



# Renal Transplant

PRE-OPERATIVE		
<b>Medications</b>  Transplant Drug Bag from OR Pharmacy	<b>Briefing</b>  Huddle in P+H prior to transport to OR	<b>Lines</b> 2 large bore PIVs Possible central line (discuss with surgeon) Possible arterial line (avoid if possible)



INTRA-OPERATIVE		
<b>Induction</b> Standard induction GETA <input type="checkbox"/> fentanyl <input type="checkbox"/> cisatracurium (rocuronium acceptable alternative)  <input type="checkbox"/> Orogastric tube (unless surgeon indicates NG). Discuss removal of any NG tubes at end of case.	<b>Maintenance</b> <input type="checkbox"/> Discuss fluid goals with surgeon <input type="checkbox"/> Expect rapid volume loss/shifts  <b>Immunosuppression</b> <input type="checkbox"/> methylprednisolone 250-500 mg give on induction or 30 minutes before immunosuppressant <input type="checkbox"/> +/- diphenhydramine 50 mg (surgeon dependent)  <input type="checkbox"/> Anti-thymocyte globulin, rabbit: Thymoglobulin-2.5mg/kg IV in NSS with filter OR <input type="checkbox"/> basiliximab --ordered by surgery, consult with surgeon before starting --both given through dedicated line  <b>Hemodynamics</b> <input type="checkbox"/> MAP > 80 mmHg, CVP 10-15 mmHg, SYS >110 <input type="checkbox"/> discuss hypotension with surgeon, fluid/albumin	<b>Emergence</b> <input type="checkbox"/> Aim to extubate but consider cuff leak considering volume administration <input type="checkbox"/> Most patients go to PACU <input type="checkbox"/> Judicious narcotic administration considering patient comorbidities

	boluses most often preferred over pressors <input type="checkbox"/> Pressor choice—surgeon dependent, have dopamine available  <b>Reperfusion</b> <input type="checkbox"/> clamp comes off donated kidney <input type="checkbox"/> expect hypotension—consult with surgeon, CaCl and sodium bicarbonate acceptable options <input type="checkbox"/> surgeon may request mannitol or furosemide <input type="checkbox"/> note time when foley is unclamped (unclamp per surgeon)	
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POST-OPERATIVE		
<input type="checkbox"/> Maintain MAP >80 or SYS > 110	<input type="checkbox"/>	<input type="checkbox"/>

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### Case Specifics

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### Special Cases

### Surgeon Specifics

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### Medication Notes

Drugs to avoid: meperidine, morphine, NSAIDs

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### Positioning

Supine with possible steep Trendelenburg  
 Pay special attention to dialysis access grafts during positioning

# Renal Transplantation

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## Anesthetic Technique

General Endotracheal Anesthesia

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## Monitoring

- Standard ASA monitors
- Triple lumen central venous line (CVL)
  - Used for immunosuppressant administration (Thymoglobulin), blood draws, and CVP monitoring post-operatively
    - Thymoglobulin can be administered through a CVL or a peripheral line (see identifier on pharmacy bag)
    - If HD catheter present, discuss use with surgeon prior to accessing
    - **Use 15cm kits for RIGHT sided lines d. Use 20cm kits for LEFT sided lines**
      - All kits are labeled- left or right
      - Inappropriately sized catheters increase risk of accidental removal
      - MUST SUTURE in place (suture in transplant bucket)
      - Anticipate 4-5 days post-op
    - 2<sup>nd</sup> large bore PIV (preferably before induction)
    - Arterial line
      - Consider patient's medical history and current volume status prior to placement
      - Prefer to avoid arterial lines
      - If necessary, use the non-access arm radial artery

## Patient Profile

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27% Diabetes -Most are Type II until pancreas tx is instituted.

22% Glomerulonephritis -Usually healthiest and younger, unless lupus.

20% Hypertension

-common etiology of renal disease

-most common in African-American patients

12% Polycystic Kidney Disease - autosomal dominant.

