CASE REPORT

Allergic reaction to polysulphone membrane dialyser masquerading as infection

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SUMMARY

Hypersensitivity reactions during haemodialysis are well documented in the literature. Most dialysis membrane reactions occur with ethylene oxide or non-biocompatible membranes and less frequently with biocompatible membranes. The symptoms are non-specific except for the temporal relationship typically occurring during the haemodialysis. Patients who present with the non-classic type of reaction pose a diagnostic challenge and clinicians must have a high index of suspicion. We present a non-classic presentation of a hypersensitivity reaction to a polysulfone membrane dialyser with recurrent fevers during and after haemodialysis, initially thought to be due to infection. After a series of negative work ups for infection, dialysis membrane reaction was considered and the patient improved after change of the membrane.

BACKGROUND

Allergic reactions during haemodialysis have been reported as related mostly to ethylene oxide sensitisation or non-biocompatible membrane dialysers such as cupramonium membranes.[1] Adverse reactions to biocompatible polysulphone are not frequent but several cases have been reported.[2–4] The typical presentation is an allergic syndrome that begins a few minutes after starting dialysis.[5] Patients with a non-classic presentation such as recurrent fever after dialysis pose a diagnostic challenge given that most patients on dialysis are also infection prone.[6] We present a case of a patient with recurrent intradialysis and postdialysis fevers initially thought to be due to infection.

CASE PRESENTATION

A 79-year-old man with end-stage renal disease had been on haemodialysis three times a week using Advance Fresenius polysulphone-based high flux dialysers (Optiflux F160 NR) through an arteriovenous fistula for 2 years. The dialysers were single use, 1.5 m^2 and sterilised by electron beam technology. The other components of the dialyser included polyurethane (potting compound) and polycarbonate (housing). At the dialysis centre, standard hygiene procedures are followed to ensure dialysate purity.

The patient presented with chest pain, light headedness, dyspnoea, fever and chills during and after haemodialysis. He had been presented multiple times to the hospital with similar symptoms over a 6-month period and each time work up for infection, including numerous blood cultures, urine and stool cultures, were negative. The dyspnoea was initially attributed to fluid overload and fever was thought to be due to recurrent pneumonia. The patient's symptoms would subside with empiric antibiotics for pneumonia, only to recur just a few days after discharge from the hospital. Physical examination revealed an elderly man with a temperature of 105.5°F, blood pressure of 148/84 mm Hg, pulse 122 bpm and respiratory rate of 22 breaths/min. Respiratory, abdominal and cardiovascular examination findings were unremarkable. There was no erythema or tenderness at the fistula site.

INVESTIGATIONS

Laboratory data revealed a total white cell count of 9.2 K/uL, without bands, eosinophil count of 5.9% from a baseline of 2%, haematocrit 26.8, blood urea nitrogen 35 mg/dL and creatinine 8.8 mg/dL. Brain natriuretic peptide was 5083 pg/mL and there was slight troponin elevation at 0.6 ng/mL. CT scan of the chest showed mild bronchiectasis unchanged from a prior study and CT of the abdomen showed cholelithiasis but no cholecystitis or other focus of infection. Doppler ultrasound of the patient's fistula was negative for septic thrombi. A transoesophageal echocardiogram was negative for infective endocarditis but showed grade 2 diastolic dysfunction with moderate pulmonary hypertension. Thyroid function tests, rheumatoid factor and antinuclear antibody were negative. Serology for Lyme disease, ehrlichiosis and babesiosis was negative.

TREATMENT

In view of the history of recurrent fever and chills during or after dialysis with negative work up for infection, an allergic reaction was suspected. Mast cell tryptase was increased both predialysis at 15.5 ng/mL and postdialysis at 17.70 ng/mL.

OUTCOME AND FOLLOW-UP

The patient's symptoms resolved after changing from a polysulphone-based to cellulose-based membrane (Baxter Exeltra 150). The Baxter Exeltra 150 is composed of cellulose triacetate, single use, 1.5 m^2 and sterilised by γ irradiation. A few months later eosinophils fell from 5.9 to 2.1 and mast cell tryptase fell from 17.7 to 11.6. The patient is doing well with haemodialysis three times a week.

DISCUSSION

Fever during dialysis is a common finding and may be due to infectious or non-infectious causes. Dialysis patients are infection prone and in one study, the rate of infection was 5.7 per 1000 dialysis days.[7] When our patient first presented with the

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fevers, infectious aetiologies needed to be excluded. It was after a negative work up for infectious aetiology that allergic reaction was considered. Allergic reactions need to be considered early in any febrile patient on dialysis, even if he or she has been on dialysis for a long time without problems, to avoid delays in diagnosis. Dialyser hypersensitivity reactions were previously thought to be rare with an incidence of 4 per 100 000, but a recent study showed that the rate of hyper sensitivity might be as high as 1 in 50.[8]

There are two types of dialyser reactions: type A and type B. Type A hypersensitivity reaction normally occurs in the first few minutes of dialysis although it can be delayed to about 30 min after the onset of dialysis.[5] Type A reactions are thought to be mediated by preformed antibodies such as immunoglobulin E. Type A reactions are usually more severe than type B and require stopping dialysis. Mild symptoms include itching, burning sensation at the access site, urticaria, flushing, cough, sneezing, wheezing, abdominal cramps, diarrhoea, headache, back and chest pain, nausea, vomiting, fever and chills. More severe reactions lead to dyspnoea and hypotension, potentially resulting in cardiac arrest and death. Compared to type A, type B reactions are less common, less severe and are mediated by complement. Type B symptoms typically do not occur until 15–30 min into the dialysis treatment, and generally do not require discontinuation of the dialysis treatment. The most common symptoms are chest and back pain, dyspnoea, nausea, vomiting and hypotension.[1] Our patient did not fit a classic type A reaction except for the severity of the reaction. One must keep in mind that patients can have variable presentations in hyper sensitivity reactions.

Elevated IgE levels, eosinophilia and mast cell tryptase support the diagnosis of hypersensitivity reaction.[9] Our patient had eosinophilia and elevated mast cell tryptase with improvement in the numbers after changing the dialyser membrane. Ethylene oxide, commonly used to sterilise dialysis materials, is a common cause of hypersensitivity,[10] although this was not the case in our patient, as ethylene oxide was not used. Polysulphone membranes can activate complement leading to a hypersensitivity cascade. Although several cases have been described,[2–4] allergic reactions are more common with cellulose-based membranes.[1] Our patient reacted to the polysulphone membrane and tolerated the cellulose-based membrane.

The treatment for type A reactions include: immediately stopping dialysis without returning the blood to the patient. Depending on severity, other treatment modalities such as antihistamines, steroids, epinephrine, bronchodilators and pressors may be used. Once a dialysis membrane is identified as the culprit, switching to a different membrane type is indicated.[11]

Learning points

- Fever in a setting of dialysis is most likely due to infection but dialysis-related hypersensitivity reactions should be considered, especially if work up for infection is negative.
- Persistently elevated eosinophil levels and mast cell tryptase are quick pointers to allergic reaction.
- Patients may tolerate cellulose-based membranes even though they are more likely to cause allergic reactions.

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