WHAT IS PLASMAPHERESIS?

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Objectives:
The Who, What & Where of Therapeutic Apheresis Department.
What is plasmapheresis?
What diseases require plasmapheresis?
What other treatments are done?
How can the ward nurse help?
Including – Rationale
Conclusion
The Who, What and Where of the Therapeutic Apheresis Department?

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What are we?

Nurse III Clinicians
-provide Therapeutic Apheresis service to all of Manitoba
-treatments are provided at HSC or St. Boniface Hospital
Monday – Friday 0730- 1600 on call until 2000, and on call on
weekends and holidays 0800-1600.
Where are we?

Health Sciences Centre and St. Boniface Hospital -GE545-HSC -paging the Apheresis nurse on call, through HSC and St. Boniface Hospital. In March 2014- outpatient treatment room - GH738 Hematologist consult with the Apheresis Nurse on call, and write orders in the patients chart.
What do we do?

We provide 3 treatment modalities called:

Leukapheresis, is used for Acute Leukemia with high white cell count (>100,000), reducing the white blood cells circulating in the blood.

Red Cell Exchange is used for Sickle Cell Anemia Crisis, reducing the red blood sickled cell circulating in the blood.

Plasmapheresis
What is Plasmapheresis?

Plasmapheresis or therapeutic plasma exchange (TPE), or plasma exchange (PLEX).
- a procedure that removes and separates the plasma from a patient’s blood using a centrifugal operating system, Spectra Optia System.
2400 RPM's
What is plasma?

**Plasma** is the yellow, watery part of your blood.
-when spun the dense red cells settle to the bottom
-plasma rises to the top
-white blood cell and platelets are in the middle
-It is the plasma that carries minerals, hormones, vitamins, and antibodies to various parts of your body in the bloodstream.

**This plasma is removed** and discarded as it is making the patient sick.
At the same time we are removing the patients blood and spinning it.
To prevent hypovolmeia:
-give back a replacement fluid as ordered by the physician based on the patient’s disease or disorder.
(Winters, 2012; Shelat, 2010).
**Doctor’s order:**
- 2/3 of 5% Albumin & 1/3 Normal Saline
- 100% Cryosupernatant plasma (CSP) or Fresh Frozen Plasma (FFP), & Octaplasma is now being used if patients have severe allergic reactions to CSP or FFP
What is being removed?

Some diseases can create substances such as:
-proteins, cytokines, toxins or antibodies which circulate in the body through the plasma portion of the blood and can attack or damage healthy cells or tissues making the patient sick.
More specifically, it is removing autoantibodies in these autoimmune disorders such as:

- Immune Thrombocytopenia (ITP),
- Autoimmune Hemolytic Anemia,
- Antiphospholipid crisis,
- Anti-GBM glomerulonephritis (Goodpasture’s),
- ANCA nephritis,
- ANCA vasculitis & Wegener’s,
- Acute Guillain-Barré syndrome,
- Limbic Encephalitis,
- Chronic Inflammatory Demyelinating Polyneuropathy (CIDP),
- Myasthenia Gravis,
- Lambert-Eaton syndrome,
- Stiff Person syndrome,
- Acute Disseminated Encephalitis (ADEM),
- Neuromyelitis Optica (NMO),
- and some Multiple Sclerosis (MS).

**Thrombotic Thrombocytopenic Purpura (TTP),** but at the same time, we can also replenish plasma factors that is needed in TTP when plasma is used.
• **Allo-antibodies**: Transplant sensitization, Transplant rejection (humoral), Transfusion reactions and RH alloimmunization in pregnancy

• **Paraproteins**: Waldenstrom’s, Hyperviscosity, Light-chain neuropathy, Light-chain glomerulopathy, Myeloma cast nephropathy

• **Endogenous toxins**: Hypercholesterolemia

With the first plasmapheresis treatment,

-approximately 63% of these circulating substances will be **removed**.
What diseases require plasmapheresis?

Disorders and examples of autoantibodies removed:

**TTP** - is a rare *life threatening* autoimmune disorder that is associated with a deficient enzyme called ADAMTS13. (a protease that cleaves von Willebrand factor within the platelet-rich thrombi to prevent hemolysis, thrombocytopenia, and tissue infarction). If ADAMTS13 is absent, VWF-dependent platelet accumulation continues, eventually causing micro-vascular thrombosis. Plasmapheresis removes the antibodies that are binding ADAMTS13, while restoring the ADAMTS13 protease activity.

- Plasmapheresis is generally preformed daily until the patient improves.
- 90% mortality without Plasmapheresis
- Affects 1- 3/1,000,000
Plasmapheresis
- Removes ADAMTS-13 inhibitors
- Removes thrombogenic ULvWF multimers, these are causing
- Replenishes ADAMTS-13
Causing blood clots in the vessel, which break apart causing schistocytes. The patient’s platelet count drops and LDH increases.

Schistocytes are the broken red blood cells.
Myasthenia Gravis
This disease is caused by the production of IgG antibodies (antiacetylcholine receptor antibodies) that attack the acetylcholine receptors of skeletal muscles. These antibodies cause a decrease in the amount of acetylcholine receptors and ultimately decreases the action potential achieved with stimulation. Causing muscular weakness and fatigue.
Goodpasture’s Syndrome

This rare disease, also known as anti-glomerular basement membrane disease, primarily affects the lungs and kidneys, leading to rapid renal failure.

The hallmark of this disorder is the presence of anti-glomerular basement membrane (anti-GBM) antibodies. This antibody is directed toward the α3 chain of type IV collagen, which is found in the basement membrane of renal and alveolar cells.
What is Leukapheresis?

