PANCREAS TRANSPLANTATION

Technical Considerations

The Ohio State University

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ASTS 7th Annual Surgical Fellows Symposium

DISCLOSURES

I have the following relevant financial relationship to disclose with respect to my presentation:

Consultant, WL Gore Co.

A Chance To Cut
Is A
Chance To Cure

Diabetes Control and Complications Trial (DCCT)

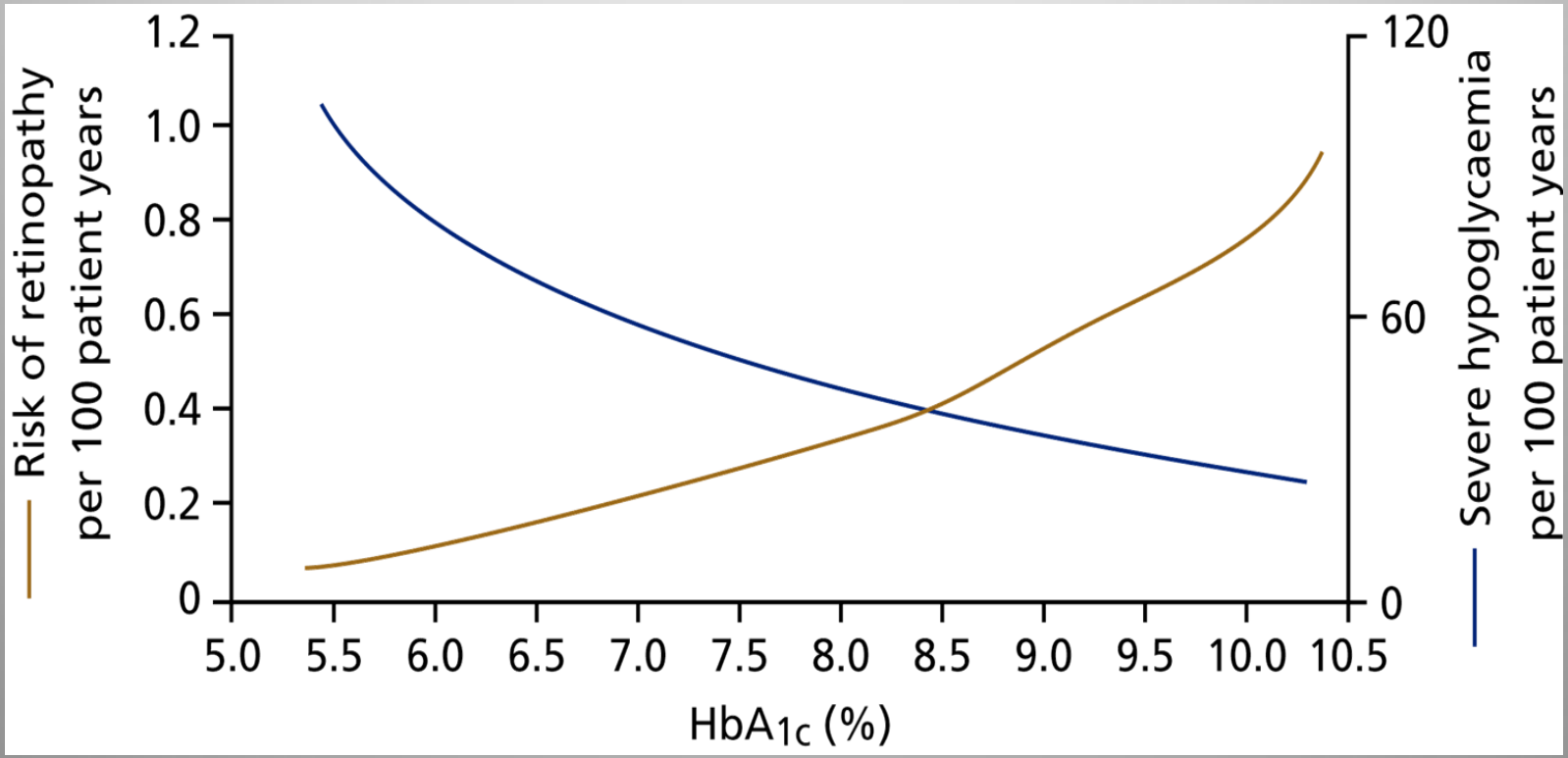
- *The Diabetes Control and Complications Trial Research Group NEJM 1993*
- *Sentinel trial of aggressive glucose control*
- *1441 pts randomized to conventional or intensive insulin therapy*
- *Follow up 6.5 year*

Diabetes Control and Complications Trial (DCCT)

