

The Essentials of DBD and DCD Multi-Organ Procurement

David P. Foley, M.D.

Associate Professor of Surgery

University of Wisconsin School of Medicine and
Public Health

ASTS Surgical Fellow Symposium

October 5, 2013

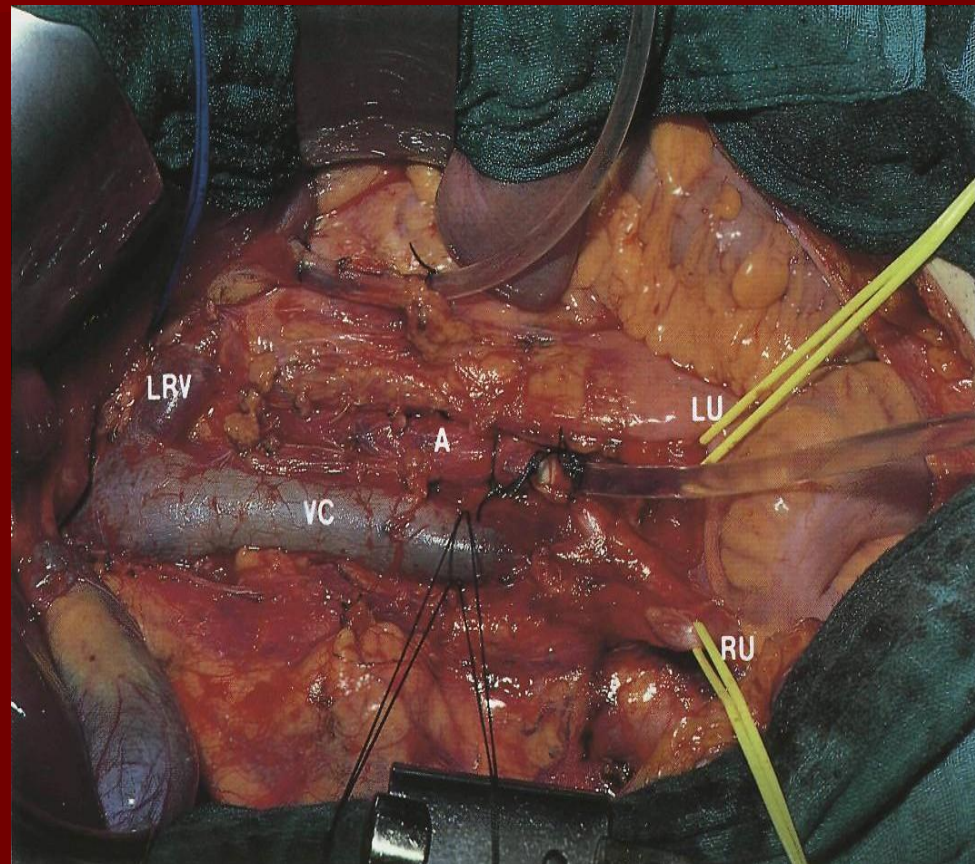
I have no financial disclosures.

Outline

- General procurement methods and principles
- Managing aberrant arterial anatomy
- Back table pearls
- DCD procurement strategies

Retroperitoneal Dissection

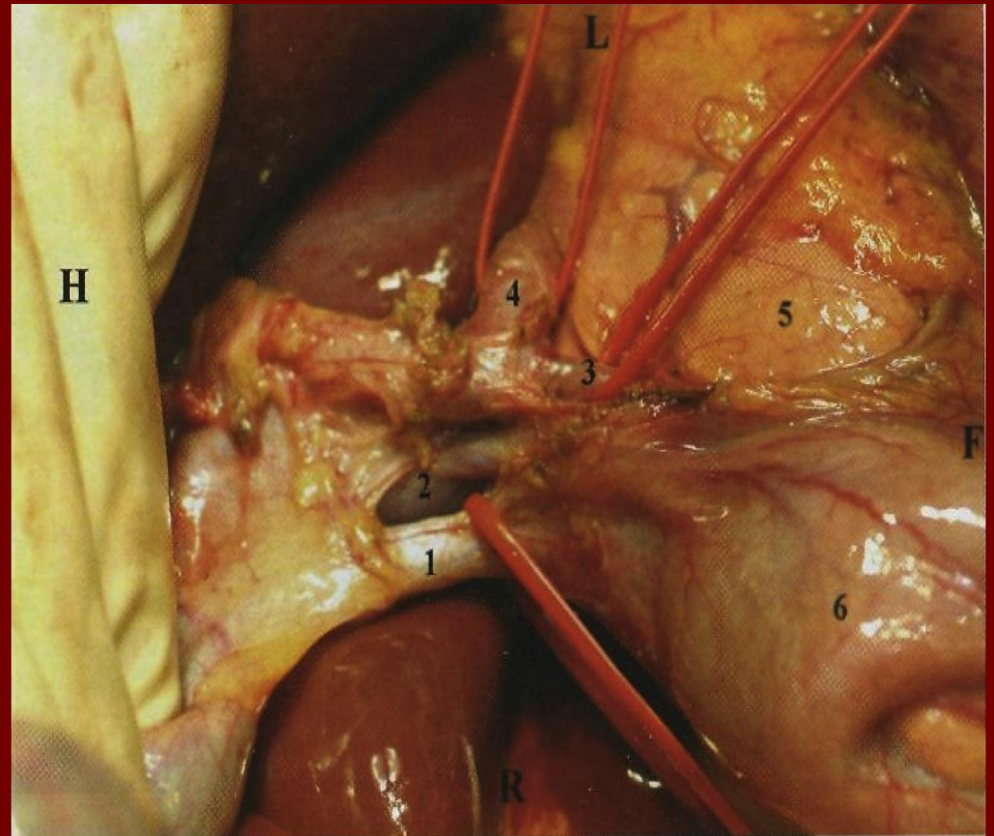
- Dissection of infrarenal aorta for cannulation
- Avoid dislodging atherosclerotic plaque
- Dissect IVC above level of left renal vein
- Retro aortic renal vein
- Duplicated IVC
- Identify IMV for cannulation

