Anesthesia for Kidney and Pancreas Transplantation

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Nothing to Disclose

U.S. Transplant Waiting Lists

- Kidney > 101,000 ▲
- Liver >15,200 ▼
- Pancreas 1050 ▼
- Kidney-pancreas 2,000 =
- Heart >4,200 ▲
- Lung 1,570 ▼
- Total >122,900 ▲

22 pts/day die on the waiting list

Source: UNOS 7/15
UCSF Kidney Transplant

- > 10,000 since 1964
- 97.3% 3-yr LD recipient survival
- Longest waiting list >5000
- 5% of U.S. and 28% of CA wait list
- 332 kidneys (2/3 DD; 1/3 LD)
- 22 kidney/pancreas

UNOS contracted to run OPTN

- 11 districts nationwide
- Maintains transplant registry
- Determines allocation policy
- Collects data and maintain database on outcomes
Nobel Prizes

1905 Alexis Carrel
"in recognition of his work on vascular suture and the transplantation of blood vessels and organs"

1960 Frank Burnet and Peter Medawar
"for discovery of acquired immunological tolerance"

1990 Joseph Murray and Donnall Thomas
"for their discoveries concerning organ and cell transplantation in the treatment of human disease"

Kidney Transplantation

- ESRD uniformly fatal before 1950
- HD in early 50’s
- 1st successful: living-related tx between identical twins – 1954

- 1960-80: 1st gen. immunosuppression (azathioprine + corticosteroids) for non-identical LRRT and CRT
- after 1980: Cyclosporine era
Anatomic/Surgical

Donor kidney placed extraperitoneally
R>L iliac fossa
Native kidneys left in situ unless compelling surgical reason
Intraop order: Renal V anastomosis – Renal Art – vascular clamps off - ureter implantation onto fluid-filled distended bladder
BP can fall at time of unclamping

Living vs. Deceased donor

- LD cases – Elective; may not be on dialysis
- DD – E-cases
  - Greater risk of delayed graft function
  - Generally sicker patients
    - PreOp dialysis
    - Longer time on wait list
    - Access issues
    - Progression of CAD
Pathophysiology of ESRD

Electrolytes - hyperK⁺, hyperPO₄³⁻, hypoCa
Metabolic acidosis – look at bicarb
Hyper- or hypo-volemic – dry weight
HTN - meds
Anemia – better since EPO
Protein malnutrition - hypoalbuminemic
Abnormal coagulation - uremic pltts

Preop Issues

Recent dialysis – when?
Recent labs
Logistics of IV’s/monitoring vs. protection of hemodialysis access
High incidence of CAD – accelerated atherosclerosis found in ESRD patients - progression during time on the Tx list?
Mini-case Report

70 y/o male with ESRD/DM2 for DDRTx

- CAD – s/p CABG 1988
  - 6 months prior: stent to L main, occluded LAD with intact LIMA bypass, 80% Circ lesion, RCA not stentable
  - Post cath: “Improved energy”
- CVA
- HTN
- ASA?

Mini-case (cont.)

11:45 – in OR, induction, lines placed
12:00 – rabbit antithymocyte globulin infusion
13:55 – ST segments 5mm, hypotensive
13:56 – started on levophed
14:35 – TEE shows immobile septum and LV
15:16 – To ICU intubated, high dose pressors
16:00 – To cath lab -> arrest x 2
17:00 – put on balloon pump
05:30 - expired

CAD and Renal Transplantation

- High prevalence of CAD: 40-80% by angiography
- MI on waiting list and after tx: 5-16%
- No clear consensus on pre-op w/u – center specific
Cardiac Work-up

? Value of pre-transplant non-invasive screening?
- Angina – 66% sens/spec
- Treadmill ECG unavailable in up to 50%
- Stress Echo
  - low sens/spec to detect 50% stenosis
  - 20% w/ normal study had significant cardiac event within 2 years
- Myocardial perfusion studies
  - sens/spec 40-90%
  - ni test or fixed defects - low incidence of perioperative MI

Cardiac W/U

Cardiac catheterization considered the gold standard
Revascularization? CABG vs. PCI vs. medical mgt
Should be re-evaluated periodically while on transplant list


Low Risk
- Satisfy these criteria:
  - age<50
  - non-diabetic
  - no hx CAD or CHF
  - normal EKG

Intermediate Risk
- age<70 w/six y of CAD or CHF
- Diabetes
- Aortic calcification

High Risk
- Any of these:
  - CAD
  - Previous MI
  - CHF

β-blockers

Transplant

Stress Echo
- Pos
  - Cardiac cath
  - Minimal CAD
  - CABG/dial

- Neg
  - No Transplant
  - Poor revascularization candidate

Perfusion study
Intraoperative management

- Std monitors, +/- CVP, no art line
- Consider RSI
- GETA anesthesia - balanced technique
- Substitute esmolol for opioids at induction
- Extreme volume loading out of vogue
- Maintain MAP>70 and CVP 10-12 range
- Std meds: antibiotics, immunosuppressants, mannitol, lasix, dopamine PSR

Neuromuscular blockade

**Succinylcholine** - 0.5 to 1.0 mEq/l K+ rise - so okay to use if preop K in good range

**Other muscle relaxants**
- Cis-atracurium - safest but slowest bet
- Steroid group dependent on liver metabolism (vec/roc) generally okay
- Combine two classes of muscle relaxants carefully

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Anesthesia after Transplant

- ? Graft function
- Pharmacologic issues
  - Steroids can induce hyperglycemia and obesity
  - Cyclosporin can induce HTN, CRF and accelerated atherosclerosis
  - Anti-metabolites can induce bone marrow depression
- ? Reversal of associated diseases

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Points of emphasis

- Avoid early opioid use - can use short acting β-blockade to control SNS
- BP may fall at time of unclamping
- Rely on fluids to maintain BP rather than pressors
- Inhaled anesthetic level can be adjusted to maintain perfusion pressure
- Assiduous attention to level of neuromuscular block

Pancreas Transplantation

First attempted in humans in 1966
Tinkering with the plumbing next 15 years
Low graft survival rate until 1980’s
At UCSF nearly all done as combined kidney-pancreas at a rate of ~20/year

Medical Considerations for Pancreas Tx

- Indication: Type I DM usually accompanied by ESRD
- Concomitant kidney transplant – higher survival rates for each graft
  Better BS maintenance
  Improved pancreatic vessel patency
- More intense immunosuppression needed to prevent rejection
- Exposure to donor duodenal bugs
Surgical Issues

Exocrine Drainage: (1) duodenum to bladder
(2) duodenum to small bowel
Bladder drainage to monitor amylase levels
but increased complications
Venous drainage: ? Better to deliver insulin
into systemic or portal circulation
Low arterial flow - increased thrombosis risk
Uremia may protect early post-op period

Preoperative Issues

Even higher incidence of CAD
Brittle diabetics
Recent dialysis/recent labs
Intraoperative blood sugar monitoring – insulin infusion
Lengthy procedure
**Intraoperative Mgt**

- Standard monitors + Aline, CVP
- Antibiosis with surgeon choice
- Administer potent immuno-suppressants early:
  - Anti-lymphocyte antibody + steroid + anti-metabolite + calcineurin inhibitor

**Resuscitate with colloid (5% albumin) rather than crystalloid**

**Points of Emphasis**

- Generous midline incision - moderate to severe pain - titrate in opioids late
- Use colloids as primary fluids
- Check blood sugars frequently
- Usually zero post-op insulin requirements
- One year survival 94%; 90% graft survival