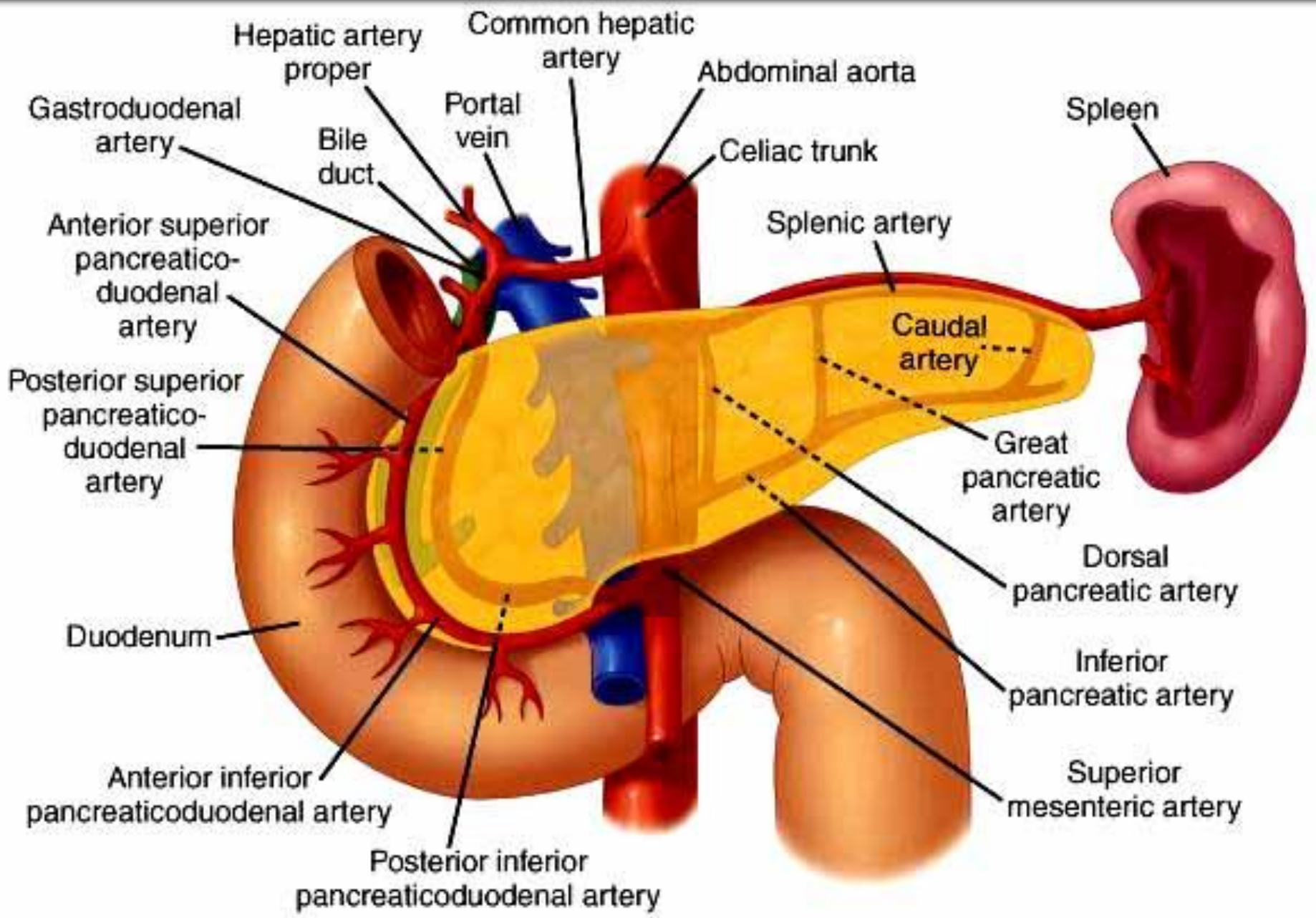
- ***Risk reduction***
  - ***Retinopathy – 63% p<0.002***
  - ***Nephropathy – 54% p<0.04***
  - ***Neuropathy – 60% p<0.002***
- ***<5% of persons were able to achieve an A1C <6.1%***
- ***Intensive group had 3-fold increased risk of hypoglycemia***

DCCT Research Group. New Engl J Med 1993;328:977

The Balance Between Prevention of Complications and Development of Hypoglycemia: DCCT



DCCT Research Group. New Engl J Med 1993;328:977.


Hepatic artery proper
Common hepatic artery
Abdominal aorta
Gastroduodenal artery
Portal vein
Bile duct
Celiac trunk
Spleen
Anterior superior pancreatico-duodenal artery
Splenic artery
Caudal artery
Posterior superior pancreatico-duodenal artery
Great pancreatic artery
Dorsal pancreatic artery
Duodenum
Inferior pancreatic artery
Anterior inferior pancreaticoduodenal artery
Superior mesenteric artery
Posterior inferior pancreaticoduodenal artery