17% previous transplant -considered high-risk.

30% with anti-HLA antibody (called panel reactive antibody)

-High immunologic risk

-Makes for difficult transplant match

-Worst scenario if obtained by previous transplant, pregnancy, or blood transfusion

14% greater than 65 yo -Current age limit is 70-75, depending on physiologic age.

20% wait greater than 3 years -Increased risk of both patient and graft loss

All with marked increased risk of cardiac disease Number one cause graft loss is death with a functioning graft in the longer term.

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## Preoperative Considerations

- **Difficult IV access-** Utilize ultrasound, if necessary, to ensure adequate IV access.
- Briefing- occurs in P&H prior to transport to OR
  - Introduction of team members by name and role

Revised by Jennifer Evans, CRNA/Judith Barnett, DO 4/6/2022

- Surgeon, anesthesia, P&H nurse, Surgical Resident, etc
  - Confirmation of:
    - Patient identity
    - Consent
    - Allergies
    - Planned procedure (living vs deceased donor)
    - Availability of blood and ABO compatibility
      - Filtered, irradiated, and CMV negative
      - Confirm at least 2 matched units are present in hospital
  - Blood bank- #1819
    - Positioning needs
    - Need for CVL or only large bore PIVs
    - Meds ordered and desired administration timing
      - Steroid
      - Immunosuppressant
- Equipment Needed:
  - Electronic infusion devices (EID) with IV pump tubing
  - Fluid warmer
  - Forced-Air Warmer
  - I-stat with +7 cartridges
  - Blood Glucose Monitor
  - EKG printer
  - Renal transplant case bucket from the anesthesia workroom
  - Transplant Drug Bag from the OR pharmacy
  - In-line filter for Thymoglobulin (immunosuppressant **MUST** be filtered with a 0.2 micron filter) if the filter did not accompany the drug, there are 2 additional filters stocked in the Transplant Case Bucket
  - Arterial line bucket
  - CVL with CVP monitoring equipment -15cm kits for RIGHT sided -20 cm kits for LEFT sided
- Drugs needed (Retrieve the transplant drug bag from the Satellite pharmacy during regular hours or the Anesthesia workroom during after hours or weekends)
  - Lasix (Diuretic) 40-100mg IV
    - Dose based on patient size and intra-operative blood pressure
  - Solumedrol (Steroid) 250-500mg IV
    - Given at induction or 30-60 minutes prior to immunosuppressant (Thymoglobulin) administration
      - Pre-med for Thymoglobulin
    - Minimizes symptoms of cytokine release syndrome
      - 500mg or less can be bolused quickly through PIV
    - Cisatracurium (Muscle relaxant)
      - Primary muscle relaxant to be used
      - If off hours, obtain from Satellite pharmacy refrigerator
  - Ephedrine
    - Verify vasopressor choice with surgeon prior to administering or starting any vasoactive drips
  - Calcium Chloride- 500-1000mg
  - Dopamine (Inotrope)- 3-5mcg/kg/min
  - Nitroglycerin or Nicardipine
  - Beta-blocker (Metoprolol, Labetalol, or Esmolol)
    - Treatment for tachycardia or hypertension
  - Cefoxitin (antibiotic) OR Levofloxacin (antibiotic)

