Types of plasma removal treatment

Plasma, the liquid component of blood, plays a crucial role in transporting nutrients, hormones, and proteins throughout the body. It constitutes about 55% of total blood volume and contains essential components such as clotting factors, immunoglobulins, and albumin. Medical procedures involving plasma—such as plasma donation, plasmapheresis, and plasma exchange—are vital for both therapeutic and donation purposes. While these terms are sometimes used interchangeably, they refer to distinct processes with specific applications. This essay explores the differences between plasma donation, plasmapheresis, and plasma exchange, highlighting their procedures, purposes, and clinical significance.

Plasma Donation

Plasma donation is a process where a healthy person altruistically donates plasma for medical use. The collected plasma is primarily used for manufacturing plasma-derived medicinal products (PDMPs), such as clotting factors for haemophilia patients, immunoglobulins for immune deficiencies, and albumin for critical care situations.

During plasma donation, blood is taken from the donor and passed through a machine that separates, using centrifugation or filtration, plasma from other blood components. The red blood cells, white blood cells, and platelets are then returned to the donor's bloodstream, while the plasma is collected for use. This process typically takes about 1 to 2 hours and can be performed more frequently than whole blood donation because the body replenishes plasma faster than red blood cells (JPAC, 2024).

Plasmapheresis

Plasmapheresis is a medical procedure that involves the removal, treatment, and return of plasma to the patient's body. It is a form of apheresis specifically targeting plasma components. Plasmapheresis can be therapeutic or altruistic. In therapeutic plasmapheresis, harmful substances in the plasma are removed to treat certain medical conditions (Schwartz et al., 2016).

In plasmapheresis, blood is taken from the patient and passed through an apheresis machine. The plasma is separated from the cellular components. Depending on the treatment goal, the plasma may be treated to remove specific substances (like antibodies or toxins) and then returned to the patient along with the blood cells (Kaplan, 2013). The procedure usually takes 1 to 3 hours and may require multiple sessions depending on the condition being treated (Mokrzycki & Kaplan, 1994).

Plasma Exchange (Therapeutic Plasma Exchange)

Plasma exchange, also known as therapeutic plasma exchange (TPE), is a procedure where a patient's plasma is removed and replaced with a substitute, such as donor plasma or albumin solutions. The primary goal is to eliminate pathogenic substances present in the plasma that contribute to disease processes (Winters, 2012).

Similar to plasmapheresis, blood is withdrawn from the patient and separated into plasma and cellular components. However, in plasma exchange, the patient's plasma is discarded entirely, and the blood cells are combined with replacement fluid before being returned to the patient

(Cervantes et al., 2023). The replacement fluids can be fresh frozen plasma, albumin, or crystalloid solutions, depending on the clinical scenario.

Comparative Analysis

- **Plasma Donation**: Intended for collecting plasma from healthy donors to produce PDMPs for patients in need. Donor's plasma is collected, and blood cells are returned; used for manufacturing medical products.
- **Plasmapheresis**: Used therapeutically to remove specific components from a patient's plasma and return the treated plasma. Patient's plasma is treated and returned; focuses on filtering out specific pathogenic components.
- **Plasma Exchange**: Involves the removal and replacement of a patient's plasma to eliminate harmful substances. Patient's plasma is entirely replaced with substitute fluids; removes a broader range of substances.

Different studies have looked at different approaches to plasma removal in PFAS exposed people. They have been considered together in this report.

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