

Research Article

Preliminary Survey of the Occurrence of Anaphylactic Reactions in End Stage Renal Disease Patients who are Undergoing Haemodialysis

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Abstract: Chronic renal failure is one of the most commonly encountered diseases in the hospital. Chronic renal failure (CRF) is a term used to describe gradual reduction in renal function over the span of weeks to years. Therapeutic options include Hemodialysis (HD), peritoneal dialysis (PD) and transplantation. Anaphylactic reactions related to hemodialysis have been increasingly described for almost 3 decades. The majority of these cases used to occur with ethylene oxide and with sterilized, complement activated cellulose membrane. Chronic renal failure patients who are on hemodialysis are observed for the prevalence of dialyzer reactions. Signs of a hypersensitivity reaction generally appear within few minutes after exposure to the provoking agent. Immune effector cells are often involved, with or without IgE involvement, but reactions may also show non-immune mediated mechanisms.

Keywords: End stage renal disease, Dialyzer reactions, Hypersensitivity reactions, Cellulose membrane dialyzer

INTRODUCTION

Anaphylactic reaction related to haemodialysis membrane was first reported in 1975 [1]. Though their severity is usually mild, thus widely underestimated, but occasionally be life-threatening [2]. A well-documented prospective study on its incidence is rare [3].

However, according to the data from the Food and Drug Administration, a severe hypersensitivity reaction was reported in 3.5 of 100,000 dialysis sessions in 1982 [4, 5].

Such reactions consist of a series of incidences involving both anaphylactic and reactions with unknown causes. The classification involves Type-A (Hypersensitivity) reactions and Type-B (Nonspecific) reactions.

During hemodialysis, the patient's blood passes through many extracorporeal Compartments. These include the dialyzer, the blood tubing set. The chemicals are used during sterilization of the dialyzer and the dialysate. The dialyzer contains a dialysis membrane which is sterilized during its manufacturing process [6].

Dialyzers are available in two geometries. According to their membrane structure they are hollow-fibre and parallel plate dialyzers. Hollow-fibre dialyzers consist of thousands of tiny hollow fibres. Blood flows into the compartment at one end of the cylinder-shaped case and passes through thousands of tiny capillaries. Dialysis solution flows in the opposite direction of the blood flow around the capillaries. Blood passing through the capillaries is collected in the compartment at the other end of the dialyzer and returned to the patient. With respect to the material used membranes are of various types various types can be cellulose, synthetic, semi-synthetic, synthetic and bioactive [7].

Synthetic membranes are commonly used. Varieties currently used include cellulose membrane, substituted cellulose membrane, cellulose synthetic membranes. Cellulose membrane also called as cuprophane (or cuprophane), is a polysaccharide-based membrane obtained from pressed cotton, composed of chains of glucose rings with abundant free hydroxyl groups. Substituted cellulose membranes are synthesized by chemical bonding of a material to the free hydroxyl groups at the surface of the cellulose polymer. The most common type of substituted cellulose is cellulose acetate, where acetate replaces 80 percent of the hydroxyl groups. Cellulosynthetic membranes are

obtained by the addition of a synthetic material (like diethylaminoethyl in the production of homophone) to liquefied cellulose during its formation [7].

MATERIALS AND METHOD

The study was conducted in the Department of Nephrology, Melmaruvathur AdhiParasakthi Institute of Medical Sciences conducted in the period between August - October in 2014. Totally 25 patients were included in the study. All the patients were on regular haemodialysis.

Inclusion criteria

Patients who are on AV-fistula, with regular heparin dosage, three times dialysis in a week. All patients were under the duration of 4 hours of haemodialysis session, with erythropoietin therapy.

Exclusion criteria

Temporary vascular access patients, peritoneal dialysis patients, who are positive for HbSAg and HCV, HIV antigen are excluded from our study. Onset of prevalence of risk of dialyzer reactions were observed throughout the session. The complications were managed during session.

OBSERVATION AND RESULTS

From our study Type A reaction were observed in 8 patients, Type B reaction was observed in 5 patients among 25 patients who are on hemodialysis.

Type A reaction observed in the study [n=8(25)]

- Dyspnoea
- Burning/heat sensation at the access site or throughout the body
- Angioedema
- Reproducible during subsequent dialysis when using the same type or brand of dialyzer
- Urticaria
- Rhinorrhea
- Abdominal cramping

Treatment

The dialysis must be immediately discontinued and the blood in the blood tubing set must not be given back to the patient. Antihistamine, adrenalin or steroid may be administered depending on the severity of the reaction [6].

Prevention

It can be considered to sufficiently wash the dialyzers before using them for each patient, to use a dialyzer sterilized by γ -rays or steam if the reaction was due to the use of a dialyzer sterilized by ethylene oxide.

Type B reactions observed in the study [n= (5)25]

- Primary symptoms are chest ,back pain, itching
- Occurs 20-40 minutes into the dialysis treatment

- Disappears or lessens dramatically during the subsequent hours of dialysis.

Treatment

Symptomatic and supportive measures. Discontinue HD and discard the blood tubing's, oxygen therapy, anti-histamines, epinephrine and corticosteroids. HD can be initiated after stabilization with a more biocompatible membrane and a hemodialysis not sterilized with ETO (ethylene oxide)

Prevention

Avoid combination of PAN membrane and angiotensin converting enzyme inhibitor (ACEI) use. Use of ARBs (angiotensin receptor blockers) and dialysate with 3.5 mEq/L calcium may lower the risk.

DISCUSSION

Type A reactions

Occur very shortly after dialysis is initiated, typically within the first few minutes due to pre-formed antibodies causing mast cell degranulation. Symptoms include hypotension, chest pain, and dyspnoea. An outbreak of Type A reactions was previously associated with ethylene oxide, but can presumably be due to other compounds within dialysis cartridges. Treatment of the Type A reaction involves immediate stoppage of the dialysis procedure, administering medications such as epinephrine, steroids, and antihistamines, and standard supportive care which may require pressors and bronchodilators [6].

The symptoms may start with dyspnoea, fear of death, and a sensation of heat in the fistula site or the whole body and end with a complete anaphylactic episode. In less severe cases, there may be symptoms such as itching, coughing, sneezing, nasal discharge, nausea and vomiting. They generally occur at the very beginning of dialysis session [8].

The major criteria includes the reaction occurring in the first 20 minutes after the beginning of dialysis, whereas the minor criteria include recurrence of the reactions during the next dialysis session when the same class or type of dialyzer is used [9].

It is mostly caused by sterilization using ethylene oxide, other reasons being the use of an AN69 membrane, complementary fragment release [10].

Type-B reactions

The primary symptoms are chest pain and lower back pain. They appear after 20 to 40 minutes after the beginning of dialysis. The symptoms alleviate or disappear in the progressing hours of the dialysis. Complement activation may be the reason, although the aetiology is not fully known [11]. The treatment is similar to that in type-A reactions and is adapted depending on the intensity of the symptoms and technical problems [12]. In contrast, in a more delayed

fashion i.e. after 15-30 minutes of dialysis and symptoms include chest/back pain, nausea/vomiting, and milder hypotension. It was apparently more common with cellulose-based membranes and is less commonly a problem with the more modern synthetic membranes. Since symptoms are generally mild and can improve with time [6].

CONCLUSION

Treatment of haemodialysis-associated anaphylactic reactions depends on the type of reactions and its severity. Stoppage of dialysis session, without returning the blood to the patient and cessation of eventual drug supply is the first measure, followed by adequate general and specific individualized procedures, according to the general rules of emergency treatment [13-16].

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