



Critical Care Therapy and Respiratory Care Section

Category:	Clinical
Section:	Aerosol Therapy
Title:	Prostacyclin Therapy Procedure
Policy #:	06
Revised:	05/00

1.0 DESCRIPTION

1.1 Definition: PGI₂ is a potent pulmonary vasodilator that can be administered intravenously or in an aerosol form. Aerosolization of PGI₂ is easily accomplished using a hand nebulizer that is placed into the inspiratory limb of the ventilator circuitry. Aerosolized PGI₂ plays a role in causing and maintaining low pulmonary vascular resistance without systemic effects. In-vitro, PGI₂ spontaneously hydrolyzed at physiologic pH into an active metabolite and has a half life of two to three minutes. PGI₂ acts by binding to cell surface prostacyclin receptors to activate adenylate cyclase. Cyclic adenosine monophosphate activates protein kinase A to express its effects, including decreased free intracellular calcium in vascular smooth muscle causing vasorelaxation. PGI₂ also stimulates the endothelium to release endogenous nitric oxide. In acute respiratory distress syndrome (ARDS), PGI₂ prevents thrombosis and may prevent endarteritis obliterans commonly seen on post mortem examination. Significant systemic absorption may lead to a coagulopathy in critically ill patients.

2.0 SETTINGS: Administered by trained personnel in the Medical Intensive Care Unit on 10D

3.0 INDICATIONS: For selective vasodilation of pulmonary vessels to decrease pulmonary hypertension unresponsive to conventional treatment in patients with ARDS.

4.0 CONTRAINDICATIONS:

- 4.1 PGI₂ should not be used in patients with a hemorrhagic diathesis
- 4.2 PGI₂ should not be used in patients with intracerebral bleeding or trauma
- 4.3 Caution should be used in patients when thrombocytopenia is present (<80,000/mm³)

5.0 COMPLICATIONS:

- 5.1 PGI₂ is a potent inhibitor of platelet aggregation and increases the risk of bleeding.
- 5.2 PGI₂ inhibits the adhesion of leukocytes to the vessel wall.
- 5.3 PGI₂ may inhibit activation of leukocytes and monocytes during inflammatory reactions and decrease the release of lysosomal enzymes.
- 5.4 Bronchoconstriction has been observed in some patients during PGI₂ aerosolization (decrease in FEV).

6.0 PRECAUTIONS

- 6.1 Maintain 15 ml of drug in the reservoir of the MiniHEART at all times
- 6.2 The aerosolized volume of drug must be continuously monitored so that correct hourly dosing will occur. Adjustments to flow to the nebulizer may need to occur hourly to maintain adequate minimal volume in the reservoir of the nebulizer.
- 6.3 The MiniHEART nebulizer must be maintained in an upright position at all times.
- 6.4 PEEP must continually be monitored to assess expiratory filter efficiency.
- 6.5 Measured tidal volumes will increase slightly due to the addition of nebulizer flow into the circuit.
- 6.6 Maintain humidity being provided by the Concha system.

7.0 ADVERSE REACTIONS AND INTERVENTIONS:

- 7.1 Excessive length of charging volume added to the ventilator circuitry may lead to increases in deadspace (CO₂ retention). Decrease the length of charging volume tubing to maintain pretreatment CO₂ levels.
- 7.2 Additional flow into the ventilator circuit through continuous nebulization can affect the flow triggering capabilities of the mechanical ventilator. Decreasing flow will also change nebulizer output.
- 7.3 The filters placed on the expiratory limb must be changed at least every two (2) hours to prevent inadvertent PEEP due to clogging filters.

