Isolated Adult Small Bowel Transplant
Anesthetic Protocol
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Pre-Operative Evaluation: Many patients requiring small bowel transplant have acquired short-gut syndrome leading to TPN dependence, cholestasis, and liver dysfunction. Multiple lines placed for TPN and a history of line related sepsis is not uncommon. **Often times there are vascular studies documenting which central veins are accessible. Be sure to know the access history prior to the case.** Hematologic evaluation in patients with associated liver disease is required. Electrolyte and acid-base disorders may also be present. A thorough history and exam is indicated. Preoperative labs include Chem 7, LFTs, CBC, PT/PTT/INR, and current type and crossmatch. Other studies and consultations are obtained when indicated by history or physical exam. Generally, a cardiac evaluation including at least an echocardiogram is available if not a stress test (DSE) as well.

Monitors and OR Setup:

- Airway
- Standard ASA Monitors (pulse oximeter, ECG, NIBP, temperature, ETCO2)
    - A medium tegaderm is placed over each ECG lead, all placed on the back.
- Two transducers
    - Arterial line (Upper extremity placement mandatory due to aortic cross clamp.)
- CVP (Double lumen, Cordis, or MAC
    - Access may be a significant issue in light of multiple lines placed for TPN.
- Foley Catheter
- Lifepak or other external defibrillator
- Two blood filters with fluid warmers. Two kits for placement of large bore IVs. In general plasma-lyte is the preferred fluid, but should be tailored to each individual patient.
- Upper and Lower Body Bair Huggers.
- Nasogastric tube
- Four units pRBCs and four units FFP. (This is the minimum…some cases will start with 10 & 10)
- For a multivisceral transplant, lines and monitors follow the liver transplant protocol.

Venous Access:

- Central venous access with at least a double lumen catheter; MAC is often used
- Additionally, Two PIVs 16G-14G provides sufficient access for volume. If peripheral access proves difficult, greater central access can be used to compensate.

Medications:

Pre-operative Antibiotics/Antifungals: Zosyn 3.375 grams
Vancomycin 1 gram
Diflucan 400 mg
Gancyclovir 300 mg

(These are ordered preoperatively by the transplant team and come to preoperative holding with the patient.) Verify antibiotics/antifungals with the Attending Surgeon prior to entering the OR.

For patients under 40kg: Unasyn 75 mg/kg, (penicillin allergic patients receive aztreonam 30mg/kg), Diflucan 10mg/kg, Gancyclovir 5mg/kg. Decrease the dose of unasyn and aztreonam by 50% in the setting of renal failure. Gancyclovir is dosed by creatinine clearance in the setting of renal failure.)

Resuscitation Drugs:

Ephedrine	10 mg/ml	5 ml syringe
Norepinephrine	16 mcg/ml	10 ml syringe
Epinephrine	1mg	10 ml Bristojet
Epinephrine	8 mcg/ml	10 ml syringe
Atropine	1 mg/ml	3ml syringe
Lidocaine	20 mg/ml	5 ml syringe x 2
Sodium Bicarbonate	1 mEq/ml	50mEq Bristojet x 3
Calcium chloride	1 gm	5 ml Bristojet x 3

Infusions:
Minimize vasoconstrictors which may compromise perfusion to the graft. If major hemodynamic instability develops dopamine maybe preferred over epinephrine.

The following should be available in the OR but do not need to be spiked:
Dopamine 400mg/250cc at 2-3 mcg/kg/min
Epinephrine 2mg in 250cc D5W (8mcg/ml) at 0.05 mcg/kg/min and titrate as necessary

Induction/Maintenance Drugs:

Propofol	10 mg/ml	20 ml syringe
Etomidate	2 mg/ml	10 ml syringe
Fentanyl	50 mcg/ml	5 ml syringe
Lorazepam	2 mg/ml	4 mg in 3 ml syringe
Succinylcholine	20 mg/ml	10 ml syringe
Vecuronium	1 mg/ml	10 ml syringe x 3

Immunosuppression Always discuss with surgeon first but usually….
Solumedrol 1 gram **prior to incision**
Simulect 20 mg before reperfusion
Simulect 20 mg during closure, before going to SICU

Occasionally, Thymoglobulin will be used
Dose: 1.5mg/kg, given over 4 hours, start 30mins after Solumedrol
(Consider premed with Tylenol 1gram IV and Benadryl 25-50mg IV)

- Liver Transplant medication cart should be available in the OR

Anesthetic Management:

- General anesthesia with endotracheal intubation and muscle relaxation is required. Isoflurane and fentanyl are appropriate for maintenance
- Do not use nitrous oxide.
- This is a lengthy operation with large fluid shifts and insensible losses. Adhesions may be significant from previous operations. Be prepared for brisk bleeding. Follow gemstats hourly to monitor electrolytes, hct, acid base status etc. Avoid vasoconstrictors.

- Target CVP is 12-14. Use volume as necessary to maximize cardiac output (remember the Starling Curve) and to be prepared for the bowel edema that occurs after reperfusion.
- Vascular anastomoses are sewn with interposition grafts. The proximal end of the venous conduit is sewn with a side-bitting clamp on the vena cava. Be prepared for abrupt changes in venous return when this clamp is placed and removed. The aortic graft is placed with cross-clamping the aorta. Hemodynamic changes with application and removal of this clamp may resemble those seen during AAA repair.
- Massive bowel endema may occur after reperfusion. Hypovolemia should be treated with volume even if edema is present.
- Patients remain intubated and sedated in the ICU overnight.
- TPN is weaned over 1-2 weeks.
- An upper GI study is typically obtained post-operative day #5. If the study is negative for complications feeding begins.