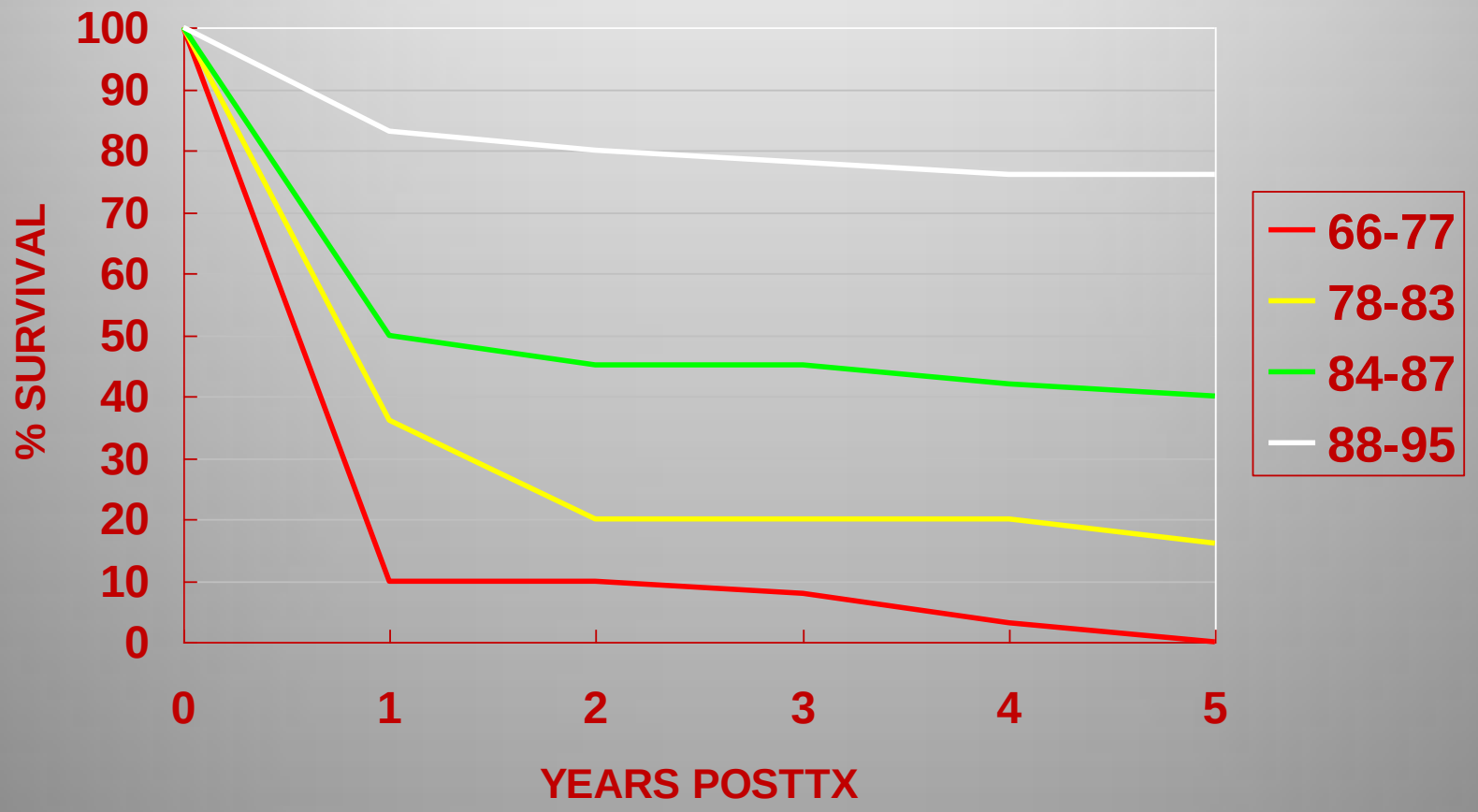
Pancreas Transplantation

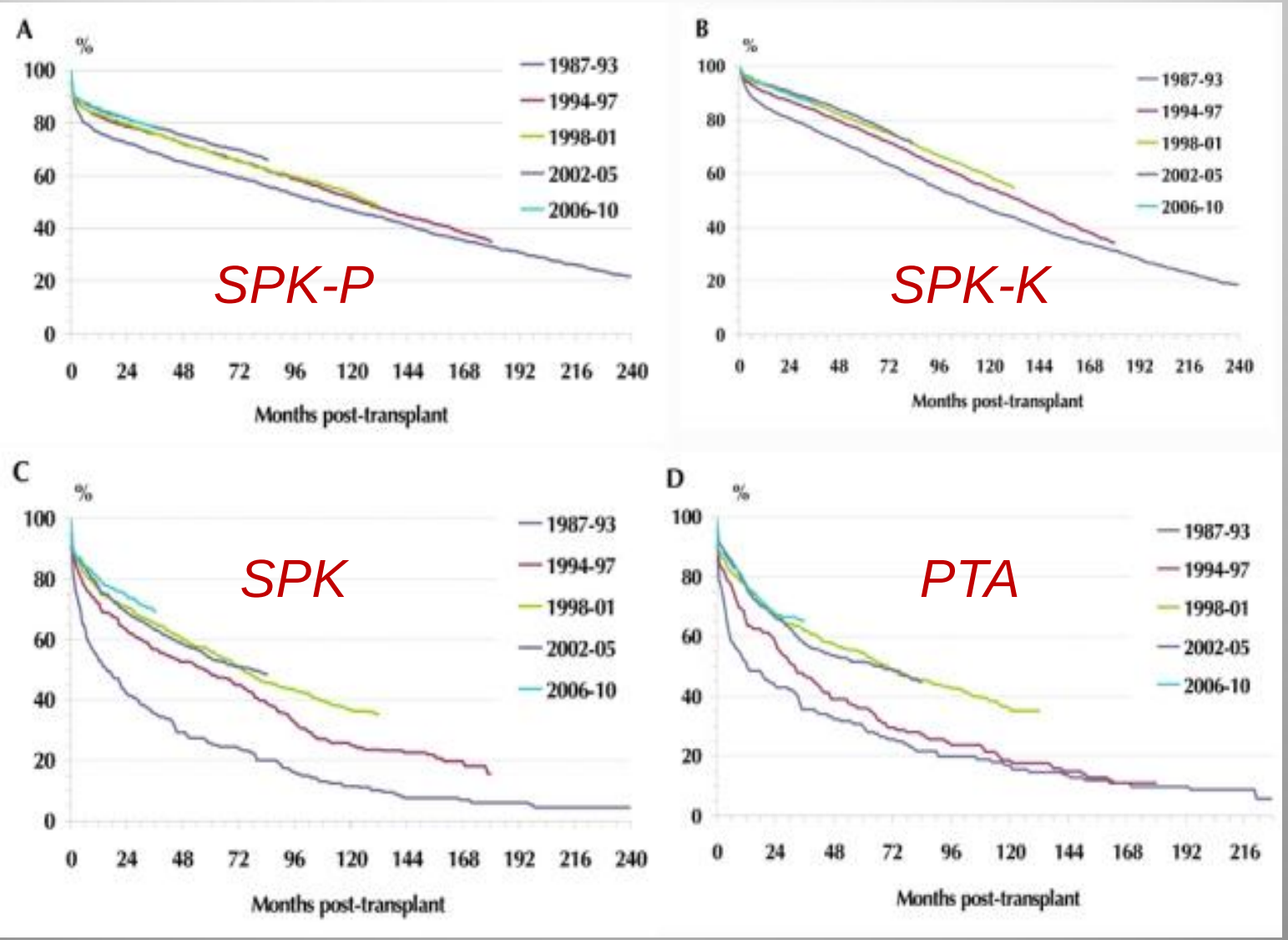
Goal

- ***To eliminate the acute complications of diabetes***
- ***By achieving normoglycemia, to slow , stop or even reverse the chronic pathophysiologic injury 2º to IDDM***