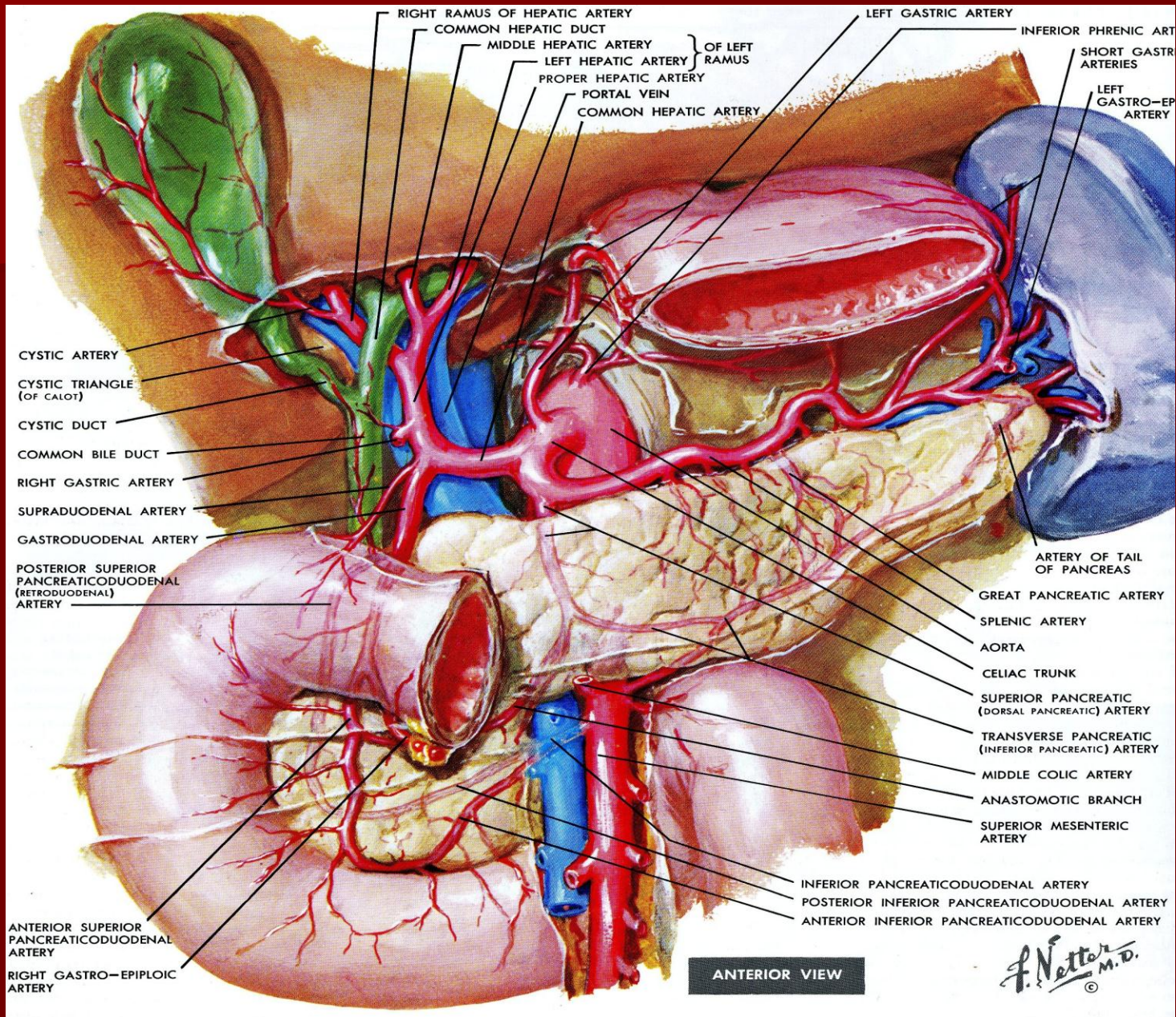


Kremer, B et al. 1994. Atlas of Liver, Pancreas, and Kidney Transplantation

Dissection of Hepatoduodenal Ligament

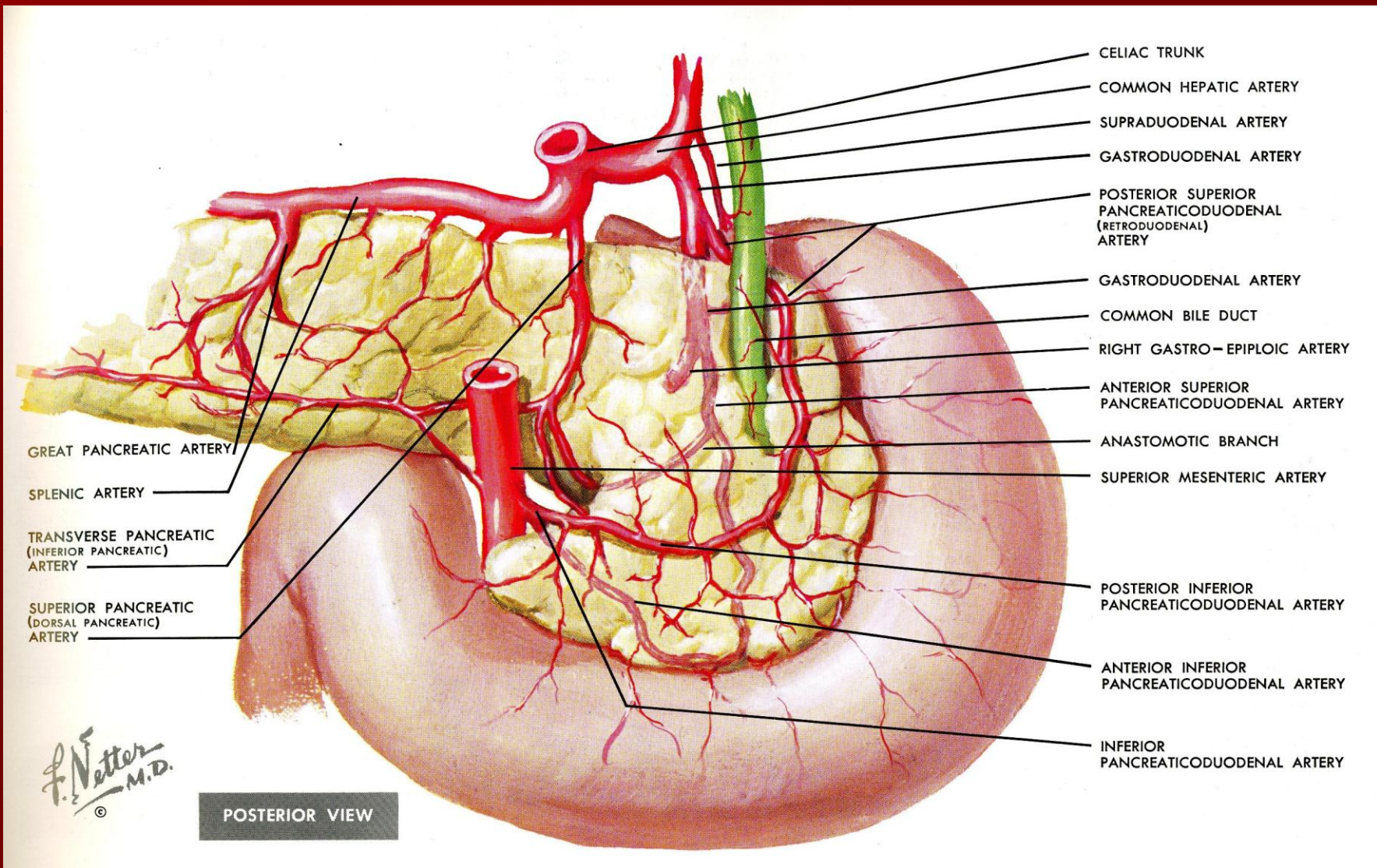
- Start hepatic artery dissection at GDA
- Avoid CBD dissection
- Transect CBD at duodenum
- Identify PV at level of duodenum
- Flush PV here if needed





ANTERIOR VIEW

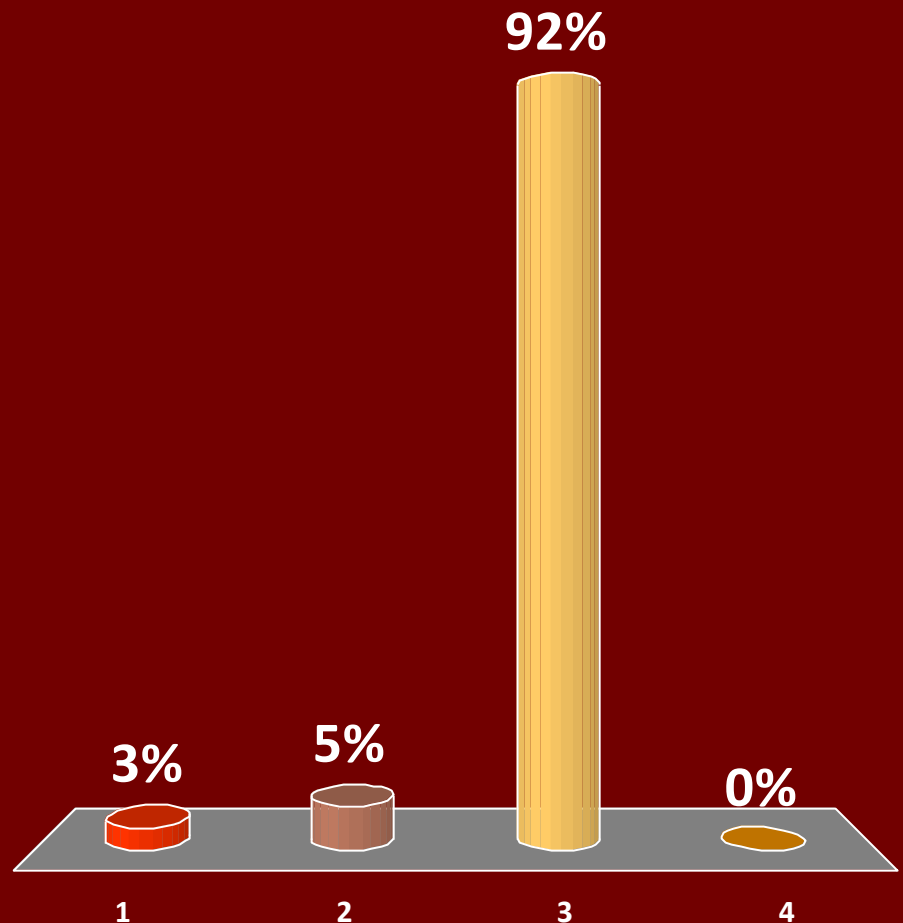
F. Netter M.D.



Netter FH. 2001. Netter Collection of Medical Illustrations

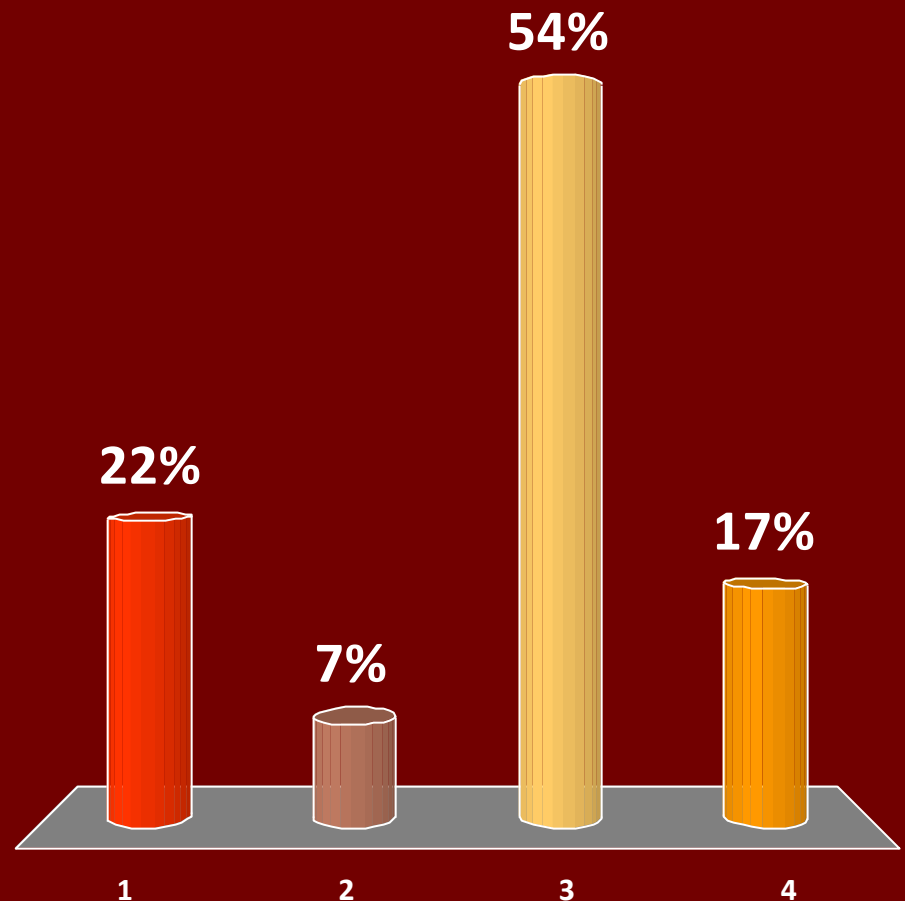
During a liver and kidney procurement you inadvertently transect a 3 mm replaced RHA in the warm at the level of the cystic duct. You should:

1. Perform in situ reconstruction of the vessel in end to end fashion and then proceed with standard recovery.
2. Perform in situ reconstruction of distal RHA to GDA and then proceed with standard recovery.
3. Convert to rapid organ recovery, remove liver, flush transected artery with cold preservative solution in situ and on back table
4. Abort recovery as liver is no longer transplantable.

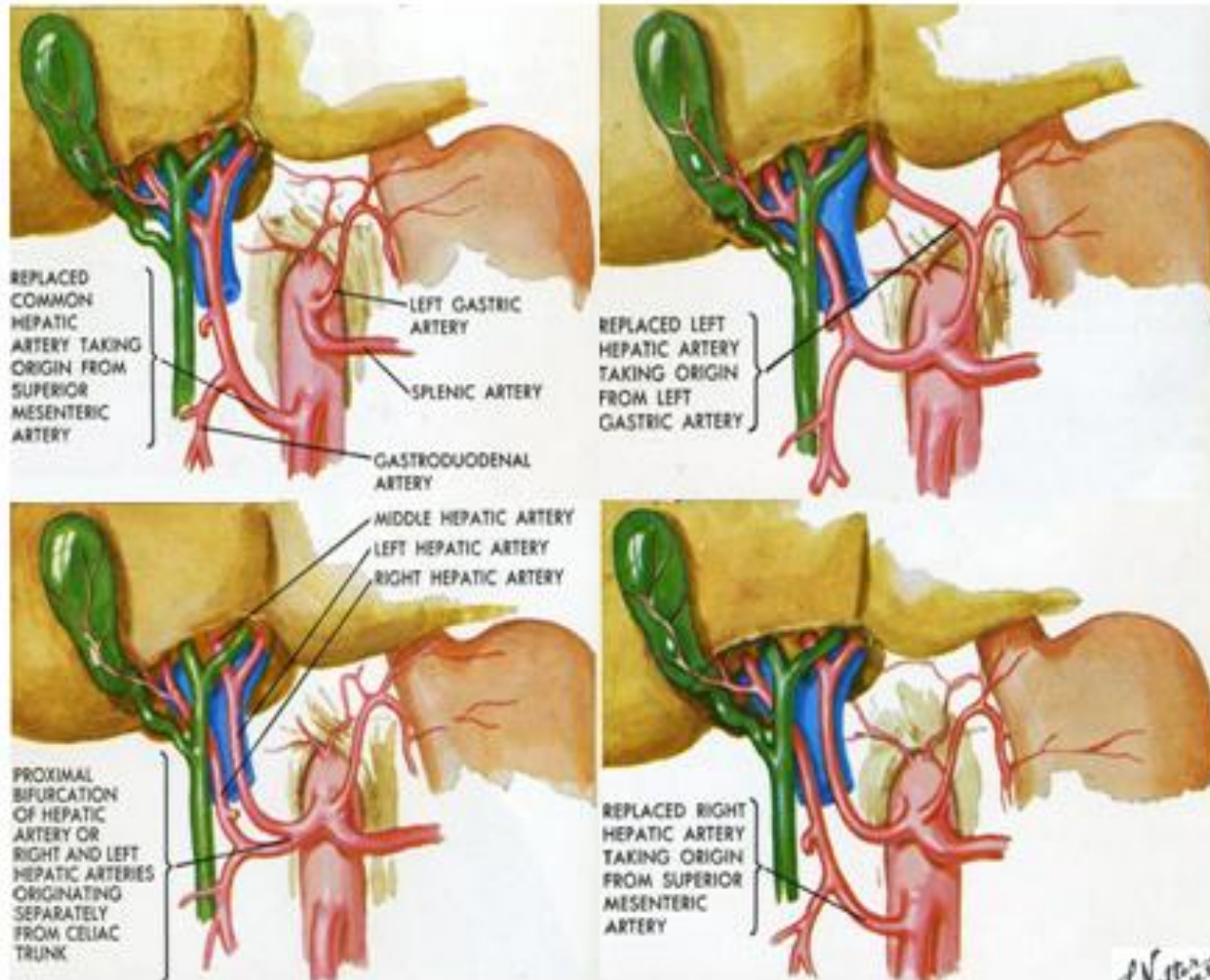


During a multi-organ recovery of a 24 year old deceased donor you identify a 4 mm aberrant right hepatic artery (RHA) arising from SMA and entering the parenchyma of the pancreas. After cold preservation you should:

