Case Report of the Reliability 1,3-β-D-Glucan Monitoring during Treatment of Peritoneal Candidiasis in a Child Receiving Continuous Peritoneal Dialysis

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Fungal peritonitis is an unusual but severe complication of continuous peritoneal dialysis. The role of 1,3-β-D-glucan is unknown in early diagnosis and in treatment monitoring of peritoneal candidiasis. This case report shows the utility of 1,3-β-D-glucan monitoring in management of Candida peritonitis in a child undergoing continuous peritoneal dialysis.

CASE REPORT

A 4-year-old male receiving peritoneal dialysis for chronic renal failure at the Nephrology and Dialysis Unit of G. Gaslini Children’s Hospital, Genoa, Italy, was admitted because of the sudden onset of fever, abdominal pain, and weakness. A short-term polyurethane venous catheter was inserted for management. Blood cultures were performed through this catheter, and cultures of the peritoneal fluid were performed through the silicon catheter used for peritoneal dialysis. Empirical antibacterial therapy was started according to internal protocol, and intravenous fluconazole (10 mg/kg of body weight, once a day) and intraperitoneal administration of 200 mg daily were added when the laboratory reported yeasts (subsequently identified as Candida parapsilosis) growing from peritoneal fluid and blood cultures. After 2 days of this therapy, clinical condition and inflammatory parameters did not improve, and cultures from peritoneum remained positive. Therefore, fluconazole was substituted with caspofungin (50 mg/m² once a day) in order to administer a fungicidal drug that did not need dose reduction in patients with renal function impairment and without renal toxicity, and the peritoneal catheter was removed. Meanwhile, a polyurethane central venous catheter was inserted for administration of systemic antifungal therapy and to perform hemodialysis (on an alternate-day basis). With this management, clinical conditions improved and there was normalization of blood and peritoneal cultures. Antifungal treatment with caspofungin was administered for a total of 4 weeks without side effects.

Seriate determinations of 1,3-β-D-glucan BDG in peritoneal fluid and in serum were performed using the Fungitell assay (Associates of Cape Cod, Inc., Falmouth, MA), with a positive cutoff of 60 pg/ml, according to the manufacturer’s recommendations. Peritoneal samples were taken through the silicon catheter for peritoneal dialysis and then by paracentesis after catheter removal. Serum samples were taken from the polyurethane catheters. When the patient underwent hemodialysis, samples were taken the day the patient did not receive the procedure in order to reduce the risk of a false-positive BDG test due to hemodialysis membranes. Sampling performed after the end of the episode was again performed through the silicon catheter reinserted for peritoneal dialysis. As shown in Fig. 1, BDG levels were positive at very high levels (>523 pg/ml, which is the upper limit of detection) in the peritoneal fluid in the first days, with lower but still positive levels in serum. After catheter removal, the values of BDG rapidly dropped and became negative. BDG in the peritoneal fluid and blood resulted negative 3 weeks later, when a new catheter for peritoneal dialysis was inserted.

Comments. Peritoneal dialysis is a good alternative to hemodialysis, but infections are a severe complication of this procedure. Fungal peritonitis is reported in 2 to 15% of patients, with Candida albicans, Candida tropicalis, and Candida parapsilosis representing the most frequently isolated fungi (2). Recent guidelines for the treatment of this infection recommend prompt catheter removal and administration of fungicidal agents (7), while there is no mention of the possible role of BDG for monitoring effectiveness of treatment.

Our case report shows that BDG monitoring both in serum and peritoneal fluid may be useful to assess response to therapy, with concomitant evaluation of clinical conditions and microbiology. The major problem existing in this case report is the possibility of a false-positive BDG test (10). While hemodialysis with cellulose membranes is reported as a risk factor for false-positive results (4, 5), the role of membranes for peritoneal dialysis is unknown. In regard to the components of the intravenous or peritoneal dialysis catheters as a possible cause of a false-positive test, a MEDLINE search using keywords “1,3-β-D-glucan,” “silicon catheter,” or “polyurethane catheter” did not show any report. Even if the marked difference in BDG levels found in peritoneal fluid before and after catheter removal could also be due to BDG release by yeasts present in the infected catheter lumen, the clinical and microbiological course of our patient paralleled the modifications of BDG levels in both serum and peritoneal fluid, with reductions and normalizations of the values clearly related to the management (catheter removal and antifungal therapy) and therefore excluding the possible risk of false-positive tests by external factors (catheter materials). A further indirect support to
this assumption is the fact that the end-of-therapy samples for cultures and BDG taken through silicon peritoneal dialysis catheters were negative in the absence of local and general signs of infection. Finally, and as supplemental information, this case report also confirms that catheter removal is essential for treatment (7) and that caspofungin may represent an effective therapy for invasive disease due to \textit{C. parapsilosis}, in spite of \textit{in vitro} data suggesting a possible lower efficacy (3).

Studies and meta-analysis show that BDG is a useful test for diagnosis of invasive fungal infections in adults with hematologic malignancies or admitted in intensive care units when combined with clinical, radiological, and microbiological findings (1, 8, 6). On the contrary, few data are available in pediatrics, and these are derived from healthy subjects or small case series of immunocompromised children with otherwise documented invasive mycoses (9, 11). The present case report shows the reliability of BDG in the management of \textit{Candida} peritonitis in patients undergoing peritoneal dialysis, with a good correspondence between 1,3-β-D-glucan levels in peritoneal fluid and serum and microbiological and clinical outcome of the patient.

REFERENCES