients are taught to inoculate 6–8ml of the dialysate drainage into a tube with nutrient medium using aseptic technique. We use soybean-casein digest medium, Trypticase (Becton-Dickinson). The inoculation is performed at 7 a.m. and 5 p.m., after the exchange of dialysate bags. The tube is then cultivated in a small incubator (Thermocult, Labora Mannheim, W Germany) at 37°C and is checked by the patient every 12 hours for 2 days. The DDM-tube is examined in obliquely incident light from a table-lamp against a dark background. In this way even slight clouding can be seen. It is advantageous if the patient quickly checks the tubes before each change of dialysate, i.e. also at 12 noon and 10 p.m., so that if clouding arises, it can be detected as early as possible.

If a DDM-tube is found to be cloudy, the patient comes to the dialysis centre without delay and brings all the inoculated tubes along.

*Measures taken at the centre* (Figures 1 and 2)

1. Dialysate exchange is started immediately.

![Diagram](image)

Figure 1. Scheme of examination when cloudy DDM-tube is found
Figure 2. Scheme of therapy when cloudy DDM-tube is found

2. A drop from the cloudy DDM-tube is examined microscopically for bacteria and fungi.

3. If bacteria are identified, a combination of antibiotics is added to the dialysate (Cephalothin 250mg, Tobramycin 10mg, Fucidin 62.5mg/L). If fungi are identified, 5-fluorocytosine 250mg/L of dialysate is administered.

4. Before starting this therapy, however, further tests are performed by staff in the centre for the purpose of verifying the peritoneal infection: one aerobic and one anaerobic culture bottle with dialysate drainage are set up (30ml dialysate in 50ml broth). The microbial culture already present in the cloudy DDM-tube is used for identification of the microbes and for direct sensitivity testing.

5. If a microbial growth is identified in the dialysate culture bottle, peritoneal infection is considered to be verified. Antibiotic therapy is then continued and adjusted to sensitivity tests from the cloudy DDM-tube. Identification of organisms and sensitivity testing is repeated again from the dialysate culture bottle. If the dialysate culture bottle remains negative, antibiotic therapy is stopped.

Results

After the DDM-tube method was introduced in our CAPD programme, in all our patients, except one, the incidence of peritonitis was reduced from average 5.6 episodes per patient-year during the first 4 months of 1980 to 0.5 episodes per patient-year in the first 4 months of 1981 (Figure 3).

During the period from May 1980 to April 1981 a peritoneal infection was detected by the DDM-tube method and treated according to the present schedule in 24 cases; in these the infection could be verified by a positive bottle-culture of
the dialysate drainage before starting antibiotics. In 12 of these cases it was possible to prevent the development of peritonitis by early antibiotic therapy. Of the remaining 12 cases, in 9 patients peritonitis developed because of rapid spread of infection, in 2 patients because of poor response to early antibiotic therapy and in 1 case no infective agent could be detected; all DDM-tubes as well as dialysate cultures before and during the very light peritonitis remained negative. There were still 17 peritonitis episodes in this period; they occurred in patients who did not yet use the DDM-tube method, or did not use it according to the present schedule. The incidence of cloudy tubes in which a peritoneal infection was not verified was 0.37 per patient-month in the first 4 months of 1981.

Discussion

The DDM-tube method is based on the existence of a latent phase in the development of peritonitis. During this phase microbes are found in the peritoneal cavity but a peritoneal inflammatory response has not yet taken place. Microbes can be detected by regular cultures of the dialysate drainage. With the DDM-tube method we have been able to observe the development of a peritoneal infection into peritonitis in several cases, in which therapy was, for various reasons, not started after the first cloudy DDM-tube was detected. As a rule, the first DDM-tube was positive 36–48 hours or, rarely, 12–24 hours before the outbreak of peritonitis. The clouding of the DDM-tube became visible mostly 24 hours, rarely 12 or 36 hours after the inoculation of dialysate drainage. In the majority of cases, a correct use
of the DDM-tube method led to the start of antibiotic therapy 12–24 hours before the expected outbreak of peritonitis. Up to now, the only way to diagnose a developing peritonitis is to demonstrate microbes in the clear and still leucocyte free dialysate drainage. Regular checks for leucocytes in the dialysate have previously been recommended as a method of early diagnosis of peritonitis [5]. But based on our experience with the DDM-tube method the peritoneal inflammatory reaction is usually a sudden and acute event. The number of leucocytes often increases rapidly within a few hours; but in some cases the leucocyte count is initially not increased even though the dialysate drainage may already be slightly cloudy. Clouding of the dialysate drainage is therefore not necessarily due to leucocytes only. Besides, our method allows the diagnosis of peritoneal infection before the outbreak of peritonitis, when the dialysate is still poor in leucocytes.

At the beginning of the DDM-tube method if a DDM-tube was found cloudy we waited for the next tube to become cloudy too, before we administered antibiotics [3]. This way we wanted to distinguish infection from contamination of the DDM-tube. However, with this approach some cases of peritonitis occurred, because the next DDM-tube remained clear and antibiotic therapy was not started. This phenomenon can be explained by the very low numbers of microbes present in dialysate in this phase, and perhaps also on the basis of cellular and humoral defence mechanisms on the peritoneal surface and in the dialysate respectively. The above experience led to a change in our approach: we now start antibiotics immediately after the detection of a cloudy DDM-tube. Contamination of the tube occurs relatively seldom and besides, is detected within 12–24 hours; in such cases antibiotics are administered for a very short time only.

The main advantage of the DDM-tube method is the possibility of preventing peritonitis, which in spite of advances in the dialysis technique still remains the most frequent complication of CAPD.

Peritonitis not only harms the patient, it also considerably increases the costs of CAPD. It is much cheaper and simpler to treat a peritoneal infection without peritonitis, as a peritonitis. The small expenditure of time and the costs for the DDM-tube method (the price of a digest medium tube is 0.80 sFr) are certainly worthwhile. Even in cases where peritonitis cannot be prevented, the DDM-tube method has advantages: a positive culture of the causative organisms is always available before the outbreak – or at the beginning of peritonitis. This speeds up sensitivity testing saving 24 hours, so that specific therapy can be started earlier. From the frequently differing series of DDM-tubes interesting information can be obtained about aetiology and development of the peritoneal infection. Therefore the DDM-tube method can also be used as a simple and helpful aid in the study of pathogenesis of CAPD-peritonitis.

References

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