- 1. Transect the RHA off the SMA and keep the entire SMA with the pancreas. Transplant liver and pancreas.**
- 2. Dissect the RHA into the substance of the pancreas, keep entire SMA with the liver, send pancreas for islets.**
- 3. Transect the SMA distal to the RHA junction. Distal SMA stays with pancreas and proximal SMA and RHA with the liver.**
- 4. Dissect the RHA into the substance of the pancreas, keep entire SMA with the liver, and abort the pancreas transplant.**

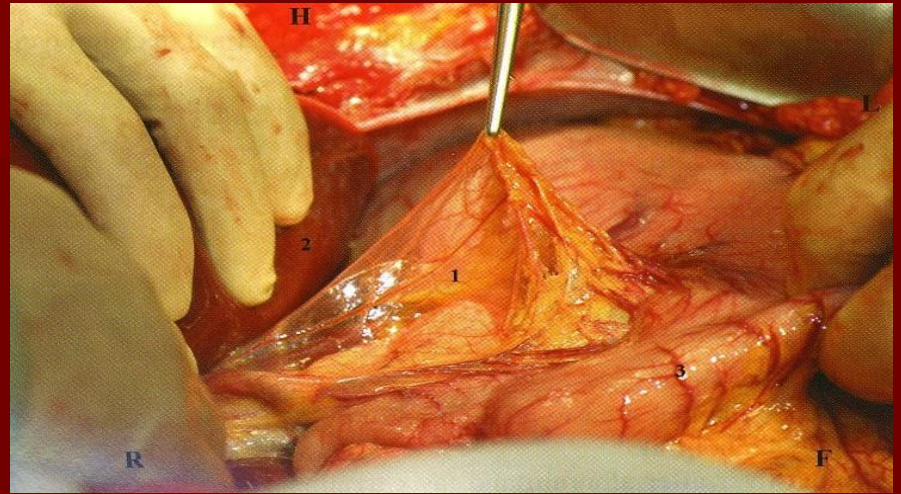


Hepatic Arterial Anomalies

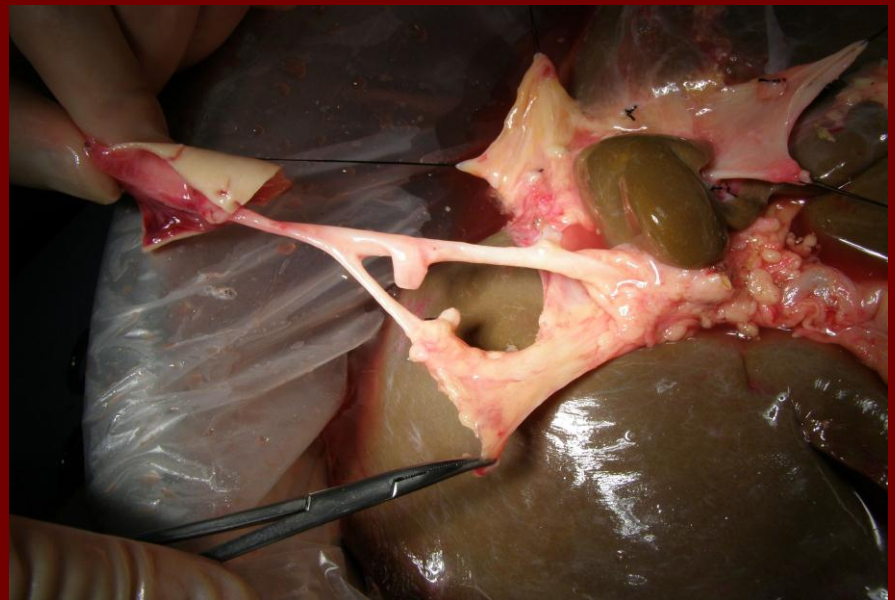


Liver Procurement

- Identifying aberrant vascular anatomy
- Entirely off SMA
- **Replaced LHA:**
 - Gastrohepatic ligament
 - Off LGA
 - Stay close to stomach with dissection
 - Off aorta



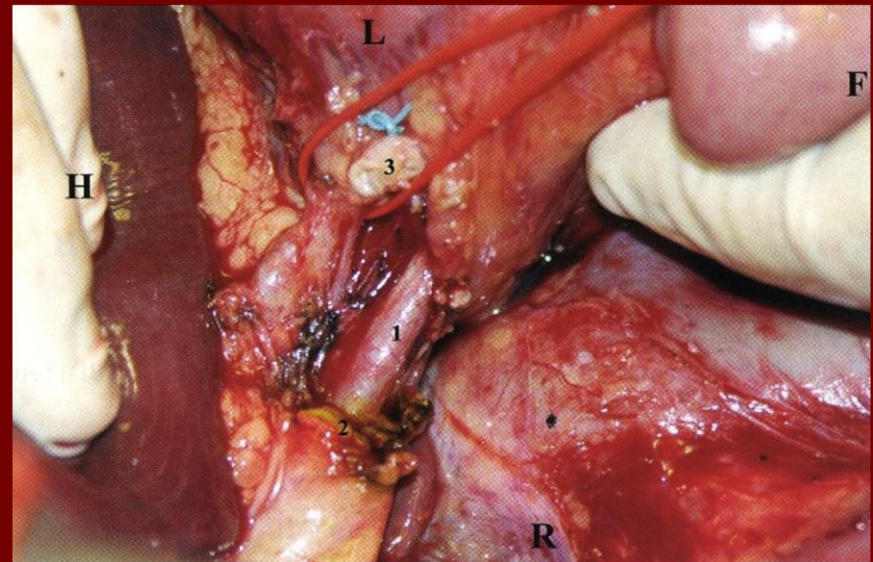
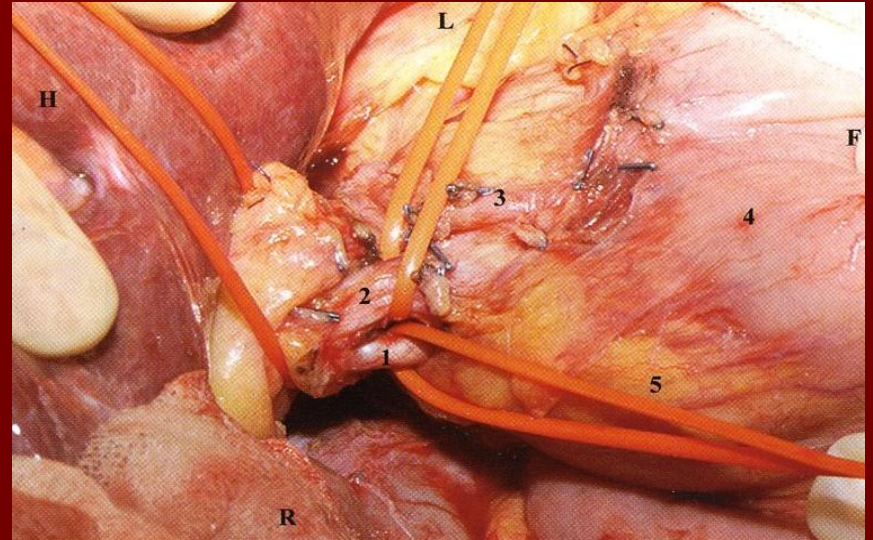
Baranski, A. 2009. [Surgical Techniques of Abdominal Organ Procurement](#)



Liver Procurement

■ Replaced RHA:

- Posterior and lateral to CBD
- Usually first branch off SMA
- Avoid injury to IPDA
- Usually remains extrapancreatic but can enter pancreas



Vascular Anomalies

RHA off SMA proximal to IPDA

- Cut SMA distal to RHA and proximal to IPDA
- Replaced RHA to GDA
- Distal SMA with RHA to CHA



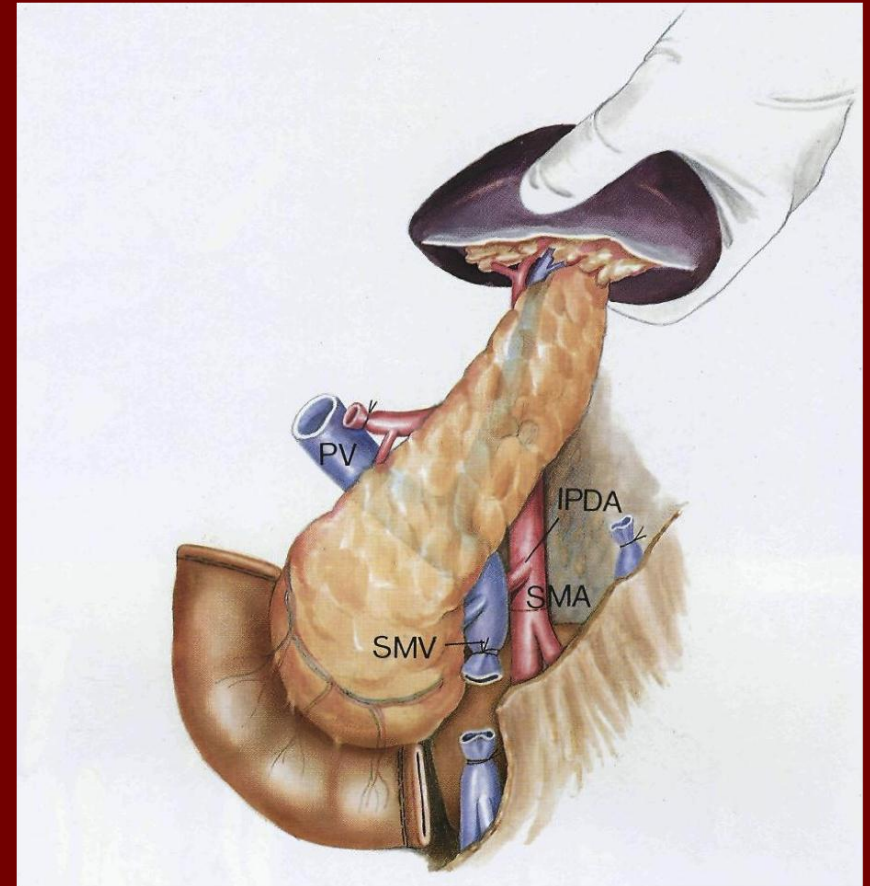
Dorsal pancreatic artery off celiac

- Talk to liver surgeon
- Celiac and SMA on one patch to pancreas
- CHA cut 3-5 mm from celiac trunk



