Heart Transplant - Antibody Mediated Rejection
Therapeutic Plasma Exchange

Introduction

This Clinical Practice Guideline (CPG) refers to the therapeutic plasma exchange for an infant/child with evidence of Antibody Mediated Rejection (AMR) after heart transplant. The goal of TPE is to remove donor-specific antibodies and/or inflammatory mediators implicated in AMR. The number of therapeutic plasma exchanges is patient specific and is ordered by the physician responsible for the patient's care. Please see Therapeutic Plasma Exchange under related documents for CPG on procedure.

The target users of this guideline will be Nurses, Physicians within the Nephrology and Cardiology programs.

Indications: This CPG applies to infants/children who have evidence of AMR.

Contraindications: Plasma exchanges should not ordinarily be performed within 24 hours of an operative procedure. If necessary to bypass this recommendation, the Staff M.D. must document the need for the procedure in the patient chart.

Definitions

- **Fresh Frozen Plasma (FFP)** - is separated from whole blood and is frozen within eight hours of collection. FFP contains all the coagulation factors in normal concentrations. Plasma is free of red blood cells, leukocytes and platelets. Plasma also has volume expansion and oncotic properties.

- **Total Blood Volume (TBV)** - the amount of blood in the whole body, both cells and fluid. The volume of the patient's blood is based on the patient's weight. The TBV is related to lean body mass. There is a difference between children and adults with newborns having a higher TBV per kg because of their higher packed red cell volume. TBV is calculated using the following formula:

  - Neonates (0-1 month): 100 ml/kg
  - Infants/children (1 month-16 years) 80 ml/kg
  - Adolescents (16 years and older) 70 ml/kg

- **Plasma Volume** is the total volume of plasma in the body.

  - Plasma Volume = TBV (ml) X (1-hematocrit)

- **Exchange** - patient plasma is replaced by donor plasma. The exchange product can be either FFP, 5% Albumin or a combination of both.
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Clinical Recommendations

1. Infant/child has Antibody Mediated Rejection (AMR) after heart transplant and requires therapeutic plasma exchange to remove donor specific antibodies and/or inflammatory mediators.

Pre-exchange requirements

1. All recent post-transplant patients should be connected to cardiac monitor during plasma exchange.
2. Complete following blood work before the procedure:
   - CBC and differential
   - Ionized Ca
   - Albumin
   - K, Mg, P, Na
3. Ensure blood work is within acceptable range.
4. Complete the following blood work after the procedure:
   - Ionized Ca
   - K, Mg, P

Order replacement solution

Replacement solution must be compatible with the patient's serum blood type and the donor blood type. Refer to Blood Groups Required for Blood Products Administered During ABO Incompatible Heart Transplantation Plasma Exchange chart.

- 5% Albumin is recommended when the patient does not require daily exchanges. For daily exchanges order last bag FFP to replace clotting factors.
- O-dextran can be used in cases of reaction to FFP.

Blood prime circuit:

- Patient weight <20kg
- Patient weight >20 kg with low hemoglobin (<70g/l)
- Patient who is hemodynamically unstable
- 5% Albumin prime is used for stable patient's between 15-20kg as ordered by MRP

Medications

1. Refer to MD orders for specific medications.
2. Recommended medication to decrease risk of a reaction to either blood or blood product include:
   - Benadryl (1mg/kg IV pre-apheresis when blood prime and/or FFP ordered) (maximum dose: 50mg)
   - Hydrocortisone (1mg/kg IV pre-apheresis when blood prime and/or FFP ordered) (maximum dose: 100 mg/dose in 512 y; 200 mg/dose in >12 years)
   - Calcium Gluconate, please see Management of Clove Toxicity
   - ACE inhibitors should be withheld for at least 24 hours prior to start of plasma exchange. Longer acting drugs of this class, including Enalapril and Lisinopril, should be withheld for 72 hours.

Volume and number of exchanges

1. Recommended volume of exchange is 1-1.5 times Plasma Volume
2. Procedure to be performed daily for 5 days then reassessed
3. Improvement in cardiac function, biopsy findings, and donor specific antibody levels are used to determine timing of discontinuation

Measurement responses

- ABO incompatible heart transplant: decreased isohemagglutinin titres
- HLA sensitized transplant with donor specific antibodies OR non-specific antibody mediated rejection: stabilization or improvement in allograft function
- Blood work: TCD, ...

Please note the following:

- Number of plasma exchanges is patient specific and ordered by MRP
- Plasma exchanges should NOT be performed within 24 hours of an operative procedure. MD must document if need to bypass this recommendation.

Acceptable blood work values prior to exchange:

- Mg > 0.5 mmol/L
- K > 3.0 mmol/L
- P > 1.0 mmol/L, for children < 2 years; >0.7 mmol/L, for children > 2 years
- TCO2 > 20 mmol/L
- Ionized Ca > 0.9 mmol/L

Blood Groups Required for Blood Products Administered During ABO Incompatible Heart Transplantation

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Related Documents:
- Therapeutic Plasma Exchange Procedure
- Management of Citrate Toxicity
- Blood component Infusions

References
1. McLeod, B C Apheresis: Principles and Practice. 1997 (409-415)

Attachments:
- heart transplant care pathway_july 2019.pdf