

# Successive cardiac arrest due to polysulfone hemodialysis membranes

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## Dear Editor,

The occurrence of anaphylactic and anaphylactoid reactions during hemodialysis treatments have been known for many years. Despite significant improvements in hemodialysis technologies, hypersensitivity reactions occur with the repeated exposure of blood to foreign substances in some patients. In the literature, dialysis membranes, materials used for sterilization, pure water used for dialysis, and various drugs given to the patient during dialysis have been shown to be responsible for the reactions (1). We aim to present anaphylactic reactions that cause repeated cardiac arrests against the polysulfone hemodialysis membrane.

A 48-year-old female patient was admitted to nephrology unit due to infection and acute renal failure. The patient had diabetes mellitus and hypertension. Sudden cardiac arrest occurred at the beginning of the second hemodialysis session in the dialysis unit. First intervention made by the Blue Code Team. Patient responded with approximately 5 minutes of cardiopulmonary resuscitation and 1 mg of epinephrine. Patient was accepted to intensive care as intubated and then hemodialysis completed. Small infarct areas in the left parietal lobe were detected in the brain diffusion magnetic resonance imaging. Piperacillin-tazobactam treatment was started because occurrence of infection. (procalcitonin:6.86 ng/mL, C-reactive protein:204 mg/L and white blood cell: 13500/L). No cardiac pathology was detected by echocardiography. Two days later, the patient had cardiac arrest again at the onset of hemodialysis in the intensive care unit. Patient responded after approximately 2-3 minutes of cardiopulmonary resuscitation and 1 mg of bolus epinephrine injection. No other Endocrinal pathology was detected in the patient. Bilateral renal artery doppler ultrasound was normal. Vancomycin was added to the antibiotic treatment.

There was no microbial reproduction in the cultures. The patient's angiotensin II antagonist + diuretic combination for hypertension was discontinued. Later, feniramin maleat and dexamethasone were administered before the hemodialysis sessions. Extracorporeal circuits were washed with saline and there was no problem in the next two dialysis sessions. The patient was cardiac arrested again despite the same preparations for the third hemodialysis session. Patient again responded with approximately 2-3 minutes of cardiopulmonary resuscitation and 1 mg of bolus epinephrine. Basophil, complement C4, Immunglobuline A, Immunglobuline E and cortisol level were high after the attack. Finally the polysulfone filter was replaced with a filter with polyamide. Later hemodialysis was done 2-3 times a week in 30 days in the intensive care unit and there was no problem.

Anaphylactic and anaphylactoid reactions due to hemodialysis have been increasing in recent years. It is difficult to accurately define the etiology of these reactions and to determine their true incidence. Studies indicate that there is more reaction with the use of synthetic membranes (1-3). In the last decade the number of hemodialysis patients in the world has increased. Hence, millions of dialysers are made from the poly-aryl-sulfonate family. In a review of the literature from 2003 to 2016, only 32 acute reactions due to polysulphone (28 cases) and poly-aryl-ethersulfone (4 cases) were reported (3). Sanchez-Villanueva et al. presented six cases of hypersensitivity with various synthetic membranes including polysulfone (helixone) and poly-ethersulfone (4). In our case, we present a series of consecutive cardiac arrest, which is connected to the Helixone FX-100 classix polysulfone (Fresenius) dialysers.

We considered our case as an anaphylactic reaction for the elevation of Immunglobuline E level and the

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development of cardiac arrest during the reaction period. Such reactions have been reported to be associated with the use of polyacrylonitrile membranes and angiotensin converting enzyme inhibitors, unlike polysulfones. However, our patient was taking angiotensin II antagonist and the drug was discontinued after the first reaction. Furthermore, acetylsalicylic acid, beta-blocker, arrhythmia, ultrafiltration, cardiac insufficiency or ischemia, which should be distinguished from dialysis reactions, did not exist in our case (3). Type A reactions usually occur at the beginning or the first 30 minutes of hemodialysis and require stopping dialysis (1). In the literature, the cardiopulmonary findings of the polysulfonol reactions occurring in the first 30 minutes of hemodialysis correspond to the diagnostic criteria of anaphylaxis (3,5). Our case is compatible with type A reaction because of cardiac arrest three times with circulatory collapse during the first minute of hemodialysis. Type B reactions are more common, less severe and the complement is mediated. Typically after about 15 to 30 minutes in dialysis treatment, it usually resolves without interruption of dialysis (6).

In our case, we tried to solve the problem by circuit washing, antihistaminic, dexamethasone, and we were late to suspect the polysulfonic membrane. There may be diagnostic difficulties in hemodialysis reactions and clinicians should have a high index of suspicion. According to Simon et al., The risk of hypersensitivity reaction in cellulose membranes is 10 to 20 times higher than in synthetic membranes (7). But the reactions that occur with synthetic membranes are usually resolved by replacing the filters with cellulosic ones (3). In our case, the polyamide filter that we can be supplied in our hospital has been replaced and the problem has been solved. In one article, 32 patients with membranes of the polyarylsulphonate family were presented. 6 patients were cardiopulmonary resuscitated and two patients were died (3). In another study, 6 patients with anaphylactoid reaction with AN69 use were presented and 4 patients were cardiopulmonary resuscitated and one patient died (8). In our case, the patient had 3 times cardiac arrest with polysulfone membrane and successfully resuscitated

with administration of epinephrine.

Successful management of these patients requires a multidisciplinary approach. In addition rapid recognition and treatment by the relevant physician are important. Awareness will increase with reporting of reactions to polysulfone membranes (2). If symptoms are seen, hemodialysis should be terminated first and blood in the circuit should not be returned to the patient. Early diagnosis and removal of membrane exposure can lead to successful results (1). The next stage is the treatment of symptoms and avoiding aggressive agents. Treatment of hemodialysis-related reactions should be based on epinephrine according to the type and severity of the reaction. Epinephrine should be administered intravenously in the event of severe life-threatening shock. We believe that the use of epinephrine is vital.

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