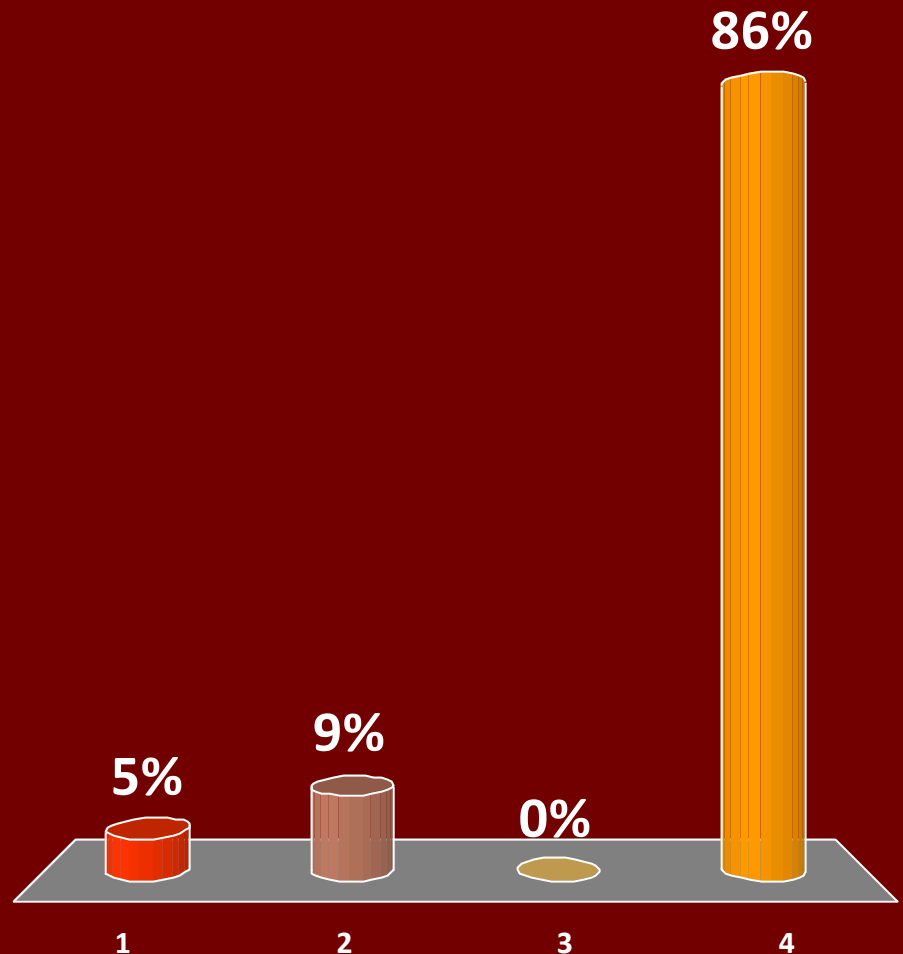
Vascular Anomalies

- **Aberrant RHA with intra-pancreatic course (rare)**
 - Consult with liver surgeon
 - May cut RHA if suitable size for reconstruction
 - Abort pancreas TXP if SMA needed for liver
- **IPDA off aberrant RHA**
 - **IPDA \geq 3 mm**: cut off RHA and reconstruct with limb of iliac Y graft
 - **IPDA $<$ 3 mm**: sacrifice IPDA and abort pancreas TXP



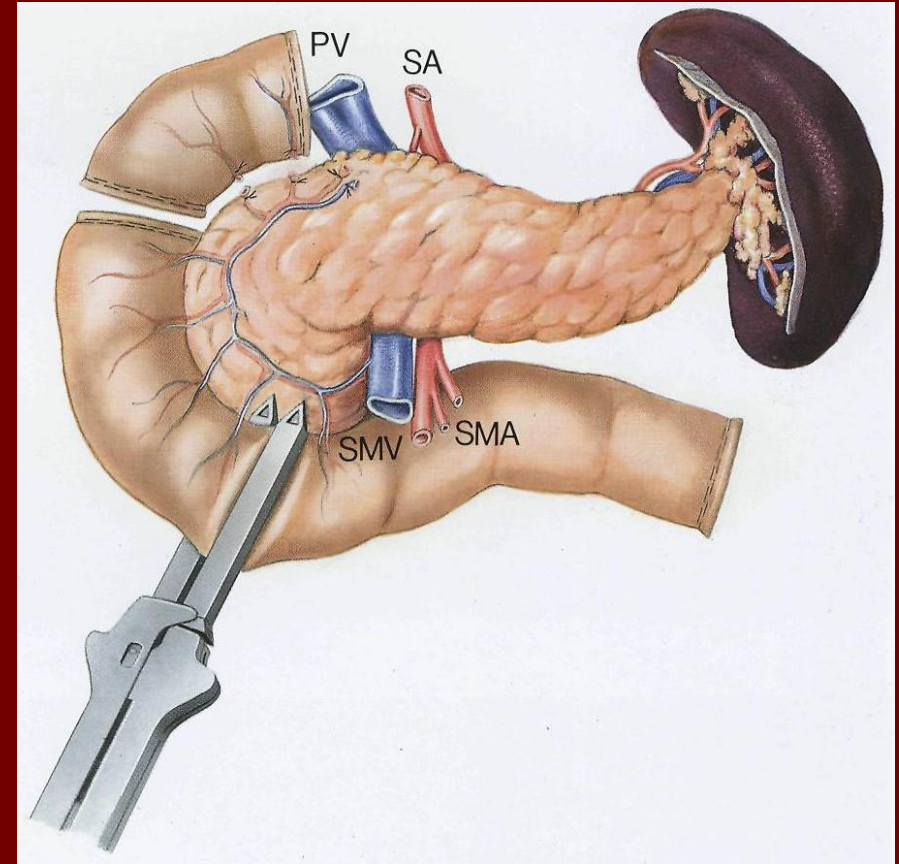
Which of the following statements regarding pancreas recovery is true?

1. Donors who have undergone splenectomy for trauma are not suitable pancreas donors.
2. The splenic artery should be dissected at pancreatic parenchyma to confirm dorsal artery is present.
3. The portal vein needs to be at least 3 cm in length to be suitable for pancreas transplant.
4. Portal venous system can be safely flushed through either IMV or PV when recovering pancreas.



Pancreas Procurement

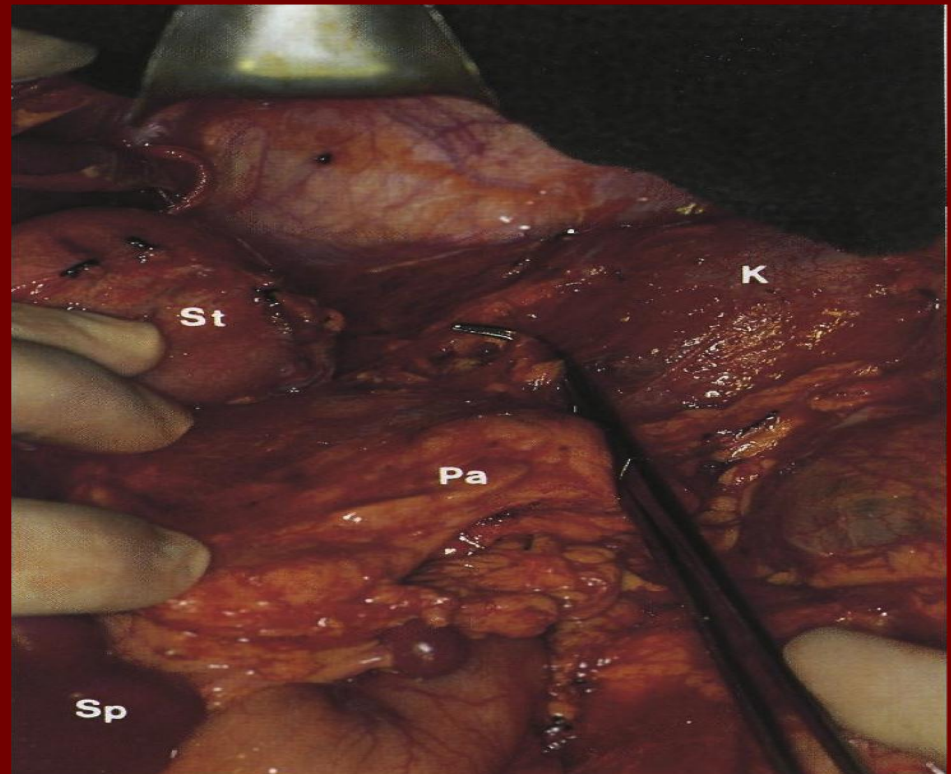
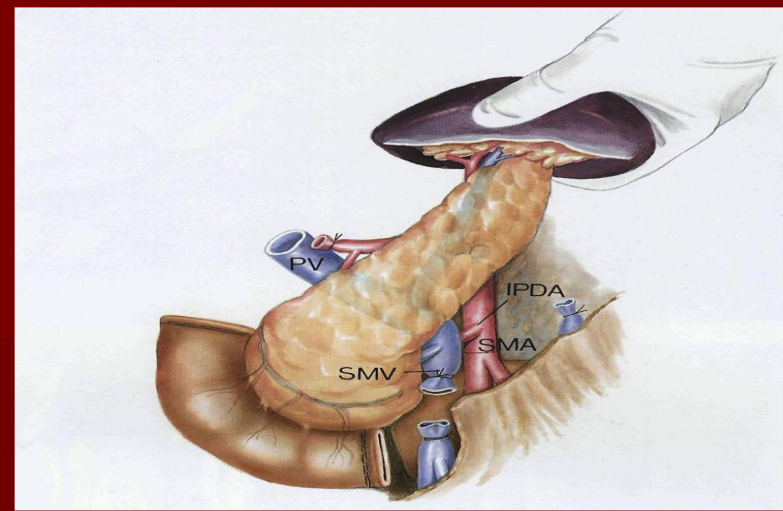
- Transect proximal to pylorus and distal duodenum
- Use spleen as handle
- Splenectomy not contraindication
- Ligation of mesenteric vessels



