Case Report
Efficacy of antibiotics for catheter-related bloodstream infection in elderly patients on hemodialysis

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Abstract: This study aimed to explore the efficacy of antibiotics for the treatment of catheter-related bloodstream infection (CRBSI) in elderly patients on hemodialysis (HD) without the removal of the catheter. Between June 2013 and October 2014, three patients undergoing HD in the Geriatric Department developed CRBSI and were treated with antibiotic for 4 weeks. The patients had temporal cannulation durations of 349, 742, and 761 days, respectively. Blood culture results were Pseudomonas aeruginosa, Staphylococcus aureus, and negative, respectively. In conclusion, CRBSI is a common complication of long-term HD catheterization. For elderly patients, vascular access is difficult and systemic administration of antibiotics via venous access in combination with an antibiotic lock is associated with better outcomes.

Keywords: Antibiotics, catheter-related bloodstream infection, elderly patients, hemodialysis

Introduction

With population aging and the advancement of hemopurification techniques, increasing numbers of elderly patients are receiving hemodialysis (HD) and living longer. A tunneled cuffed catheter (TCC), also called a long-term catheter, appears to be the optimal alternative for these patients with poor vasculature. However, catheter is associated with several complications, especially catheter-related bloodstream infection (CRBSI) [1]. The present study aimed to investigate the efficacy of antibiotics for the treatment of CRBSI in elderly patients receiving HD. We enrolled three elderly patients receiving HD who developed CRBSI in the Geriatric Department of Beijing Hospital between June 2013 and October 2014, and treated them with antibiotics to identify the optimal treatment modality.

Methods

Between June 2013 and October 2014, 98 elderly patients received HD at our Department. All patients used catheter during HD. The age of patients ranged from 70 to 98 years. Three patients developed CRBSI after HD. The medical records of the three patients were extracted and analyzed. This study was approved by the Ethics Committee of Beijing Hospital (Beijing, China), and all patients signed informed consent.

Results

Among 98 elderly patients who received HD, three patients developed CRBSI, including two patients who could walk and one who used a wheelchair.

The first patient was a 95-year old woman (weight: 60 kg, height: 163 cm) and she was on HD for 2.5 years. After HD on September 29, 2014, she developed a fever (39°C), no-shaking chills, and cough with copious phlegm. Blood test was normal. Chest radiography showed increased bronchovascular shadows in the right lung. Pseudomonas aeruginosa was cultured from the sputum, and she was initially diagnosed with a pulmonary infection and probable CRBSI. Therefore, she was given intravenous suplerazon (1.5 g) (Pfizer, China) and oral linezolid tablets (Pfizer, USA). However, the temperature increased to 39.2°C following HD on October 1, 3, and 4 but was normal on the day...
with no HD (October 2). On October 4, the patient's temperature increased to 39°C following HD. Rough breath sounds were heard in both the lungs with no significant rhonchi or rales. Several samples from the peripheral vessels as well as the arterial and venous accesses of the TCC were cultured for microorganisms. The results of blood test were as follows: WBC count 18.71 × 10^9/L, Hb 114 g/L, and PLT 114 × 10^9/L. Ultrasonic cardiography (UCG) revealed no vegetations on the heart valves. During this period, blood cultures were positive for *P. aeruginosa*, and 0.5 g meropenem (Dainippon Sumitomo Pharma, Japan) in 100 mL was administered every 12 h via both venous and arterial access. The arterial and venous accesses were locked using 2.9 mL meropenem dilutions and 0.4 mL fraxiparine. The patient’s temperature improved and meropenem was replaced with 2.25 g tazocin (Wyeth Lederle SPA, USA) and the arterial and venous accesses were locked using 2.9 mL tazocin dilutions and 0.4 mL fraxiparine. On October 27, tazocin was discontinued. Thus, the antibiotic was used for a total of 4 weeks. Up to now, the patient is still live and remains on regular HD through the right internal jugular vein TCC.

The second patient was a 90-year-old man (weight, 60 kg; height, 167 cm) and he was on HD for 2.5 years. On June 3, 2013, the patient developed a fever after HD accompanied by anorexia with a dry cough and fatigue. His temperature increased from 37.5°C to 37.8°C on the HD days but was normal on the non-HD days. Physical examinations were normal. The results of blood test were also normal. The next day, antibiotic was taken orally. However, the patient still had a low-grade fever (37.4°C) and anorexia, and CRBSI was suspected. On June 12, 0.2 g of targcid (Gruppo Lepetit S.r.l., Italy) in 100 mL of saline was infused via the HD access every other day. After 1 week of treatment the fever persisted (temperature increased to 37.8°C), therefore, he received 0.5 g of meropenem twice daily on HD days and once daily on non-HD days. One week later, his temperature increased to 38.5°C accompanied by chills and vomiting just after HD. Blood test showed the following: Hb, 112 g/L; WBC, 10.23 × 10^9/L; and PLT, 227 × 10^9/L. Multiple blood cultures were negative. On June 25, targarocid and meropenem were replaced by linezolid (0.6 g; Fresenius Kabi Norge AS, Norway) and sulperazon (1.5 g in 100 mL of saline) injected intravenously every 12 h and the HD accesses were locked using 2 mL linezolid dilution and 1.6 mL raxiparine, for arterial and venous access, respectively. The patient had no fever or discomfort. Up to now, the patient is still live and continues HD via the right internal jugular vein TCC.