Pancreas Survival

Early Eras





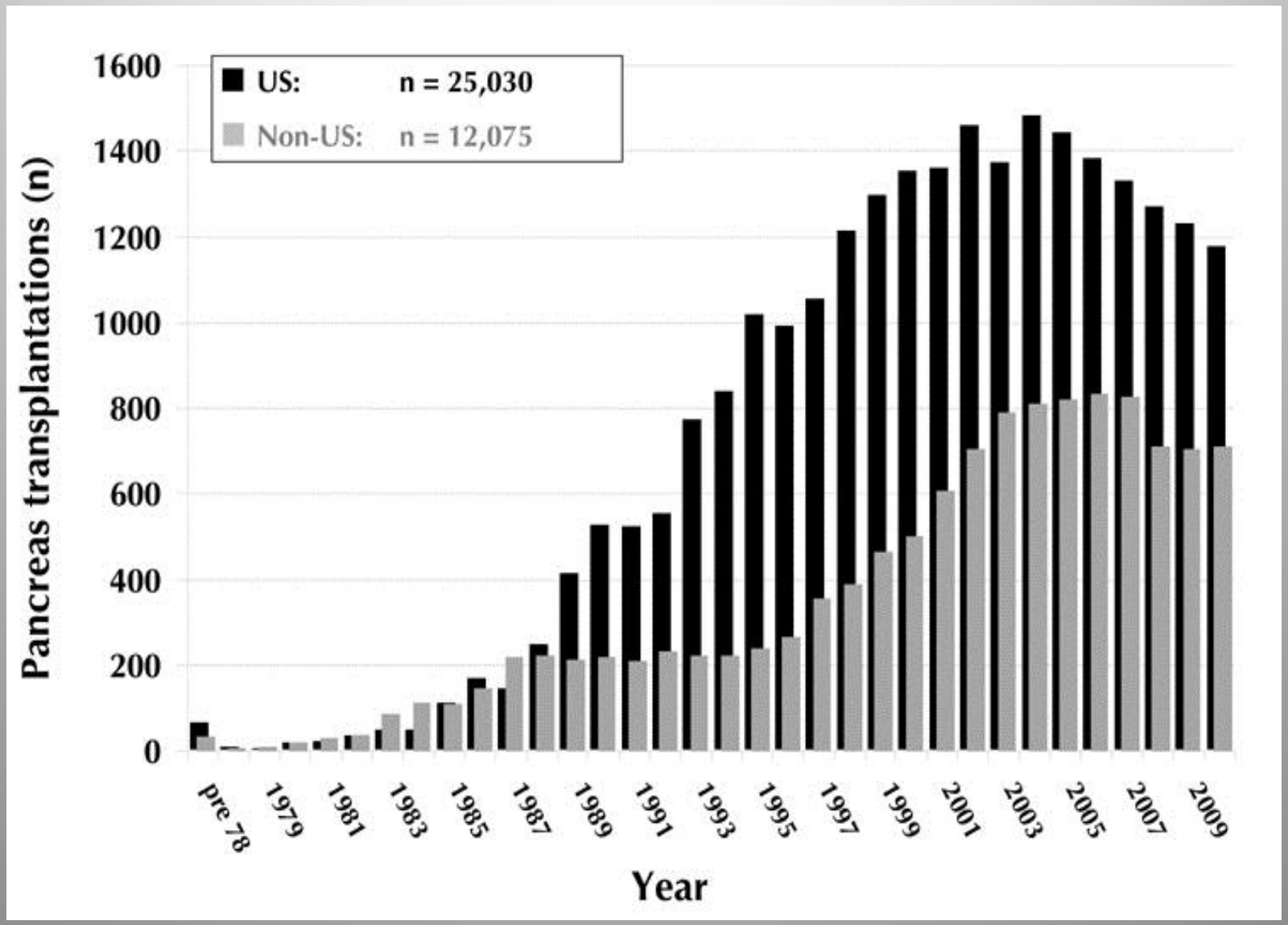
Graft survival by era

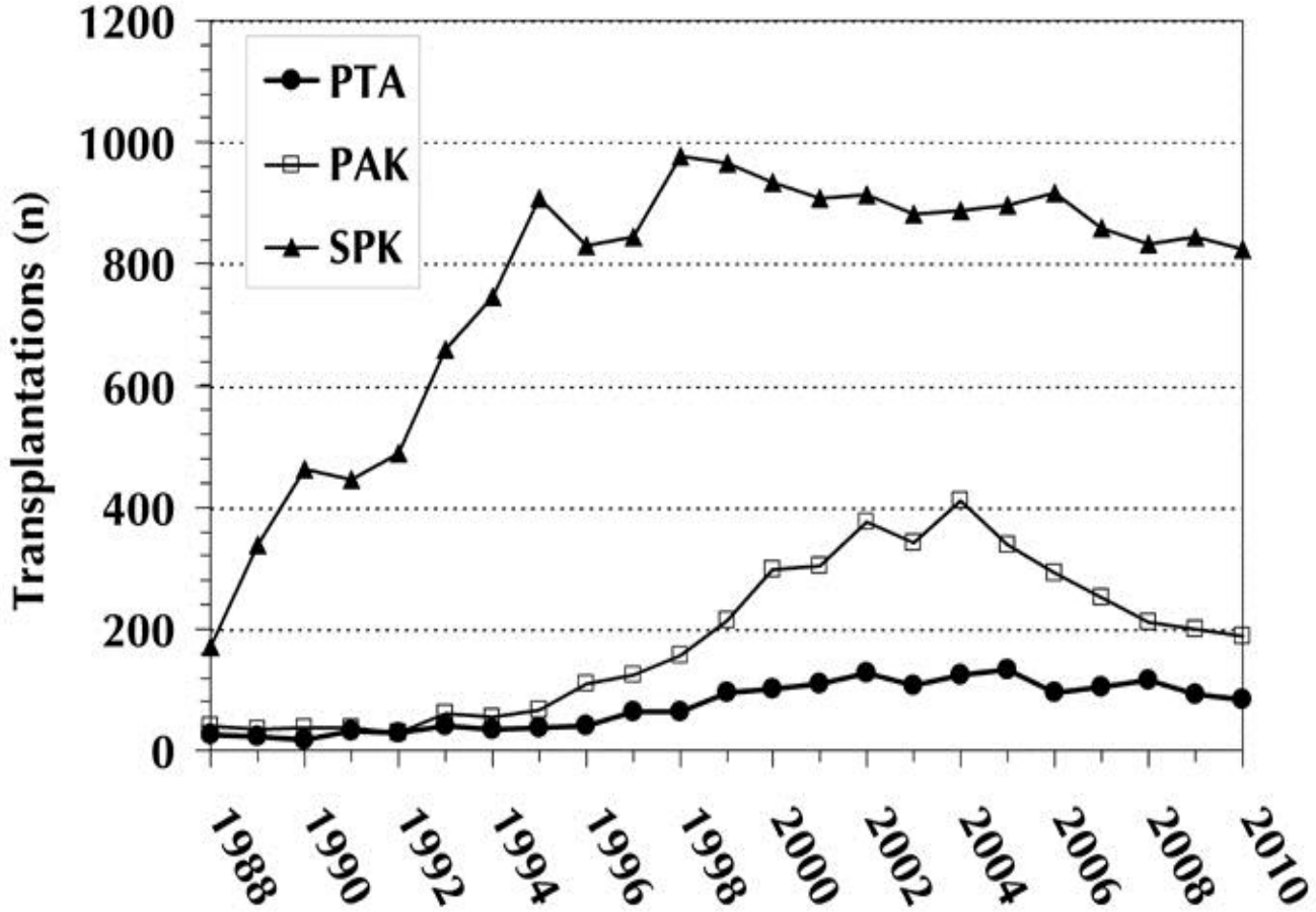