Kremer, B et al. 1994. Atlas of Liver, Pancreas, and Kidney Transplantation

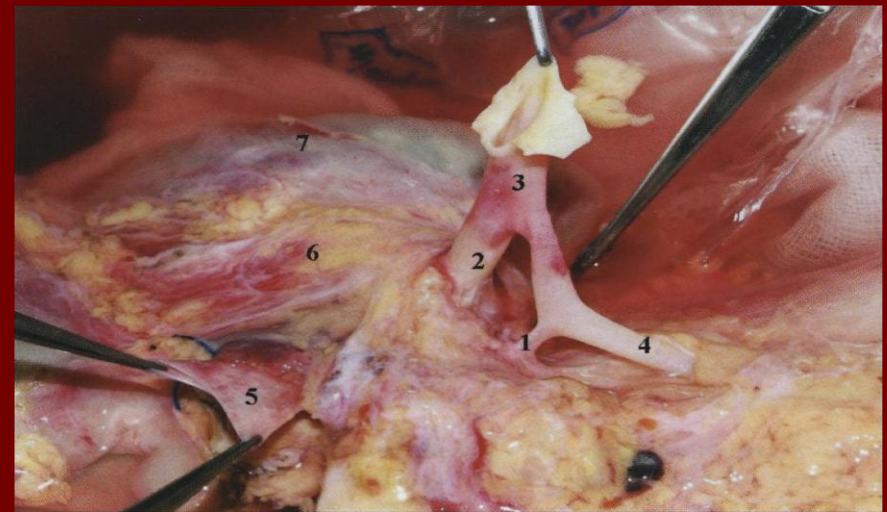
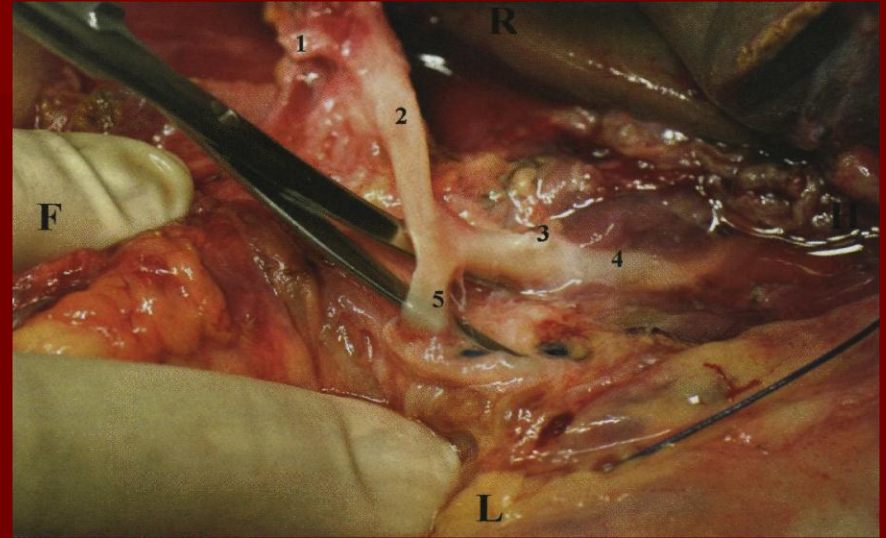
Pancreas Procurement

- Avoid pancreas and duodenal injury
- Get in the right plane
- Normothermic dissection of pancreas
- Dissect posterior pancreas medially to aorta

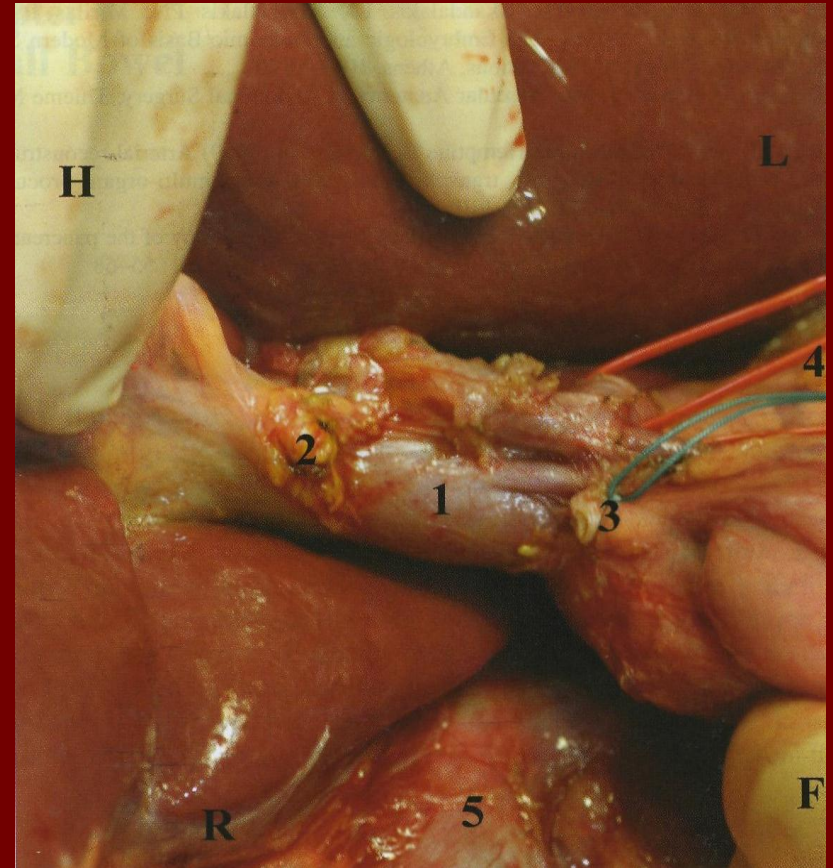
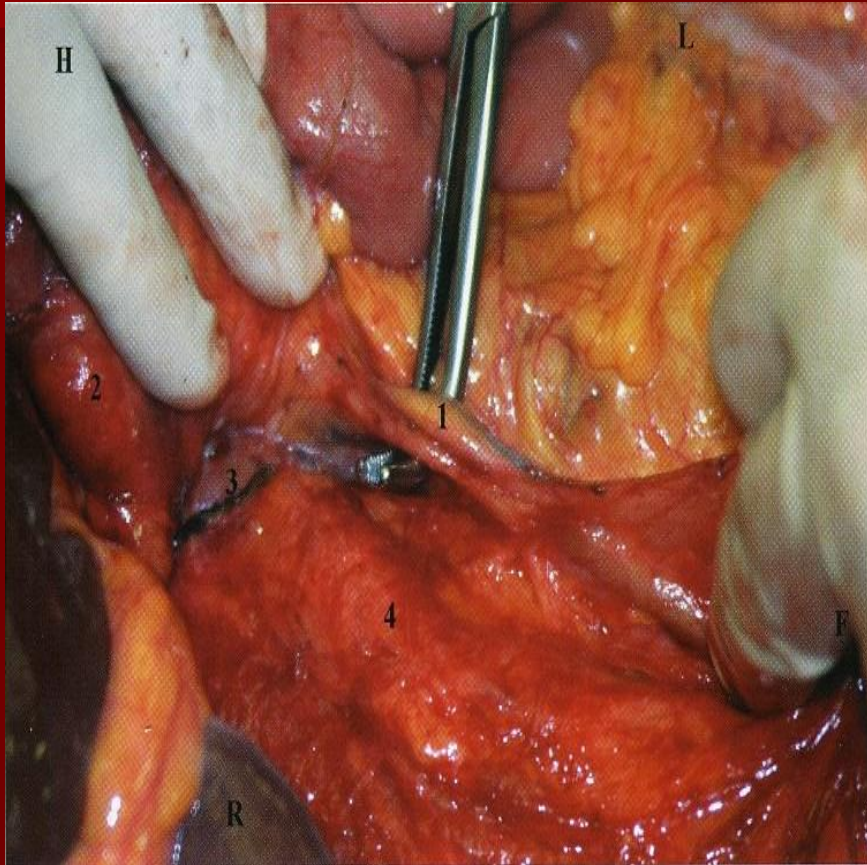


Pancreas Procurement

- Identify and tag splenic artery
- Avoid further splenic artery dissection
- Recognize dorsal artery to pancreas off splenic artery if present

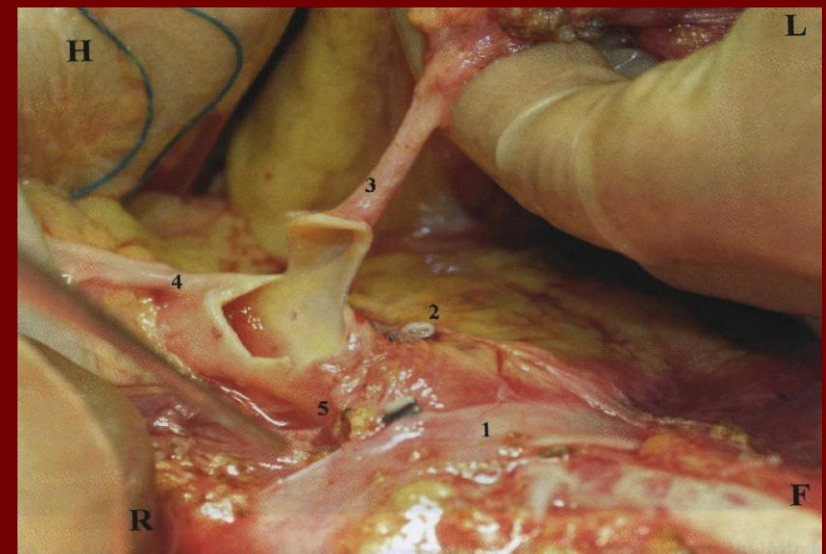
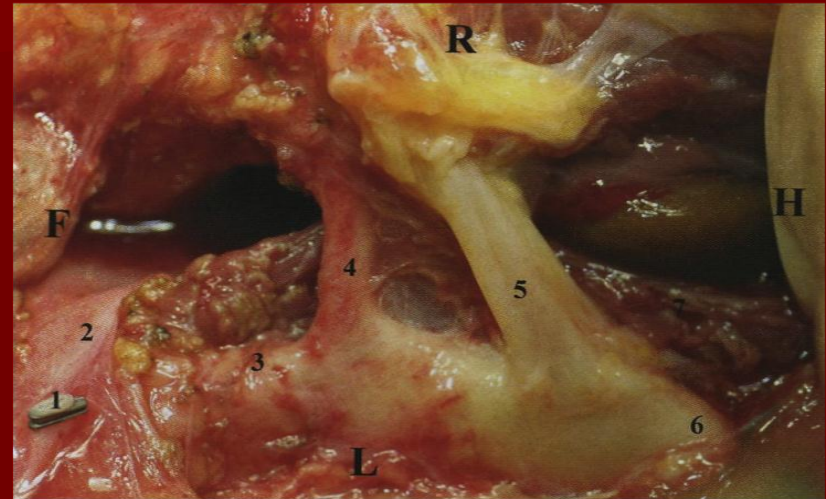


