

Liver Transplant Set-up and Management Reference

OR Setup

1. Triple setup for transduction of arterial, pulmonary, and central venous pressures
2. OR Cart with two shelves from nursing (or grab it from another room)
 - a. Top shelf – Cordis, VV line equipment, gloves/gown
 - b. Bottom Shelf – Trialysis kit, CCO Swan, gloves
3. 2 Level-one rapid transfusers with Plasmalyte spiked on each one
 - a. Rapid infuser on patient right should replace the IV pole on that side and have a fluid warmer clamped to it as well as a blue mutli-outlet power strip
 - b. Other rapid infuser should be left outside room until patient arrives as shown in figure 1
 - c. Blood filters spiked into both non-plasmalyte sides of the y-tubing
4. Liver Transplant Pharmacy Cart
 - a. Should be sitting outside of room 15 in bed bay
 - b. Check to make sure there are >6 amps of sodium bicarbonate (top drawer), >10 amps of CaCl (2nd drawer), and >10 L of plasmalyte (bottom drawer). If CaCl is not present, make sure calcium gluconate is adequately stocked (>30 amps).
 - c. Pull out 2 amps of sodium bicarbonate and 3 amps of CaCl and have them ready to go with blunt needle tips.
5. Cell Saver
 - a. If during times when we have an anesthesia tech available they will set it up and you should check to make sure it is in bed bay 16 as shown in figure 1
 - b. If this is not already setup, ask perfusion to help or you do it yourself.
6. IV Pole
 - a. 8 Alaris pump channels
 - b. Bair hugger
 - c. Should be stored in bed bay 16 as shown in figure 1 and then positioned as in figure 2 when patient arrives to OR and cart is removed from room.
7. GEM
 - a. Perfusion should help obtain an ABG machine
 - b. If perfusionist is not present, please go steal one from one of the cardiac rooms or the pump room but be sure to leave a note!
 - c. See Figure 1.
8. CCO
 - a. CCO box should be obtained
 - b. Place on top of anesthesia machine
 - c. Have catheter plugged in and calibrated, ready to go
9. Drugs
 - a. Drips
 - i. IF MELD <30, then **only** norepinephrine and epinephrine should be ordered, spiked, and hanging on alaris pump. Vasopressin should **not** be ordered unless attending asks for them.
 - ii. IF MELD >30, then norepinephrine, epinephrine, and vasopressin should be spiked, hanging on alaris pump
 - iii. NO insulin, phenylephrine, or amicar drips should be routinely ordered
 - b. Syringes
 - i. Propofol 20cc, Sux 10cc, Roc 10cc, Epi 20cc, Levo 20cc, Phenyl 10cc, Lidocaine pre-mixed, Fentanyl 500mcg, Versed 5mg

- ii. As discussed above, also need CaCl and NaCO₃
 - c. Omnicell
 - i. Make sure omnicell has Lasix 40mg, epinephrine 1mg pre-made syringe, epinephrine 30mg/30mL vial, albuterol with ETT adapter, 2 vials of Vitamin K 10mg, MgSO₄, and protamine.
 - ii. After drawing up drugs secure and lock in omnicell
 - d. Immunosuppression/Antibiotics
 - i. To be ordered by surgical team and picked up by us at mather OR pharmacy
 - ii. Confirm with surgical attending at time-out what antibiotics and what immunosuppression should be given as the plan may change late in the game
- 10. Liver Flush
 - a. Obtain 5 gallon bucket from perfusion room
 - b. Fill $\frac{3}{4}$ with ice
 - c. 500cc NS bag with 100cc of albumin 25% added
 - d. For Chavin make two (2) 1 Liter NS bags with 100cc of albumin 25% added to each
- 11. Blood Products
 - a. 10 PRBC in one igloo, 10 PRBC on hold in blood bank
 - b. 10 FFP in another igloo, 10 FFP on hold in blood bank
 - c. If platelets <50k, then order 10pk of platelets prior to going in room
 - d. If fibrinogen <100, then order 10 cryoprecipitate prior to going in room
 - e. ALL product should be checked, signed off, and ready to transfuse by the time the patient gets to the room
- 12. Electrical
 - a. Patient should have defibrillator pads placed on them, but not hooked up, prior to induction. Please be careful to leave them out of the surgical field and out of the way of potential line placement.
 - b. The cell saver, GEM, and any headlights from the surgeon must be plugged into the high capacity surge protector that is on a pole in room 15. Please see figure 3 below for further details as you can see the pole in between the pharmacy cart and the GEM ABG machine. Otherwise blue surge protectors, one per side, can be used on the level 1 to the patient's right and on the IV pole to the patient's left.