Patient Survival

Kidney tx alone vs simultaneous Kidney/Pancreas tx

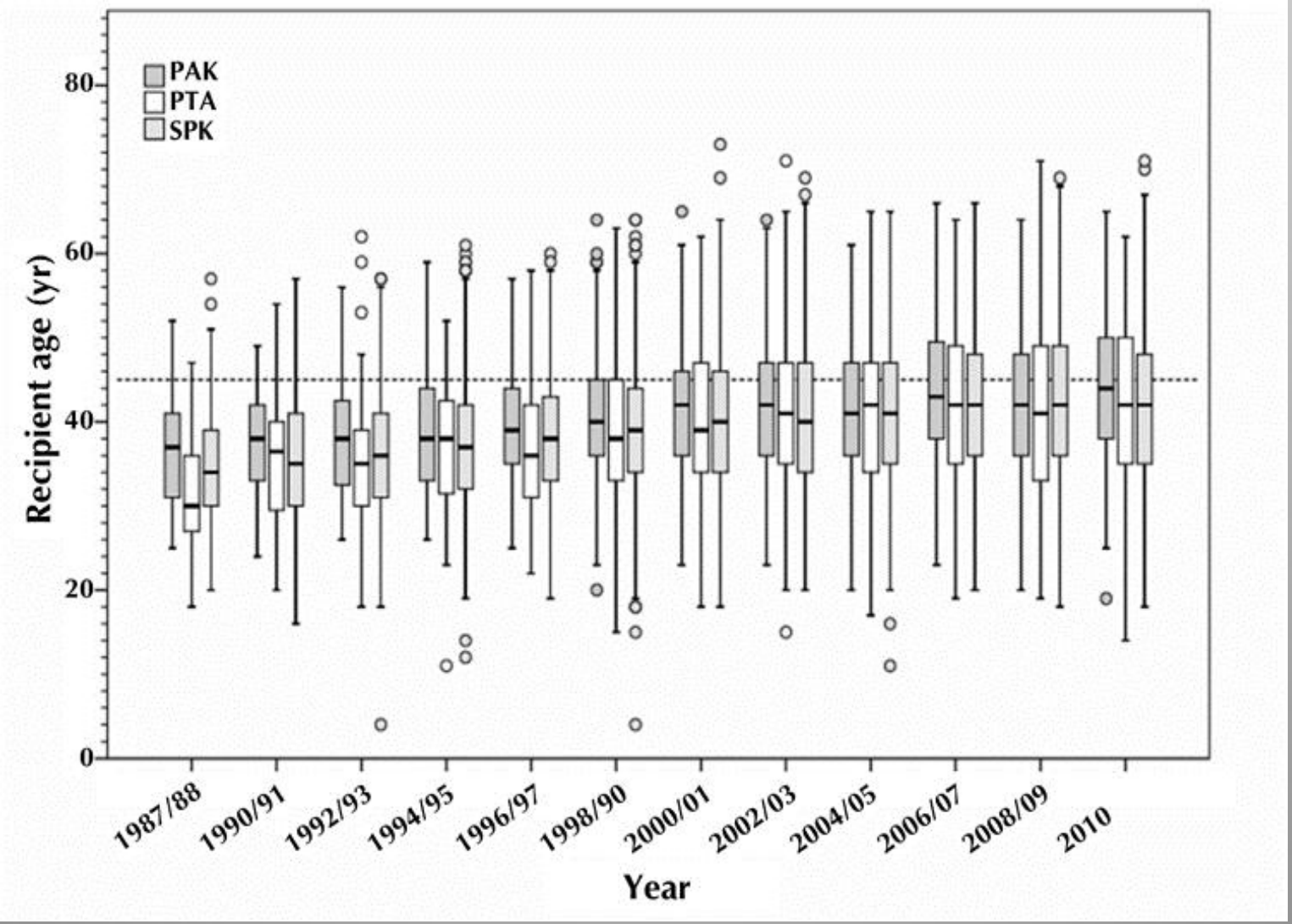
Tyden et al

Life style versus life saving?