IMV vs. PV Flush



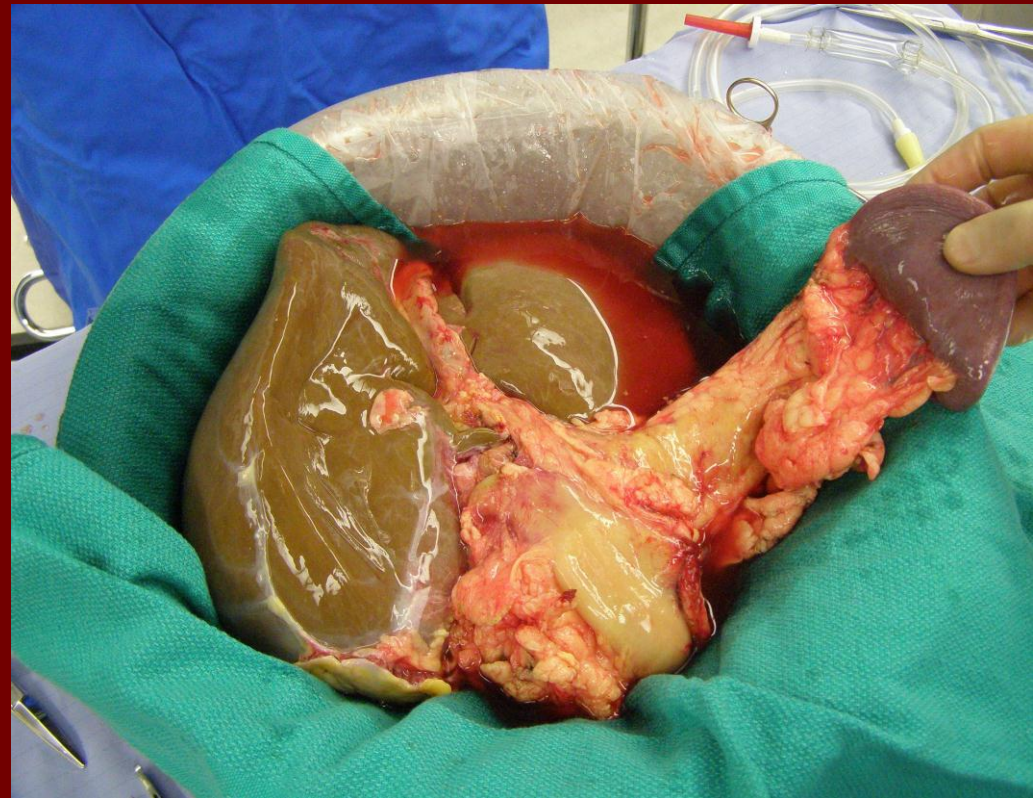
In Situ Separation of Liver and Pancreas

- Remove celiac ganglion
- Identify celiac and SMA
- Avoid aberrant left gastric artery off aorta
- Open SMA and identify ostia of renal arteries
- Avoid injury to left renal vein



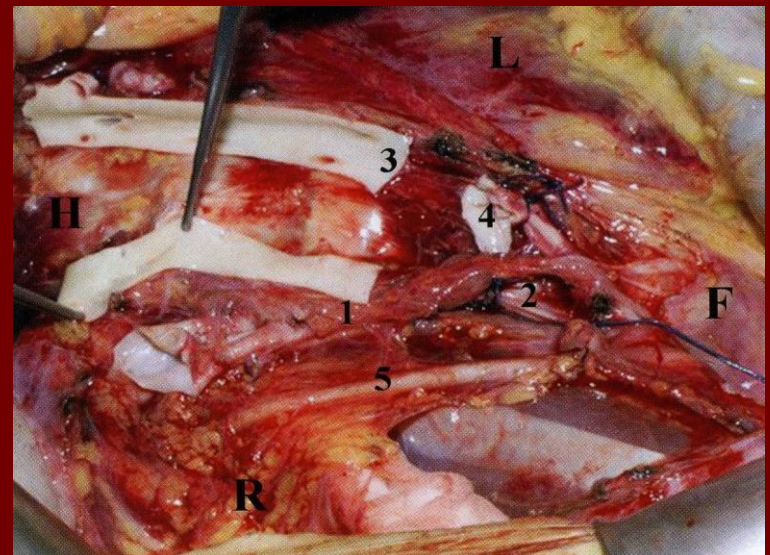
Ex Vivo Separation of Liver and Pancreas

- Dissect CHA from aorta to GDA
- Transect SA and tag pancreas side
- Ligate LGA if no replaced LHA
- Ligate GDA
- Transect PV above duodenum
- Transect lymphatics



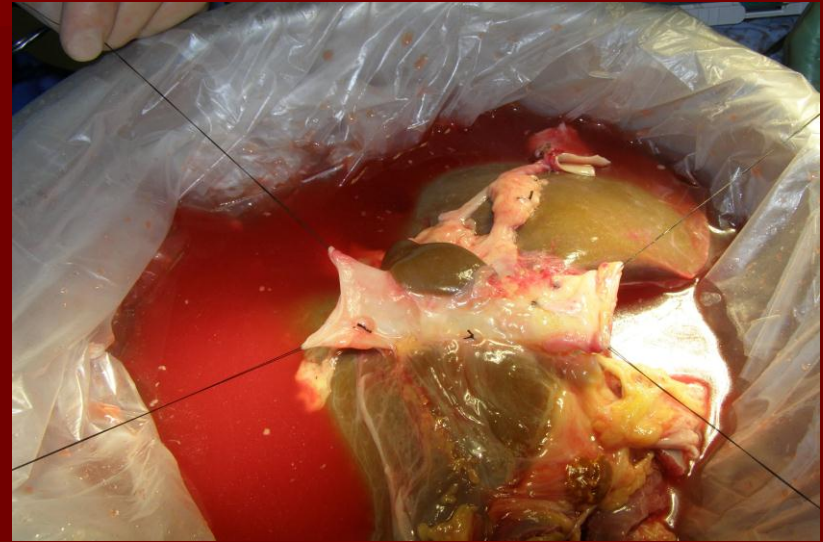
In Situ Kidney Separation

- Open aorta anteriorly
- Avoid left renal vein
- Transect left renal vein at IVC
- Identify ostia of renal arteries
- Divide posterior wall of aorta
- Transect ureters at UVJ
- Dissect artery of psoas muscles to avoid injury



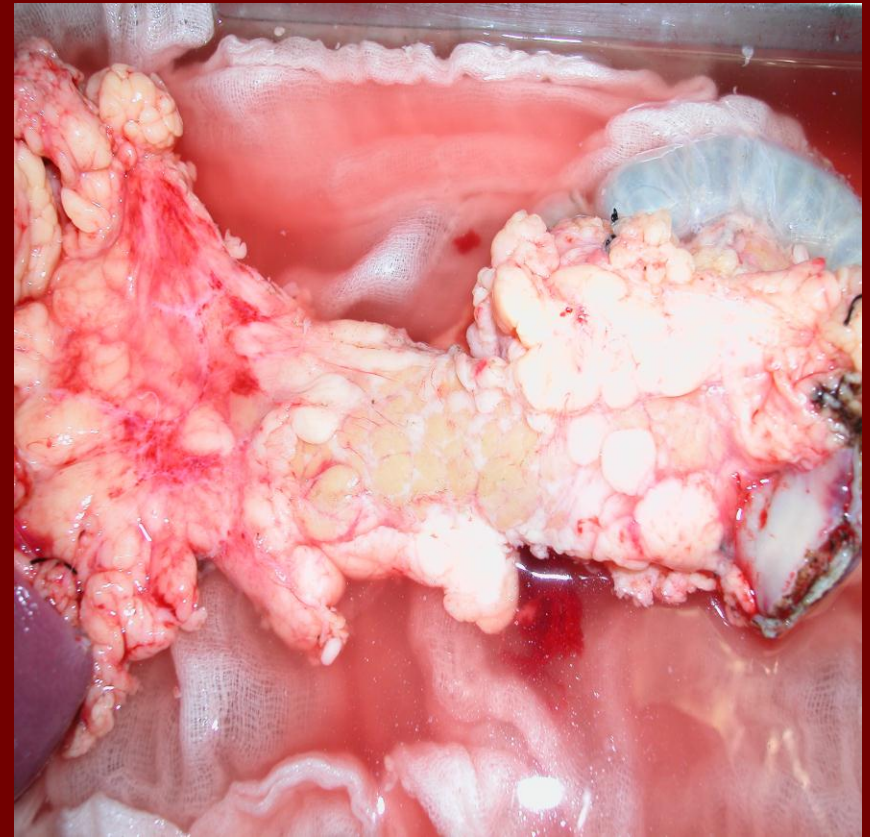
Back Table Preparation

- Keep infrahepatic IVC long
- Ligate phrenic veins
- Avoid injury to hepatic veins close to liver
- Stop HA dissection at GDA
- Flush vessels (replaced LHA)

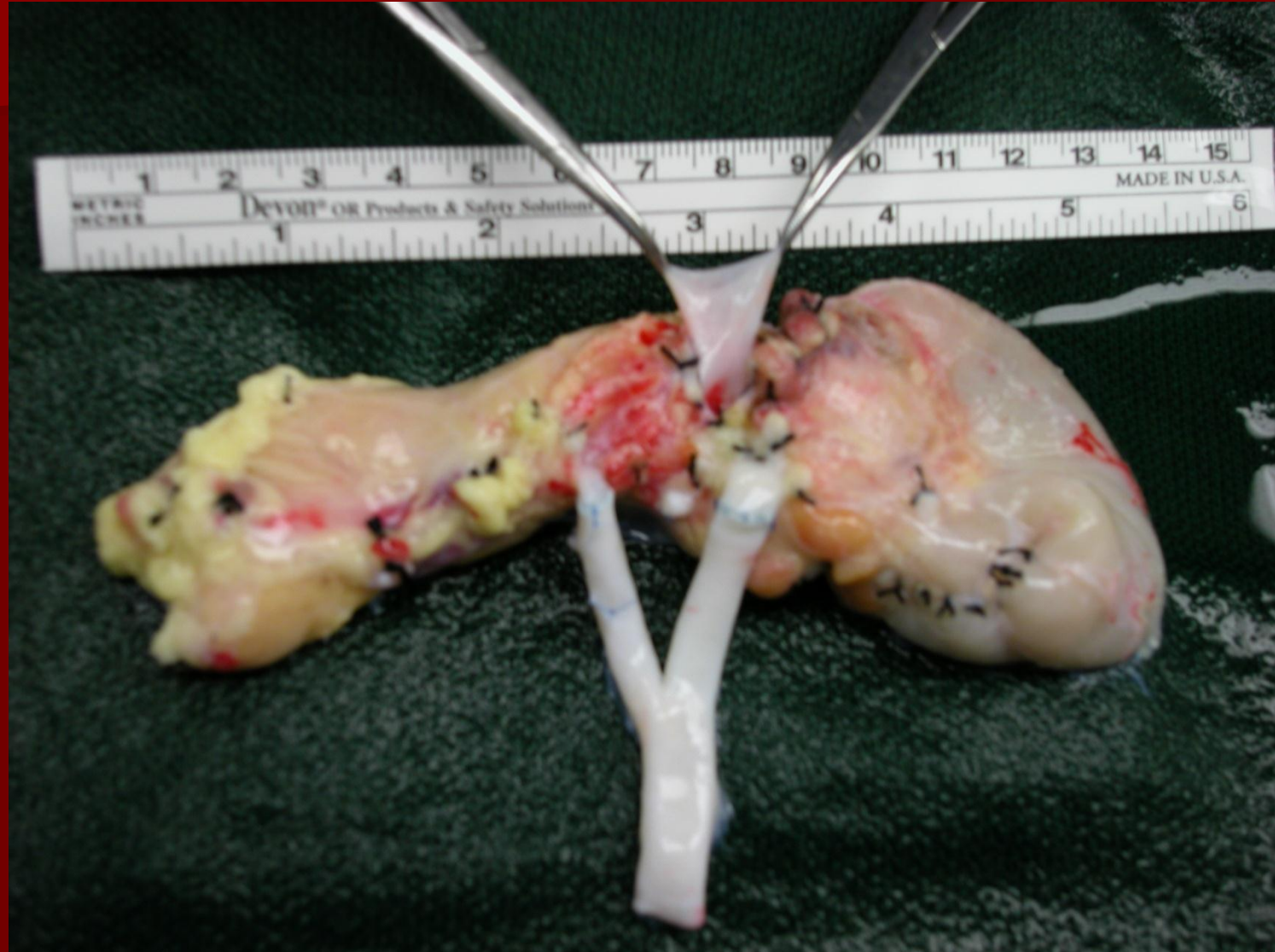


Back Table Preparation of Pancreas

- Back Table Preparation
- **Most Important**
- Assessment of fatty, fibrotic, firmness, edema
- Ligate small vessels
- Oversew duodenum staple lines
- Oversew mesenteric staple line
- Avoid long PV



