



Clinical Protocol

CP.XX.xxx

The objective of this document is to be a resource, not a replacement for institutional specific protocols. It is intended as a template for your perfusion team to edit and adapt into a resource that fits your institutional specific needs. These Clinical Protocols may also be superseded by the judgment of the healthcare professional considering the facts and circumstances of the individual case.

SUBJECT/TITLE: LEFT HEART BYPASS (LHB)

PURPOSE: To provide adequate blood pressure and systemic perfusion during thoraco-abdominal aortic cross clamping.

TARGET POPULATION: Patients requiring Left Heart Bypass cardiopulmonary support.

DEFINITIONS:

1. **CPB:** Cardiopulmonary Bypass, is a technique utilizing the Heart Lung Machine to bypass the heart and lungs, while maintaining blood and oxygen circulation within the patient's body.
2. **LPM:** Liters per minute, rate of flow.
3. **HLM:** Heart Lung Machine, device that is run by a Perfusionist to take over the function of the heart and lungs during open heart surgery.
4. **ACT:** Activated Clotting Time, used to describe how long it takes blood to form a clot.
5. **Fr:** French, a system used to measure the size of a catheter or cannula.
6. **NIRS:** Near Infrared Spectroscopy, is a method of using light absorbance to indirectly measure brain activity.

POLICY: This is a guideline that outlines the perfusionist's role and responsibility for the conduct of Left Heart Bypass.

PERFUSION PUMP CONSIDERATIONS:

Equipment and circuit recommendations as follows:

1. Centrifugal pump, $\frac{3}{8}$ " tubing with LA-Fem Bypass Circuit (institution specific)
2. Full HLM circuit as LA-Fem Bypass, Circulatory arrest may be utilized
3. Utilize NIRS; Cerebral and flank sat probes should be placed to monitor oxygen saturation.
4. Cannulation based on surgeon preference and anticipated patient flow needs.
 - a. Possible Cannulation sites include Left Atria/left superior or inferior pulmonary vein to descending aorta or femoral artery.

PROCEDURE:

LHB Utilizing a Centrifugal Pump

1. The patient should receive at least 100 U/kg of Heparin when using the centrifugal pump.
2. Maintain ACT's between 180–220 seconds.
 - a. No oxygenator is used in this set up, therefore, lower ACT's are acceptable when compared to using the full HLM option.
3. Monitor ACT's and maintain the perfusion record according to departmental protocols.
4. Utilize the warming blanket and/or Bair Hugger to assist in maintaining normothermia.

Full HLM Option

1. Requires Full heparin dose (300u/kg) or institutional protocol
2. Maintain ACT's using departmental on bypass heparin protocol.
3. The venous occluder should be opened gradually to maintain adequate cerebral blood flow/pressure and allow for enough drainage to provide adequate distal perfusion.
4. Be sure to transfuse any blood loss. The reservoir level should remain unchanged as much as possible to ensure stable hemodynamics.
5. If desired pressures and flows cannot be maintained, consult anesthesiologist for volume or pharmacologic support.
6. Consider additional pump suction.
7. A Cardioplegia pump may be utilized to provide flow to the renal and intercostal arteries.

CLINICAL ASSESSMENT/SCREENING:

A. Contraindications: In the event of a trauma patient, the surgeon may decide not to heparinize the patient. However, in a low flow state of less than 2 LPM for an extended time period, heparin administration should be discussed with the surgeon and anesthesiologist.

B. Hemodynamic Targets:

1. Adjust flows to maintain pressure of 80-100 mmHg in the radial artery and pressure of >60 mmHg in the femoral artery.
 - a. If it is not possible to maintain the recommended pressures, consult with the anesthesiologist so that appropriate measures can be taken (i.e., volume replacement or pharmacologic support).
 - b. Flow rates of 20-40 cc/kg/min or a C.I. of 1.3 m² are acceptable for perfusing the lower portion of the body.
 - c. The arterial line may be split, and a multi-perfusion set catheter may be used in order to provide perfusion to the renal, intercostal or mesenteric arteries. Flow to the mesentery, renal and intercostal arteries should be approximately 200-400 ml/min.

One important thing to note:

Left heart bypass is *opposite* of standard bypass due to the patient pressure monitoring within the radial artery. During left heart bypass, you are removing volume from the left side of the heart, instead of the right.

If you need to INCREASE your patient's blood pressure; you will DECREASE your patient's blood flow.

If you need to DECREASE the patient's blood pressure, you will INCREASE your patient blood flow.

Increasing your flows on LHB will steal volume from the head, and return it into the femoral side and vice versa. Always remember that LHB is the OPPOSITE of normal CPB.

RELATED DOCUMENTS:

A. None.

REFERENCES:

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2. Clark, A. M., Rivard, D., Kelly, S., Williams, G. M., & Frank, S. M. (1994). Descending Aortic Aneurysm Repair Utilizing Moderate Hypothermia in Conjunction with left Heart Bypass. *The Journal of Extra-Corporeal Technology*, 26(4), 172–177.
3. del la Cruz, K. I., & LeMaire, S. A. (2012). Thoracoabdominal aortic aneurysm repair with a branched graft. *Annals of Cardiothoracic Surgery*.
4. Gravlee, G. P., Davis, R. F., Kurusz, M., & Utey, J. R. (2000). *Cardiopulmonary bypass*. Lippincott Williams and Wilkins.
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6. Lick, S. D., Conti, V. R., Zwischenberger, J. B., & Kurusz, M. (1996). Simple technique of left heart bypass. *The Annals of Thoracic Surgery*, 61(5), 1555–1556.
7. Marc A.A.M. Schepens, Jo J.A.M. Defauw, Ruben P.H.M. Hamerlijnck, Freddy E.E. Vermeulen, Use of Left Heart Bypass in the Surgical Repair of Thoracoabdominal Aortic Aneurysms, *Annals of Vascular Surgery*, Volume 9, Issue 4, 1995, Pages 327-338,

IMPORTANT INFORMATION ABOUT THESE PROTOCOLS:

If this protocol/process is adopted as is, the AmSECT log must be removed and replaced with an institution specific logo.

This protocol/process encourages high quality patient care but observing it cannot guarantee any specific patient outcome.

This protocol/process should be reviewed or revised as warranted by institutional specific protocol, taking into account the evolution of technology and practice.

Review period: Review as changes occur or per institutional protocol.
Original hard copies and/or computer copies of this protocol are stored under the supervision of the Chief Perfusionist, Department of Cardiovascular Perfusion.

APPROVED BY: *(signature of CMO and CNE only required)*

Source: *(originating department/committee)*

Effective Date: *(can use 'created date' for this)*

Version Number: *(should match # of revisions, use 1.0 if new document)*

Date Revised: *MM/YYYY; all dates any content changes were made*

Date Reviewed:

Signatures:

Date:

<Insert Name, Title>

Date:

<Insert Name, Title>

Date:

<Insert Name, Chief Medical Officer >

Date:

<Insert Name, Chief Nursing Executive>