US: n = 25,030
Non-US: n = 12,075
Pancreas transplantations (n)
1600
1400
1200
1000
800
600
400
200
0
pre 78
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Year



US tx's by year


PAK
PTA
SPK
Recipient age (yr)
0
20
40
60
80
1987/88
1990/91
1992/93
1994/95
1996/97
1998/90
2000/01
2002/03
2004/05
2006/07
2008/09
2010
Year

Pancreas Transplantation

Technical considerations:

- ***Donor***

- ***Backtable***
  - ***Arterial supply***
  - ***Venous drainage***
  - ***Duodenum***
  - ***Spleen***

- ***Tx Procedure:***
  - ***Exocrine drainage***
  - ***Venous drainage***

Pancreas Transplantation

Technical considerations:

- ***Donor***

- ***Usually procured en bloc with liver and split on back table***

- ***Virtually no arterial scenarios where pancreas and liver can't both be procured***

- ***In situ flush trending toward non-viscous fluids, for better capillary access/cooling***

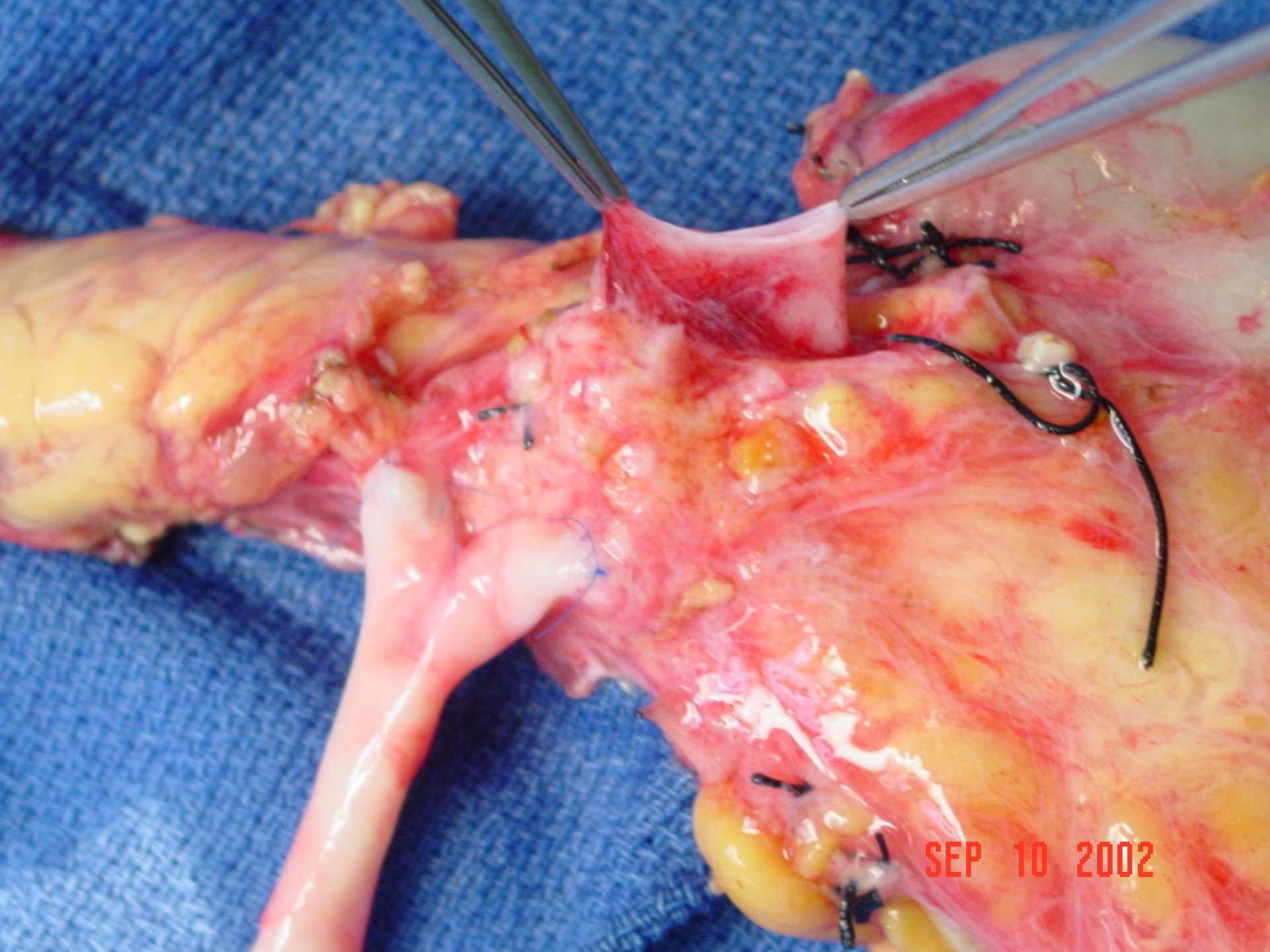
Pancreas Transplantation

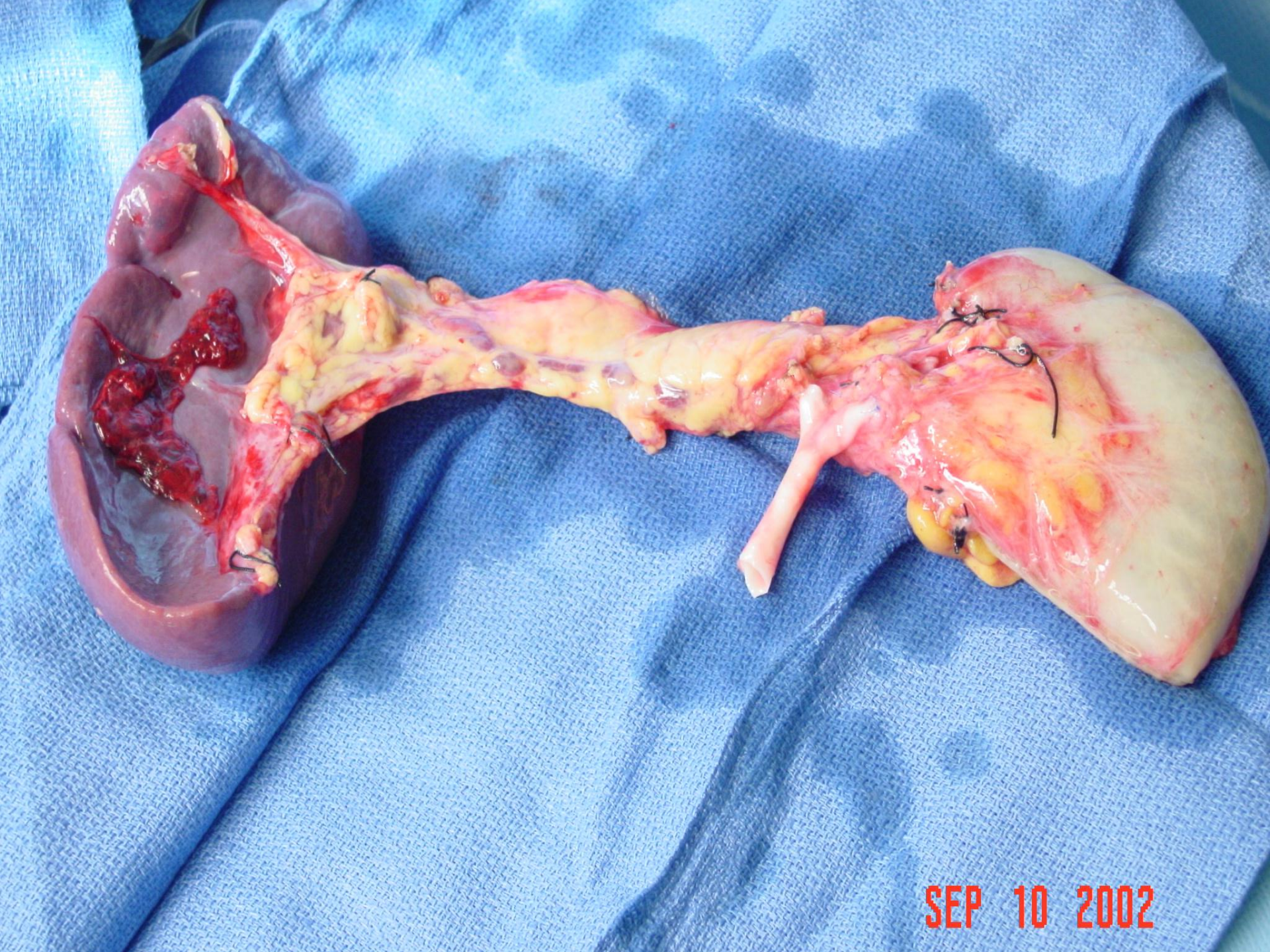
Technical considerations:

- ***Backtable***

- ***Arterial supply***
  - ***Y-grafting to SMA and splenic artery***
  - ***Choose best graft available - iliacs***
  - ***Can endarterectomize if necessary***
  - ***"Short enough" with proper orientation***

- ***Venous - portal vein***
  - ***"A little" dissection from parenchyma***
  - ***Gently shorten – some advocate venous grafting***


