EMORY HEALTHCARE

PROTOCOL TITLE: Nitroprusside (Nipride) Challenge for Advanced Heart Failure							
APPLICABLE FACILITIES:							
☐EHC	☐EDH	☐EHH	☐EHI	☐EHN	☐EJCH	☐ELTAC	☒ESJH
☒EUH	☐EUHM	☐EUHS	☐EUOSH	☐EWWH	☐RJV-ERH	☐RJV-ESOP	☐TEC/ESA
EFFECTIVE DATE:				**ORIGINATION DATE:**			

SCOPE: This policy applies to patients with left heart disease undergoing heart transplant evaluation with elevated PVR/TPG/PASP. This policy does **NOT** apply to other World Healthcare Organization (WHO) groups of pulmonary hypertension (Group I, III, IV, or V).

PURPOSE: To determine the reversibility of pulmonary hypertension during pre-transplant evaluation

CONTENT:

Right ventricular (RV) dysfunction after cardiac transplantation continues to complicate outcomes by contributing to post-transplant morbidity and mortality. Pulmonary hypertension secondary to elevated left cardiac pressures is a complication seen in advanced heart failure and increases risk of post-transplant RV failure and mortality. Current listing criteria define a pulmonary vascular resistance (PVR) > 5 Wood units or a transpulmonary gradient (TPG) ≥ 15 mmHg as relative contraindications to cardiac transplantation. However, there is a subgroup of these patients who have reversible pulmonary hypertension and may be considered low risk for post-transplant mortality due to RV failure.

Nitroprusside is a potent, intravenous vasodilator that relaxes vascular smooth muscle through nitric oxide effects, ultimately promoting vasodilation of both peripheral arteries and veins. Venous dilation effectively decreases blood volume returning to the heart, which reduces pulmonary capillary wedge pressure (PCWP) and left ventricular end diastolic pressure (LVEDP). Arterial relaxation promotes reduction in systemic vascular resistance (SVR). Finally, nitroprusside has direct pulmonary vasodilatory effects. Thus, it may be used to test the reversibility of pulmonary hypertension, which predicts greater likelihood of normalization of pulmonary pressures post-transplant and decreased risk for post-transplant RV failure.

Pulmonary hypertension is considered reversible (i.e., reactive pulmonary vasculature) if administration of nitroprusside results in a PVR < 2.5 Wood units and/or TPG < 15 mmHg. Data indicate that patients with reactive vasculature are not at increased risk of post-transplant death from RV failure, assuming systemic pressures and other hemodynamics remain stable during the nitroprusside challenge. However, this benefit is mitigated if the patient becomes hemodynamically unstable (SBP < 85 mmHg) during the challenge, even with normalization of PVR or TPG.

PROCEDURE:

1. Determine if patient qualifies for nitroprusside challenge
    a. Eligibility criteria: pulmonary artery systolic pressure (PASP) ≥ 50 mmHg and either TPG ≥ 15 mmHg or PVR > 3 Wood units
    b. Do not use in patients with SBP < 85 mmHg

   i. Proceed with caution or use lower dose of nitroprusside in patients with SBP ≤ 90 mmHg or mean arterial pressure (MAP) ≤ 60 mmHg
c. High dose nitroprusside titration is preferred in patients with SBP > 90 mmHg
d. Caution in patients with renal or hepatic failure
e. Attending physician must be present at the bedside for duration of procedure

2. Pharmacokinetics
   a. Onset of action: < 2 minutes
   b. Duration of action: 1-10 minutes
   c. Half-life: 2 minutes

3. Dose and Titration
   a. Low Dose Nitroprusside:
      i. Initial dose: 0.1 mcg/kg/min
      ii. Titration: 0.1 mcg/kg/min every 3-5 minutes until TPG < 15 mmHg or hypotension develops (MAP < 60 mmHg or SBP < 85 mmHg)
      iii. Maximum dose: 5 mcg/kg/min
   b. High Dose Nitroprusside:
      i. Initial dose: 0.5 mcg/kg/min
      ii. Titration: 0.5 mcg/kg/min every 3-5 minutes until TPG < 15 or hypotension develops (MAP < 60 mmHg or SBP < 85 mmHg)
      iii. Maximum dose: 5 mcg/kg/min

4. Monitoring (baseline and after each dose increase)
   a. Blood pressure, heart rate, cardiac output (CO), MAP, PCWP, PASP, pulmonary artery diastolic pressure (PADP)
   b. Calculate MPAP, TPG

5. Adverse effects
   a. Hypotension – dizziness, headache, nausea, tachycardia
   b. Cyanide toxicity – metabolic acidosis, increased serum lactate levels, hypoxemia, bradycardia, confusion, convulsions
      i. Rare, most often occurs in patients with hepatic impairment, recent cardiac surgery, malnourishment, B12 deficiency
   c. Thiocyanate toxicity – abdominal pain, nausea/vomiting, muscle weakness, agitation, confusion, lethargy, seizure, coma
      i. Rare, most often occurs in setting of renal failure and prolonged infusions

6. Preparation and Administration
   a. Available concentrations: 200 mcg/mL in NS
   b. Protect from light

7. Calculations

$$MPAP = \frac{PASP + 2 * PADP}{3}$$

$$TPG = MPAP - PCWP$$

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RELATED POLICIES / PROCEDURES:

DEFINITIONS:

REFERENCES AND SOURCES OF EVIDENCE:

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KEY WORDS: