INTRODUCTION

In the last decades of the previous century, acute dialysis reactions were relatively common in patients treated by hemodialysis (HD). Causes included the use of bio-incompatible, complement-activating dialyzer membranes, ethylene oxide sterilization of dialyzers inducing IgE mediated hypersensitivity and exposure to polycrylonitrile (PAN) membranes triggering bradykinin production. However, even in the current era of more biocompatible dialyzers and the replacement of ETO sterilization with other methods, cases of acute dialyzer reactions continue to be reported, also recently (e.g. Semin. Dial. 29:81-84, 2016, Clin. Nephrol. 83:100-103, 2015).

OBJECTIVES

1. To report 2 recent cases of acute dialyzer reactions;
2. To define characteristics of acute dialyzer reactions in the current era;
3. To increase awareness of acute dialyzer reactions;
4. To define a management strategy in cases of acute dialyzer reactions.

METHODS

PubMed & Internet search for “acute dialyzer reactions” from January 2005 through December 2015.

RESULTS

Literature: 30 more cases (total number analyzed including our cases: 32).

Characteristics of acute reactions

- **Age**: 64.7 years (range 22-89.5%)
- **Early onset dialyzer exposure**: 93% (72-100%)
- **Early onset of symptoms**: 69 (33-100%)
- **Immediate cross-reactivity**: 29 (14-100%)
- **Immediate cross-reactivity, non-PSu/PESu**: 20 (10-100%)
- **Early onset of symptoms, non-PSu/PESu**: 20 (10-100%)
- **Immediate cross-reactivity, non-PSu/PESu, CTA or CDA**: 20 (10-100%)
- **Immediate cross-reactivity, non-PSu/PESu, CTA or CDA, and PAN**: 20 (10-100%)
- **Early onset of symptoms, non-PSu/PESu, CTA or CDA, and PAN**: 20 (10-100%)
- **Immediate cross-reactivity, non-PSu/PESu, CTA or CDA, and PAN, and PMMA**: 20 (10-100%)
- **Early onset of symptoms, non-PSu/PESu, CTA or CDA, and PAN, and PMMA**: 20 (10-100%)

Dialyzers causing acute reactions

- All dialyzers contained polysulfone/ polyethersulfone membrane
  - Polysulfone (PSu): 20 (87.5%)
  - Polyethersulfone (PESu): 4 (12.5%)
- Freestyle: 23 (75.0%)
- Gambro: 3 (12.5%)
- Toray: 3 (12.5%)
- Bbraun: 1 (4.25%)
- Nipro: 1 (4.25%)
  - Nipro: 1 (4.25%)

Lost to follow-up: 2 patients

Alternative PSu/PESu dialyzer: 14 patients, 18 trials (see legend to figure)

Only 2 patients (14.3%) could be treated successfully with an alternative PSu/PESu containing dialyzer.

In 12 patients (85.7%) or 16 trials (88.9%) acute dialyzer reactions occurred, usually at first exposure.

These patients reacted favorably to CTA (n=7), CDA (n=1) or PAN (n=4) dialyzers

Alternative non-PSu/PESu dialyzer: 16 patients

These patients reacted favorably to CTA (n=10), CDA (n=1), PAN (n=1) or PMMA (n=4) dialyzer

CONCLUSIONS

The incidence of acute dialyzer reactions appears to be low with 32 cases reported in the last decade in which billions of dialyzers have been used world-wide. However, the true incidence is unknown, many cases not being recognized or remaining unreported.

Consequently, dialysis staff should always consider an acute dialyzer reaction in a patient repeatedly showing unexplained cardio-pulmonary symptoms early during dialysis. Notably, almost 50% of these reactions occur late (11 months, range 1–36 months) after first exposure to the offending dialyzer.

CASE 1

Male, 74 years old, diabetic nephropathy, start HD in February 2012.

Dialyzer: F8-HPS, polysulfone, steam sterilized, low flux (Fresenius®).

After 7 months gradually increasing dyspnoea in early phase (>30 min) of dialysis, resulting in severe attacks: hypotension - hypoxia - abdominal pain.

Switch to Sureflux, cellulose triacetate, gamma radiation, low flux (Nipro®): asymptomatic.

Intentional rechallenge with F8-HPS dialyzer: immediate recurrence of symptoms.

Follow-up on cellulose triacetate dialysis sessions uneventful >3 years.

CASE 2

Male, 69 years old diabetic nephropathy, start HD in November 2015.

Dialyzer: F8-HPS, polysulfone, steam sterilized, low flux (Fresenius®).

At 3rd, 5th, 6th and 9th session episodes of severe unexplained hypotension, nausea and vomiting.

Switch to Sureflux, cellulose triacetate, gamma radiation, low flux (Nipro®): asymptomatic.

Accidental rechallenge with F8-HPS dialyzer: severe hypotension after 50 minutes.

Follow-up on cellulose triacetate dialysis sessions uneventful >6 months.

Acute dialyzer reactions in the current era were all caused by dialyzers containing a polysulfone or polyethersulfone capillary membrane.

In ~90% of attempts, patients with acute reactions who were treated with a different polysulfone or polyethersulfone dialyzer showed cross-reactivity.

Hence, patients with acute reactions to a polysulfone or polyethersulfone dialyzer should not undergo potentially dangerous exposure to a similar type of dialyzer in a trial-and-error fashion. They should be switched to a dialyzer containing cellulose triacetate or diacetate (most experience), or to a dialyzer containing polycrylonitrile (PAN) or polymethylmethacrylate (PMMA).

Abbreviations

- PSu/PESu: polysulfone/polyethersulfone
- CDA: cellulose diacetate
- CTA: cellulose triacetate
- PAN: polycrylonitrile
- PMMA: polymethylmethacrylate