Timing

The primary anesthesia attending will communicate with the surgeon regarding "in the room" timing and then disseminate that information to the anesthesia team. This team will include a secondary attending, an anesthetist, a resident, and an MSA student. This communication will take place in a group text but PLEASE MINIMIZE reply all texts. Arrival to setup to the OR is at your discretion but in general it takes >90 minutes to set everything up, see your patient, and be fully ready to make the deadline.

Labs

- 1. Tubes
 - a. Red/Yellow- For electrolytes and hepatic function panel
 - b. Blue- For coagulation profile and/or fibrinogen
 - c. Purple- CBC
 - d. Small heparinized syringe- ABGs
- 2. Requisitions

- a. All labs should be sent with a “blue card” that can be found in the room, please make sure there are enough stocked.
 - b. ABGs will drawn and ran in the room, no need for a requisition
3. Timing
- a. Beginning
 - i. ABG, TEG
 - b. Anhepatic
 - i. ABG q30mins
 - c. Neohepatic- 10 minutes after reperfusion
 - i. ABG
 - ii. Liver Function Tests
 - iii. CBC
 - iv. Renal Function Panel
 - v. Coags
 - vi. Fibrinogen
 - vii. TEG
 - d. Other- The above is the minimum, clinical course may dictate more frequent lab draws

Basic Phases of Operation

Induction: Once the patient is moved onto the operating room bed, zoll pads should be placed. Induction is at the discretion of the attending anesthesiologist, as is maintenance of anesthetic. Line placement is done after induction, specific lines will be planned prior during discussion between surgical and anesthesiology attendings. NG tube should be placed early on, verification by surgery. Baseline laboratory values can be sent during this time, organize setup, check blood products.

Preanhepatic Phase: Incision -> Removal of native liver. Monitor pH, electrolytes, blood loss, and any coagulation defects. While adequate MAP needs to be maintained, volume overload will cause hepatic congestion that can lead to worsening bleeding and hepatic function of the new liver. Judicious fluid management should be utilized. If VV bypass is to be utilized, it will be hooked up during this period. Discuss any planned IV Heparin utilization.

Anhepatic Phase: Clamping of hepatic vessels -> Reperfusion of donor liver. Issues include hemorrhage, coagulopathy, fibrinolysis, acidosis, hypothermia, and renal dysfunction. As in prehepatic phase, acidosis, hypocalcemia, glucose, coagulation, and other electrolyte abnormalities should be treated. Judicious management of fibrinolysis should be considered, especially during VV bypass due to embolism risk. Surgeon will hand sterile tubing during this period for hooking up to Liver Flush described above, place on pressure bag, open when required.

NeoHepatic: Reperfusion of new liver can lead to significant hemodynamic instability. Prior to reperfusion optimize pH, electrolytes, and MAP. Reperfusion can lead to significant acidemia, hyperkalemia, and hypotension/dysrhythmias all contributing to possible cardiac arrest. Once reperfusion has passed and bile duct reconstruction begins, continue to monitor liver function while optimizing MAP, hemoglobin, and coagulation status. Labs should be sent to monitor these parameters including CBC, PT, PTT, Fibrinogen, ABG, LFTs, and TEG if needed. Lasix might be utilized at this time to help reduce hepatic congestion. Check with surgeon concerning immunosuppressant utilization.

Post-Operative Considerations: ICU bed should be present with monitor for transport. ICU should be aware and prepared for patient including post-operative ventilator requirements. VV Bypass line should be removed prior to transport to ICU. All blood products should be transferred from operating room to ICU for further utilization.

Figure 1 – “Bed Bay 16 Prior to Patient Arrival”



Figure 2 - "After Patient Arrives"



Figure 3 – “GEM and Pharmacy Cart”



Liver Transplant Anesthesia Personnel (as of 10/1/17)

Present at Every Liver Transplant:

1 Anesthesia Attending
1 CRNA/AA
1 Senior Resident

Anesthesia Attendings on Liver Transplant Team (All ICU fellowship trained):

Matthew Norcia
David Dininny
James Rowbottom
Dane Coyne
Nicholas Pesa
Gurbinder Singh

Anesthesia Providers on Liver Transplant Team:

Wade Stanley
Chris Ferguson
Kris Ferguson
Carol Veilette
Coleen O'Malia
Kent Hardesty
David Zagorski