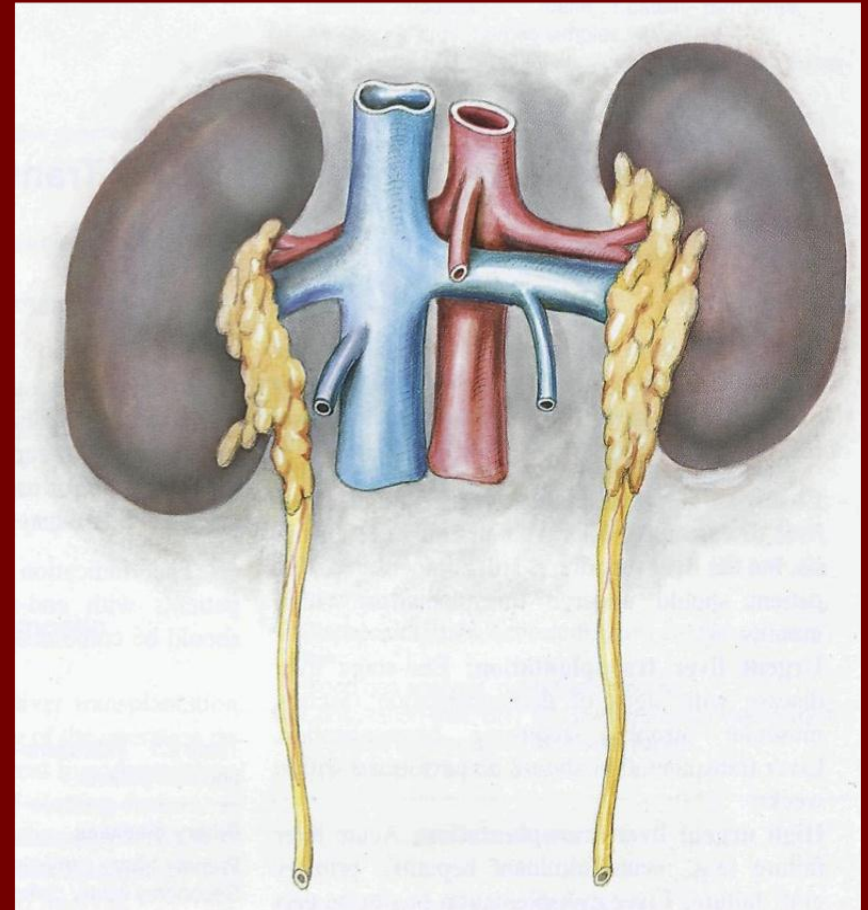
Back Table Preparation



Pediatric En Bloc Kidneys

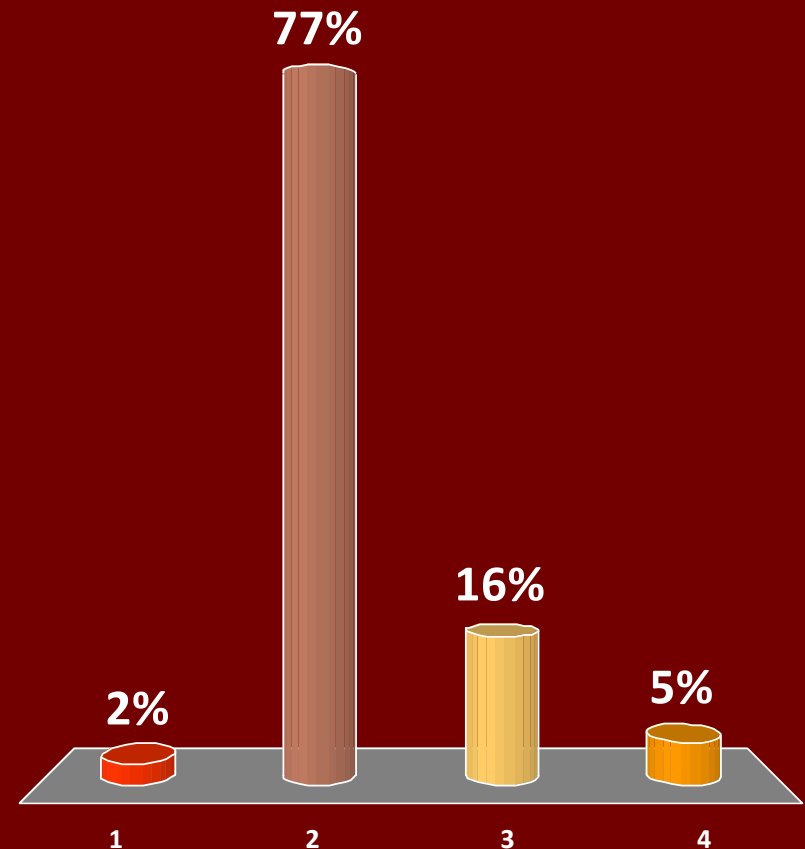
■ Back Table

- Ligate all lumbar vessels
- Oversew suprarenal IVC
- Oversew suprarenal aorta
- Avoid twisting of vessels at implantation



Which of the following statements regarding DCD liver recovery is FALSE?

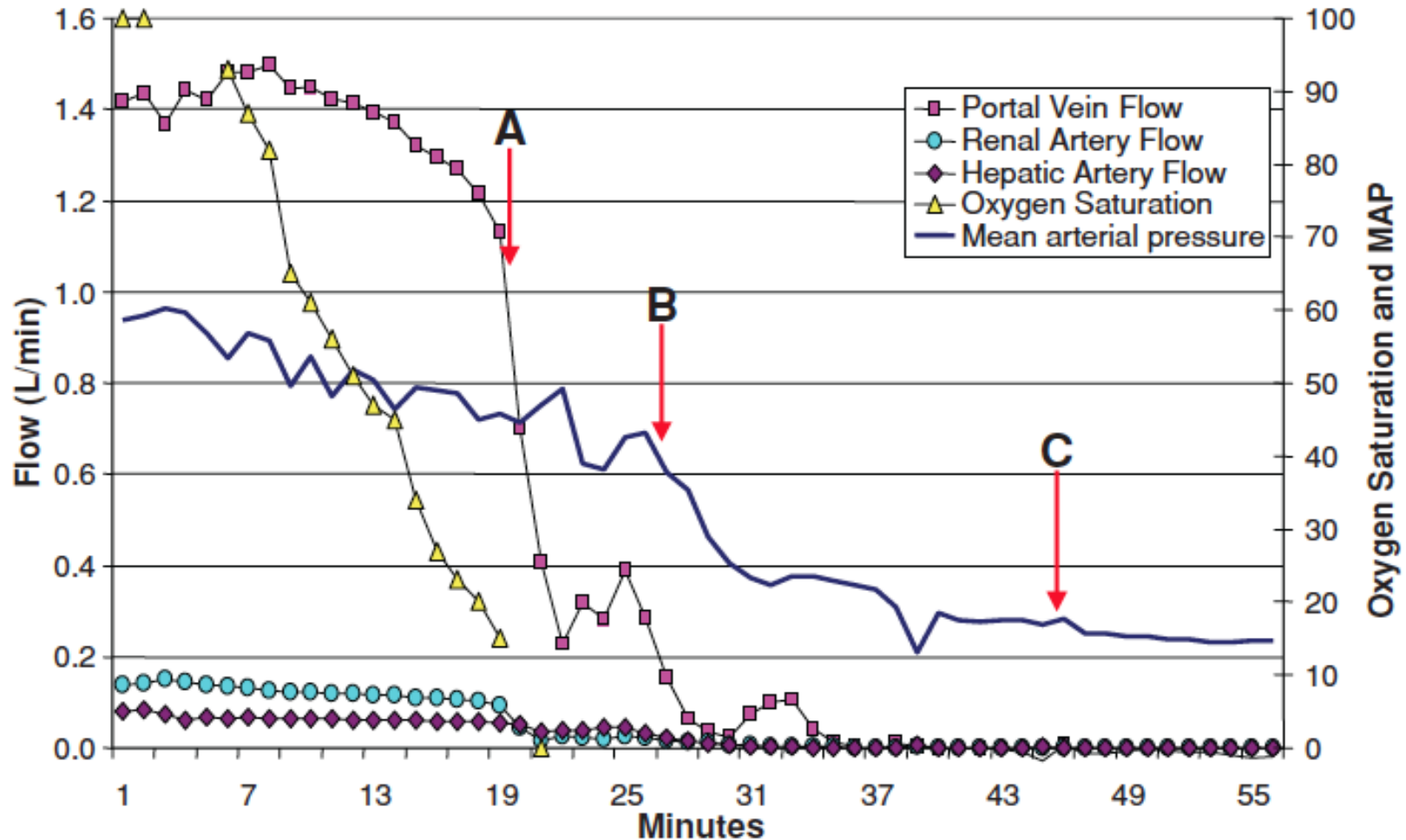
1. The time from pronouncement of death to the cold preservation flush has been shown to impact risk of ischemic cholangiopathy after transplant.
2. Bile duct flush should be avoided to minimize damage to non-pulsatile, vascular structures.
3. Time of donor hypotension during withdrawal phase impacts outcomes after DCD liver transplant.
4. Animal studies suggest that during the withdrawal phase, significant reduction of hepatic flow occurs prior to circulatory arrest.



Characterization of the Withdrawal Phase in a Porcine Donation after the Cardiac Death Model

J. Y. Rhee^{a,*}, J. Alroy^b and R. B. Freeman^c

American Journal of Transplantation, 2011; 11: 1169-75.