The third patient was a 97-year-old man (weight, 49.5 kg; height, 163 cm) and he was on HD for 2.6 years. On March 17, 2014, he developed sudden chills and fever accompanied by nausea and vomiting of 100 mL of gastric content at the end of HD. The breath sounds of both the lungs were normal. The results of blood test were as follows: WBC count 10.56 × 10^9/L, Hb 132 g/L, and PLT, 227 × 10^9/L. Multiple blood cultures were negative. On June 25, targarocid and meropenem were replaced by linezolid (0.6 g; Fresenius Kabi Norge AS, Norway) and sulperazon (1.5 g in 100 mL of saline) injected intravenously every 12 h and the HD accesses were locked using 2 mL linezolid dilution and 12500 U heparin. Afterward, the temperature and blood WBC count gradually returned to normal.
Catheter-related bloodstream infection in hemodialysis

drawn on July 21. The patient died in April 30, 2015 because of biliary tract infection.

Discussion

Increasing numbers of elderly patients are receiving MHD and living longer. In 2011, 399,000 patients underwent sustainable dialysis with an average age of 62.6 years in US [2]. In Europe, patients with end-stage renal disease older than 65 years constitute 55% of all patients with HD. In the USA, the median survival is 15.6 months for the patients beginning dialysis at age 80-84 years, 11.6 months for those beginning dialysis at age 85-89 years, and 8.4 months in those beginning dialysis at age ≥90 years [3, 4]. In this study we presented three elderly patients with an average age of 94 years who had a high quality of life due to intensive treatment and care.

For elderly patients, the creation of vascular access is challenging because of accompanied diseases such as peripheral arteriosclerosis and TCC is an excellent alternative. In the present report, the three patients received a long-term indwelling catheter in the internal jugular vein. In our hospital, 60% of all elderly patients >90 years of age have a long-term catheter, this is consistent with the results of a study in Canada that showed that 62% of patients on HD >85 years of age had a central venous catheter [5].

Catheter-related infection (CRI) is a severe complication of long-term catheterization that influences the working life of the catheter and even patient lifespan. In 2009, the Infectious Disease Society of America (IDSA) recommended that long-term catheters should be removed from patients with CRBSI associated with infections due to S. aureus, P. aeruginosa, fungi, or mycobacteria, and temporal non-tunneled catheter should be indwelled in other sites. To treat CRBSI, an antibiotic lock should be combined with systemic administration of antibiotics [6]. However, for elderly patients with poor vasculature, particular concern should be given to protect the existing vascular access. In the present study, the long-term catheters were not removed from all three patients. One patient was given the combination regimen after intravenous administration proved poorly effective, while the other two patients were treated directly by medicine via the vascular access plus antibiotic lock. The three patients remained on regular HD through the TCCs after infection control for a long time (7 months to 1.5 years). We believe that without the removal of catheters, intra-catheter administration plus antibiotic lock is enough to bring good outcomes under strict aseptic manipulation in elderly patients.

There is still no consensus about the concentration and frequency of catheter sealing or the effect on catheter thrombosis and infection [7, 8]. In our clinical practice, vascular access is locked with urokinase at a dosage of 50000 U/mL every 2-4 weeks, which is higher than the 5000 U/mL recommended [9] to avoid the risk of bleeding. Therefore, we propose that regular catheter sealing with urokinase is valuable for preventing thrombosis and ensuring adequate HD and survival under strict aseptic manipulation.

In conclusion, CRI should be highly suspected in the event of fever during or following HD but not on non-HD days, and timely blood cultures should be obtained. The catheter should not be removed until there is evidence about complicated infection such as a tunneled infection, endocarditis, or osteomyelitis. Early and full-course administration of sensible antibiotics is highly effective. CRBSI could be effectively treated by systemic antibiotics via the catheter in combination with an antibiotic lock under strict aseptic manipulation, without the removal of the catheter.

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Disclosure of conflict of interest

None.
Catheter-related bloodstream infection in hemodialysis

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