8.0 EQUIPMENT AND MATERIALS

- 8.1 IMED "Gemini" PC-1 IV Pump
- 8.2 IMED IV Tubing #2260 (Vented/Non-Vented)
- 8.3 VORTRAN "MiniHEART" Nebulizer Kit
- 8.4 O₂ Source
- 8.5 Disposable Filters (3)

9.0 PROCEDURE

- 9.1 Collect supplies and equipment.
- 9.2 Obtain prostacyclin order and drug.
 - 9.2.1 Obtain physician order for delivery of aerosolized prostacyclin and dose to be administered.
 - 9.2.2 Consult with the ICU Pharmacist regarding the appropriate prostacyclin **concentration** to deliver the prescribed dose. The prostacyclin concentration must be adjusted to change the Prostacyclin dose. The rate of infusion will always be 8ml/hr and the volume to be infused is 50ml.
 - 9.2.3 The pharmacy will prepare an eight hour supply of prostacyclin.
 - 9.2.4 The prostacyclin solution must be reordered from the pharmacy through the hospital information system (MIS) **at least one hour before it's due**, in order to ensure timely delivery to the unit.
- 9.3 Set up:
 - 9.3.1 Filters
 - 9.3.1.1 Place two filters into the expiratory limb of the ventilator circuit proximal to the water trap and one on the inspiratory limb of the ventilator.
 - 9.3.2 MiniHEART Nebulizer Kit
 - 9.3.2.1 Assemble nebulizer and place into the inspiratory side of the ventilator circuitry according to the CCTRCS standard inline aerosol procedure.

Warning: KEEP NEBULIZER UPRIGHT AT ALL TIMES!

- 9.3.2.2 Attach O₂ connecting tubing from MiniHEART nebulizer to O₂ source.
- 9.3.3 Obtain prostacyclin (drug may be delivered in a plastic or glass container).
- 9.3.4 IV Pump
 - 9.3.4.1 Remove IV tubing (#2260) from package.
 - 9.3.4.2 Remove spike cover from IV spike.
 - 9.3.4.3 Insert spike into the upright prostacyclin container. Keep prostacyclin upright during spiking.
 - 9.3.4.4 Release clamp.
 - 9.3.4.5 Fill IV Drip chamber to 50%.
 - 9.3.4.6 Close clamp.
 - 9.3.4.7 Hang inverted prostacyclin container on IV pole.
 - 9.3.4.8 Connect the luer end on the IV tubing onto the infusion port on the MiniHEART nebulizer.
 - 9.3.4.9 Prime IV tubing by slowly opening the clamp making sure all air is being removed during this process.
 - 9.3.4.10 Allow priming procedure to continue until 15ml of drug has been introduced into the MiniHEART nebulizer.
 - 9.3.4.11 Close clamp.
 - 9.3.4.12 Install IV tubing into the pumping chamber and close the latch.
 - 9.3.4.13 Turn IV pump on by pressing the gray POWER ON button.
 - 9.3.4.14 Enter the rate of infusion by pressing the green button marked RATE. The rate of infusion is always 8ml/hr.
 - 9.3.4.15 Enter the volume of drug to be infused by pressing the green button marked VOLUME TO BE INFUSED. The volume of infusion will always be 50ml.
 - 9.3.4.16 Open clamp.
 - 9.3.4.17 Start infusion by pressing the Green button marked START.

10.0 POST PROCEDURE

10.1 Disposal of prostacyclin:

- 10.1.1 Dispose prostacyclin through the normal procedure for liquid waste material.

10.2 Equipment processing:

10.2.1 The MiniHEART nebulizer is single patient use and totally disposable. Discard equipment into the trash upon completion of therapy.

11.0 CHARTING/DOCUMENTATION

11.1 Continuous Ventilation Record

11.1.1 Record the initiation and termination of therapy each day for each shift on the Comments side of the Continuous Ventilation Record. This note should include the evaluation of the patient's tolerance to therapy, any adverse effects and action taken, and efficiency of nebulization. The flowrate used for nebulization should also be noted.

11.2 Nursing Flowsheet

11.2.1 Prostacyclin will be listed in the medication area of the nursing flowsheet and must be signed off by the therapist at the start of the therapist's shift.

SIGNATURE: _____
Assistant Section Chief, CCTRCS, CCMD

DATE: _____

SIGNATURE: _____
Section Chief, CCTRCS, CCMD

DATE: _____

SIGNATURE: _____
Medical Director, CCTRCS, CCMD

DATE: _____

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