-is known as a white blood cell depletion.
-used for some types of Leukemia with high white blood cell count >100,000

Very high numbers of leukaemia cells in the blood may cause problems with normal circulation.
-Chemotherapy may not lower the number of blood cells until a few days after the first dose. So in the meantime, doctors can order leukapheresis treatment to quickly lower white blood cell counts.
What is a Red Blood Cell Exchange?

- is used for patients in a Sickle Cell Anemia Crisis & Malaria.
- reducing the red blood sickled cell circulating in the blood.
- patient’s red cells are removed and replaced by the Optia machine using packed red blood cells specific for that patient.

The exchange prevents the removed sickle cells from participating in new vaso-occlusive events, reduces hemolytic complications, and provides added oxygen carrying capacity while decreasing the blood viscosity.
A Normal red blood cells

RBCs flow freely within blood vessel

B Abnormal, sickled, red blood cells (sickle cells)

Sickle cells blocking blood flow

Sticky sickle cells

Cross-section of RBC

Normal red blood cell (RBC)

Cross-section of sickle cell

Abnormal hemoglobin form strands that cause sickle shape
How it works!
First!!!!
- The treatment is determined by the Hematologist on service.
  - Plasmapheresis Orders are written
  - Consent is obtained from patient
  - Central Venous Catheter is ordered and inserted
  - Consult to Apheresis Nurse on call to commence plasmapheresis either, routine or urgent
Apheresis nurse on call responds to page from Hematologist

-takes report
-gathers certain information needed to start a chart from the ward, the nurse and patient.
-orders blood product from blood bank
-introduces patient to plasmapheresis
-completes patient assessment
Answers questions to patient and family
How can the ward nurse help?

To **Initiate the first** treatment.
1. Current height, weight and hematocrit

**Rationale:**
- these 3 parameters (Ht, Wt, Hct) = total blood volume.
- used to calculate how much replacement fluid is required for each treatment.
used to enter into our Optia machine to provide an optimal treatment for that particular patient.
2. Recent bloodwork: CBC, Lytes, Coagulation factors, Calcium levels, LDH (if TTP)

**Rationale:**
- provides a baseline
- helps us determine how much calcium gluconate to give to the patient.
- helps us monitor Hgb, HCT, & LDH and determine if PLEX is working.
- Safe parameters for Hbg should be >80 but we have done treatments ≤ 80
3. Type and Screen is required if the doctor orders plasma as the replacement fluid.

Rationale:
Mandatory for Blood Bank
Blood bank will not release any blood plasma product if this is not done, and can delay treatment by 3 – 4 hours.
4. Signed consent from patient.

**Rationale:**
-Hematologist to obtain prior to treatment. Complications, risks and benefits are explained to the patient providing them with the information to obtain informed consent.
5. Central line should be inserted, along with x-ray and OK to use order.

Rationale:
- A central line is needed to provide the plasma exchange to the patient especially if more than one treatment is required. A peripheral access may not always sustain an appropriate access flow rate.
- Verifies correct placement.
- Safe to proceed.
6. Medications should be held if possible, one hour before treatment is done. Unless ACE inhibitors, as these should be held 24-48 hours before.

**Rationale:**
Some medications are highly protein bound and will be removed out of the patient deeming them ineffective. Blood pressure medications can cause serious hypotensive episodes during treatment, causing delays or causing the treatment to be stopped until resolved.

- ACE inhibitors can cause severe reaction and hypotension due to bradykinin accumulation.
7. The Apheresis Nurse will require medications as ordered by Physician:
--Calcium Gluconate 10% - usually ordered
  1-2 grams IV with one repeat
--Benadryl 25 – 50 mgs
--Heparin in central line

**Rationale:**
**Calcium** is needed to replace ionized calcium to prevent hypocalcemia that occurs from excess citrate caused from the anticoagulation used in the Optia system. Citrate will bind with Calcium and is removed and discarded in the waste bag. **Benadryl** is used to prevent or treat allergic reactions to blood products used for their treatment.
On Average:
Plasmapheresis can take 90 – 140 min and patient should eat and be well hydrated prior to treatment.

Although, plasmapheresis is considered to be a safe procedure, it is not completely free of potential side effects. **Side effects:** citrate toxicity, hypocalcemia, hypotension, metabolic alkalosis, infection, or anaphylaxis.
During the treatment:

- Patients are monitored 1:1 nursing
- Vital signs q 15 min
- Monitored for signs and symptoms:
  - of citrate toxicity, hypocalcemia—perioral tingling, hypotension, paraesthesia, headache, nervousness, flushing, shivering, nausea, vomiting, chest discomfort, abdominal cramping, tetany, laryngospasms, cardiac arrhythmias, seizures, vasovagal episodes, urticaria, rash/itch, pain, shortness of breath.
- Monitor for anything unusual!
After the treatment:

- Vital signs post treatment
- (should be same as pre treatment)
- Patients should remain in bed 30 minutes
  - hypotensive, vasovagal
- Patient at risk for bleeding or hematoma (vas cath) - D/T clotting factors removed by plasmapheresis
- Patient at risk for infection - D/T decreased immune system – good antibodies removed
- Patient at risk for blood product reaction post treatment - D/T Benadryl given during treatment -- monitor for hives.
- Patient will feel fatigued.
This presentation was done to:
Enhance knowledge and provide awareness for patient care during plasmapheresis.

Each year thousands of Canadians will require Therapeutic Apheresis or Plasmapheresis.

- In 2012, 13,850 plasma exchanges in Canada
  (The Canadian Apheresis Group-CAG)
  Manitoba
- 2014, 577 plasmapheresis procedures completed
- 2015, 410 treatments
  7 patients had TTP, provided 142 treatments
- 2004 one TTP patient required in excess of 110 treatments.
Stay Healthy!

Retired our Cobel!
"How about a tune, this thing is also a piano!"
QUESTIONS ?????