- See MAR for order
  - Mannitol (diuretic)- 25-50grams
    - Given at time of anastomosis (check with surgeon for appropriate timing)
    - Administer over approximately 35-45 minutes
  - 25% Albumin (Colloid)- 50 or 100mL
    - Consider as first or second line anti-hypotensive agent
      - Most patients are hypoalbuminemic
    - Consult with surgeon prior to administering
  - Potassium Chloride 20mEq/L (2 bags)
  - Calcium chloride amp (2 amps)
  - Anti-thymocyte globulin, rabbit: Thymoglobulin- 2.5mg/kg IV in NSS with filter
    - Poly-clonal antibody derived from rabbit proteins
    - Used in patients if moderate to high risk of rejection, especially deceased donor kidney transplants
    - Costs in excess of \$12,000 per dose
    - Only have prepared when definitive green light for transplant
      - Prepared by pharmacy and transported by hand
    - MUST BE FILTERED- A 0.2 micron filter (in-line filter)
      - Comes with drug from pharmacy
      - Extra in Transplant bucket
    - Can be given through CVL or dedicated PIV (check pharmacy label)
    - Must run through pump
      - Typically runs for 6+ hours
      - Starts 30-60 minutes after steroid administration
    - Signs of reaction: fever, hypotension, and/or pulmonary issues
- OR- (only one immunosuppressant is given, NEVER both)
- Basiliximab (Simulect)
    - Anti-IL2 receptor blocker with small amount of mouse protein
      - Less risk of cytokine release syndrome or anaphylaxis
    - Given after steroid
    - Given via CVL or PIV over 20-30 minutes

Immunosuppressant drugs are individually prepared for each patient by a pharmacist and will accompany the patient to the OR. If immunosuppressant drug is not present, contact the OR satellite pharmacy (Ext. 2983) during regular hours or the 2<sup>nd</sup> floor pharmacist during off-hours (ext. 2028). If medication issues, please consult transplant surgeon and/or pharmacist

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## Intraoperative Considerations

- Time out
  - Standard pt identification, procedure, side, and antibiotic
  - Address additional questions or concerns
  - Confirm administration of steroid, antibiotic, etc
- Central line placement
  - Use full sterile technique (gown, gloves, mask, etc)
  - Used for immunosuppressant and fluid administration
- Immunosuppressant
  - Given after steroid administered
  - Consult with surgeon prior to starting
    - Must start prior to reperfusion of kidney

- Monitoring
  - Maintain CVP (if monitoring) slightly elevated (8-13mmHg)
  - Maintain MAP ~80mmHg
    - Always use fluids as first line agent for BP support
      - LR and 0.9NSS are acceptable
      - Alert surgeon of major BP changes
      - Consult surgeon prior to starting any pressor gtt
        - Avoid phenylephrine
      - If significant hemodynamic instability, consider intraoperative TEE
  - Use Cisatracurium as primary muscle relaxant
    - Rocuronium is an acceptable alternative
  - Check blood glucose if appropriate
- Surgery
  - Bench work on donated kidney
    - Typically occurs prior to patient arrival in the OR or during induction and line placement
    - Right kidneys take longer because of need for vein extension
  - Exposure
  - Transplant
    - Cannot occur until final crossmatch results return
  - Reperfusion
    - Start of “reperfusion time” occurs when clamp comes off donated kidney
    - Anticipate sudden hypotension (related to adenosine in preservation solution)
      - Consult with surgeon prior to treatment
      - CaCl bolus and sodium bicarbonate are effective options
    - Anticipate large fluid volume administration to maximize reperfusion
    - May give Mannitol or Lasix to promote diuresis
    - Note time when foley is unclamped (do not unclamp prior to surgeon saying so)
      - Bladder is filled with antibiotic solution before transplant
    - Closure
- Extubation/Recovery
  - Aim to extubate after procedure
  - Consider checking cuff leak prior to extubation given large volume administration and trendelenberg positioning
    - Be aware of signs of fluid overload and pulmonary edema
  - Usually patients go to PACU
  - Ensure all medications are on a pump prior to transport to PACU
- Post-op
  - Careful consideration of narcotic administration is advised given typical patient comorbidities
  - Epidurals are NOT recommended for post-op pain related to likely platelet dysfunction in this patient population a.
- Debrief
  - Did clear communication occur?
  - Were all roles and responsibilities understood?
  - Were requests for assistance and guidance answered?
  - Were any errors made? How could they have been avoided?
  - Are there any suggestions for improvement?