DCD Procurement: In Situ Separation

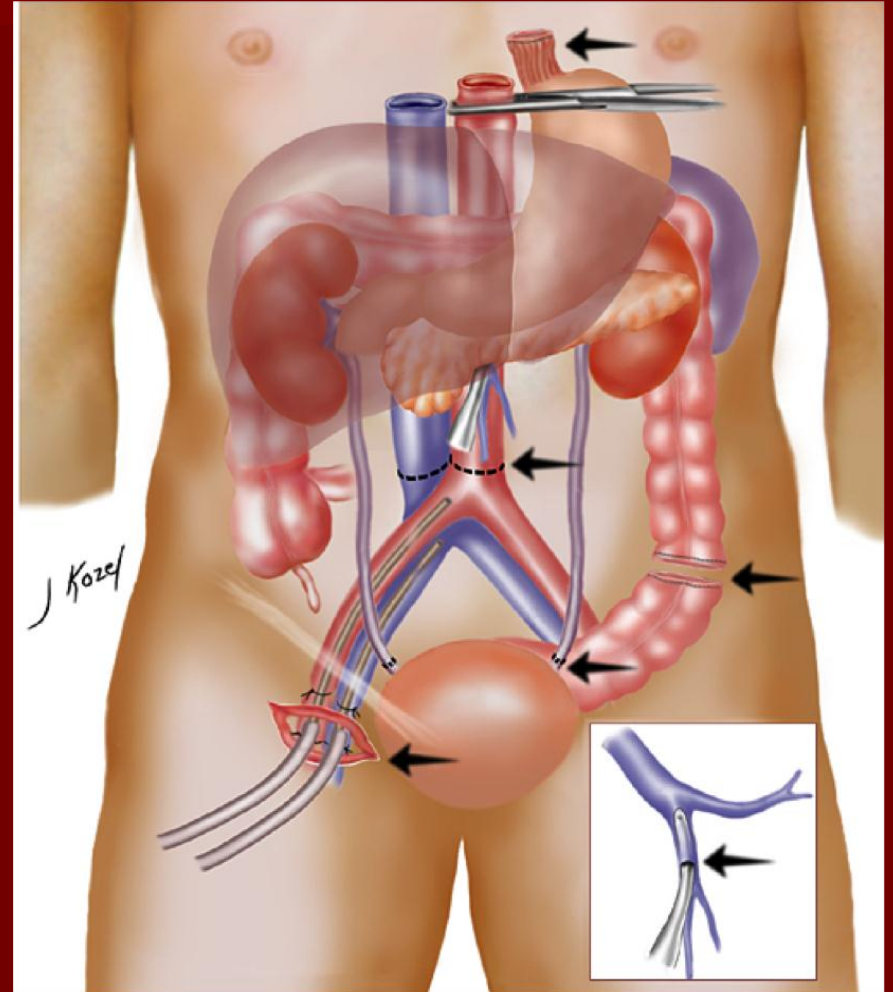
- **“Super” Rapid recovery**
 - Open abdomen and chest
 - Cannulate and flush through distal aorta
 - Cross clamp proximal aorta
 - Vent prior to hepatic engorgement
 - **Flush bile duct early!**
 - Separate liver in situ and remove
 - Flush portal vein in situ or on back table

DCD Procurement: *In Situ* Separation

- Start dissection in porta hepatis
- Dissect anteriorly on common HA from GDA to the aorta
- Replaced RHA: dissect to SMA to aorta
 - **Avoid IPDA injury if recovering pancreas**
- Replaced LHA: dissect along LGA, staying close to stomach to LGA-CHA junction
- Open SMA at aorta and avoid renal artery injury
- Proceed with circumferential dissection and removal

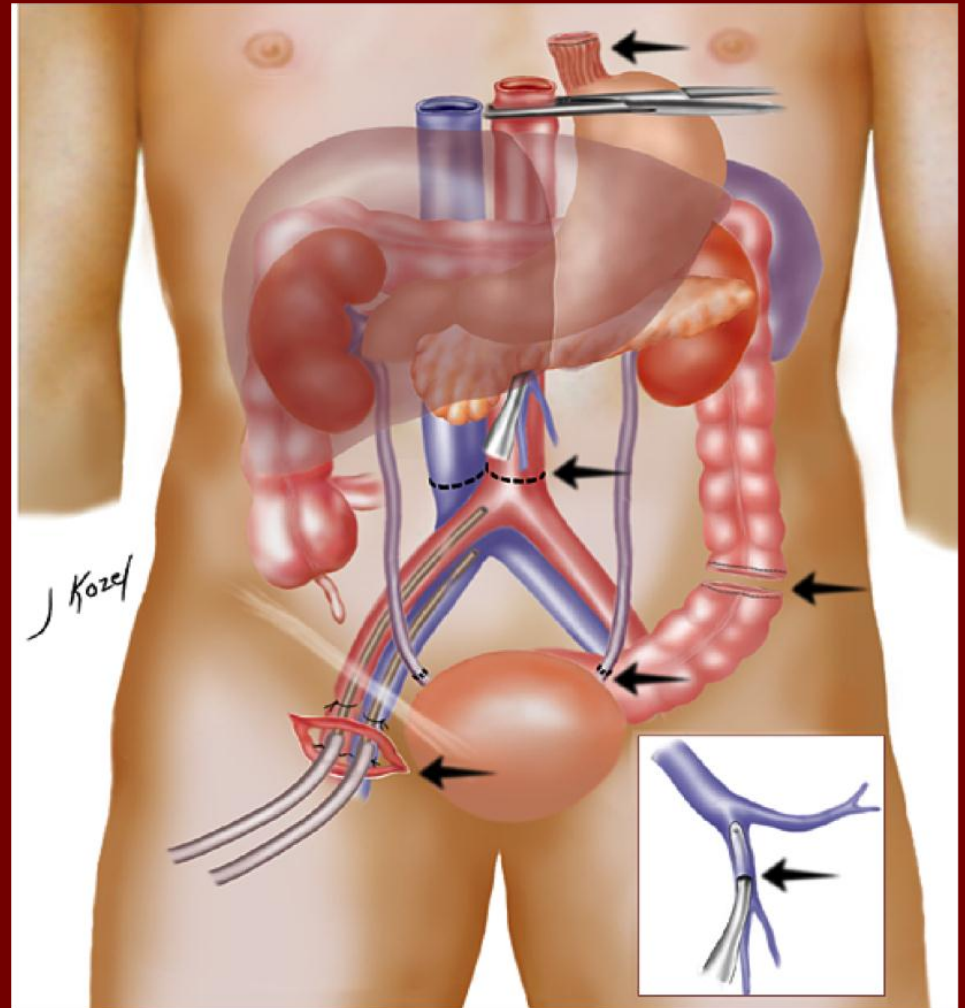
DCD Procurement: En Bloc Removal

- Consent for femoral cannulation under local anesthesia
- Start femoral flush and venting after declaration
- Open abdomen and chest
- Cross clamp aorta
- Vent IVC in chest
- 3L of UW in aorta
- Topical cooling with ice



DCD Procurement: En Bloc Removal

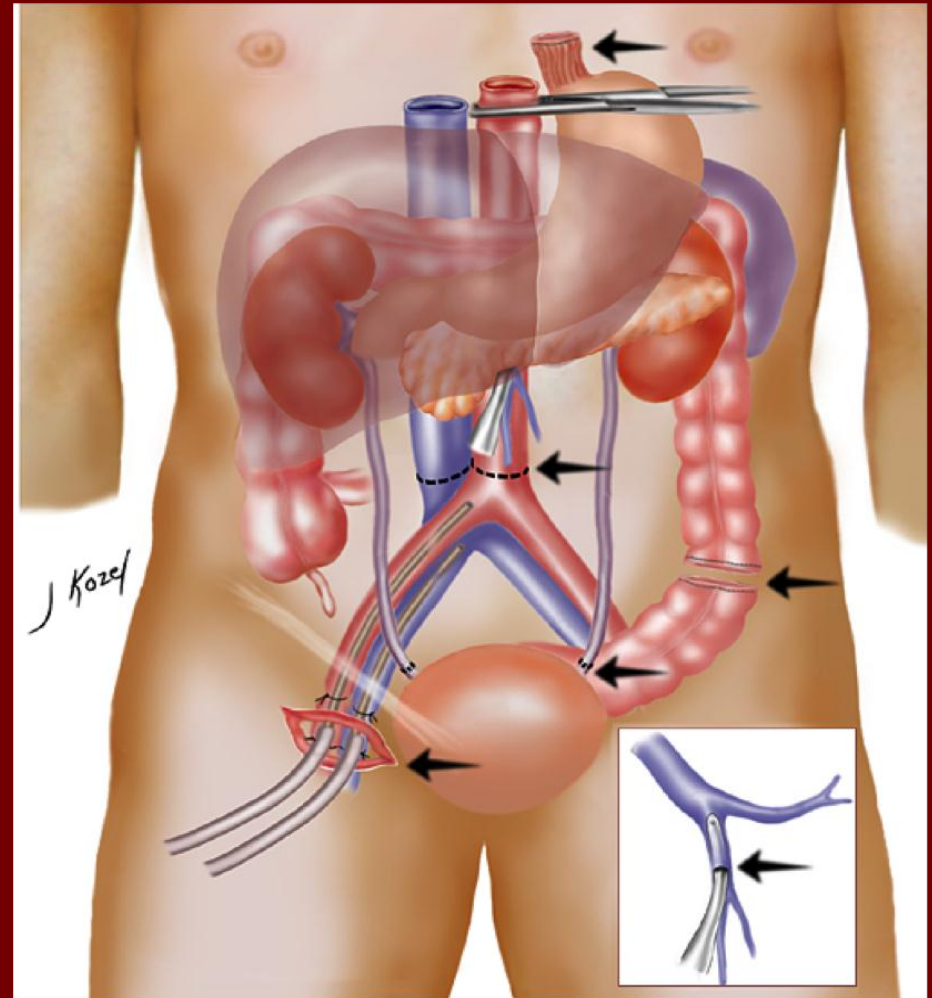
- Transect aorta at diaphragm
- Ligate and transect esophagus
- Dissect all organs inferiorly off vertebrae
- Transect ureters at UVJ
- Ligate and transect sigmoid colon
- Transect aorta at bifurcation



DCD Procurement: En Bloc Removal

■ Back Table:

- Flush IMV or PV
- Flush GB and CBD
- Open aorta and flush celiac and SMA
- Package and return to center
- 1-1.5 h for organ separation



DBD and DCD Procurement Differences

■ DBD

- Dissection in warm
- Arterial pulsation
- Decreased risk of vascular injury
- Less stress
- Entire pancreatic dissection in warm

■ DCD

- Dissection in cold
- No arterial pulsation
- Increased risk of arterial injury
- Increased stress with rapid recovery
- Pancreatic dissection in cold

Summary

- Maintain procurement principles
 - Hemodynamic stability, rapid flush, hypothermia
- Recognize vascular anomalies, avoid injury
- Back table organ examination and preparation are critical
- Optimize DCD recoveries to maximize organ utilization
- **Minimize total ischemia time at DCD organ recovery**
- When in doubt: **Convert to Cold**

References

- Kremer, Bernd, Broelsch, Christoph E., and Doris Henne-Bruns. *Atlas of Liver, Kidney, and Pancreas Transplantation*. New York: Thieme Medical Publishers, Inc., 1994.
- Baranski, Andrzej. *Surgical Technique of Abdominal Organ Procurement*. London: Springer-Verlag, 2009.



DEPARTMENT OF
Surgery
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE
AND PUBLIC HEALTH