SEP 10 2002

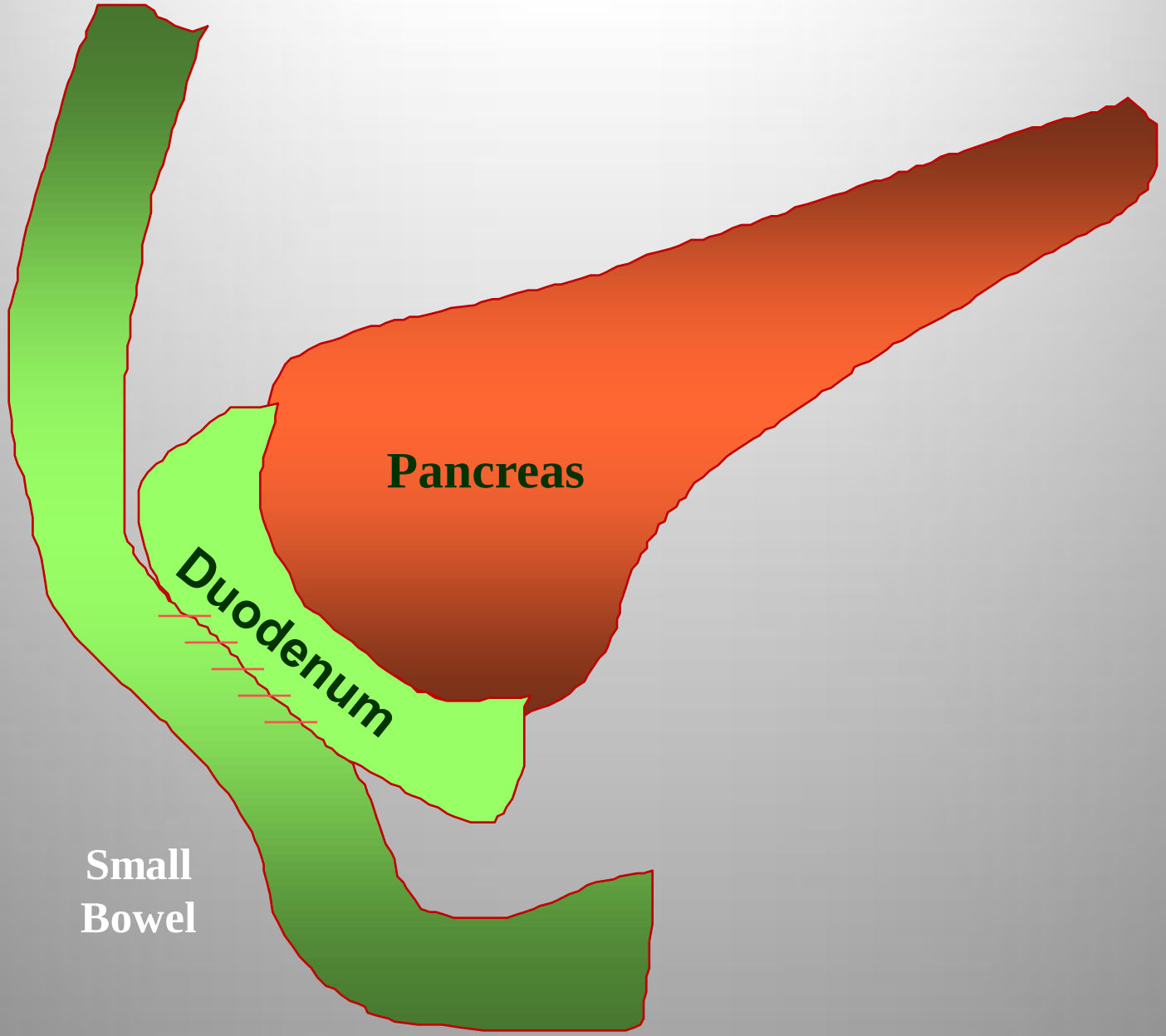

SEP 10 2002

Pancreas Transplantation

Technical considerations:

- ***Backtable***

- ***Duodenum***
  - ***Depends on choice of exocrine drainage***
  - ***Enteric - shorten enough to avoid ischemia***
  - ***Bladder – significant shortening to decrease fluid losses***
  - ***Can mark sphincter by passing dilator down bile duct to mark exit site***
  - ***Stay right on duodenum with dissection***


Pancreas
Duodenum
Small
Bowel

Pancreas Transplantation

Technical considerations:

- ***Tx Procedure***

Exocrine drainage

Enteric drainage - 80+% of programs

Advantages

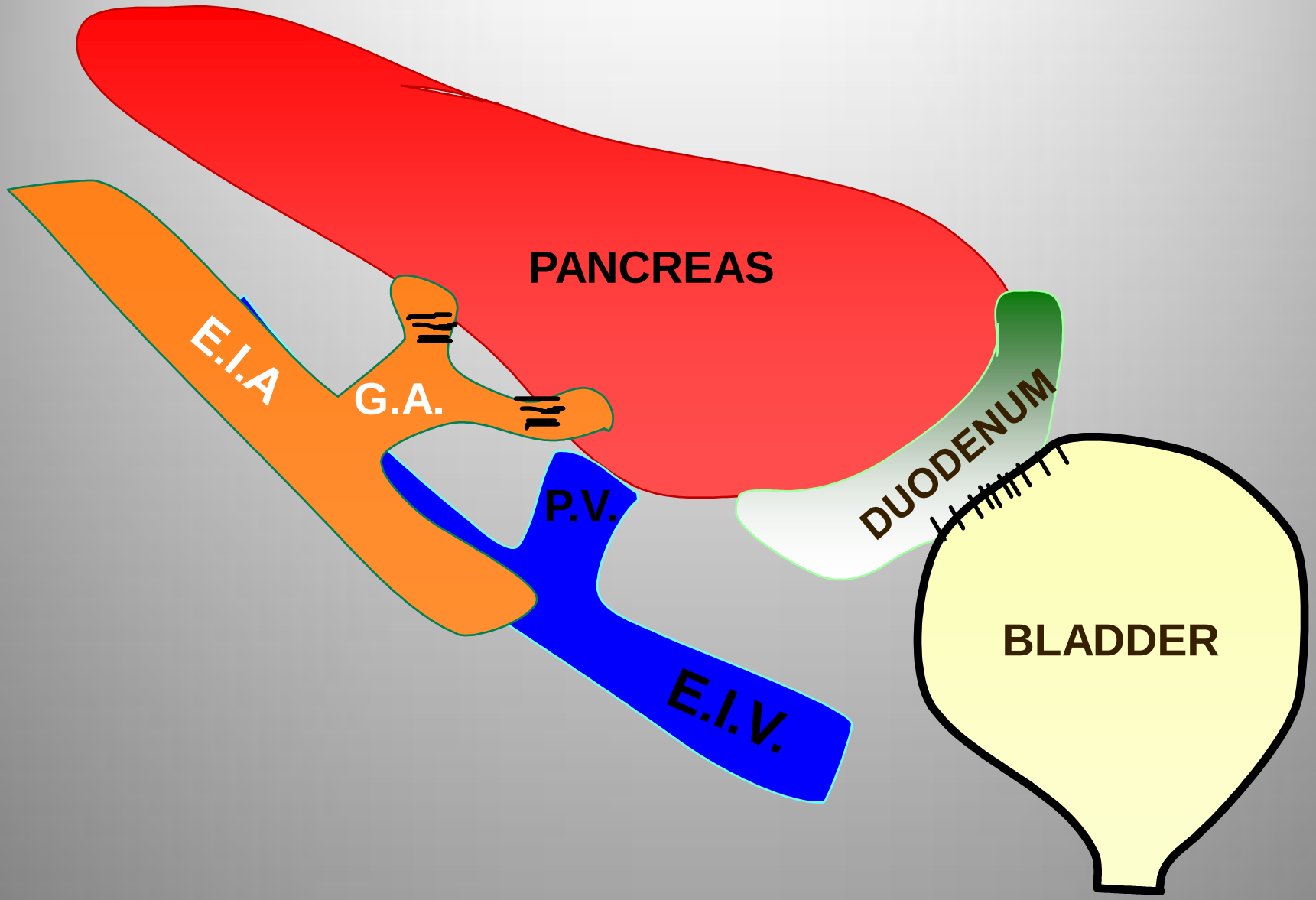
- more "physiologic"

- avoid dehydration, acidosis, K^+ issues

Disadvantages

- early leaks – can be disastrous

- ?? increased intra-abdominal infections, small bowel obstructions


PANCREAS
E.I.A
G.A.
P.V.
E.I.V.
DUODENUM
BLADDER

Pancreas Transplantation

Technical considerations:

- ***Tx Procedure***

Exocrine drainage

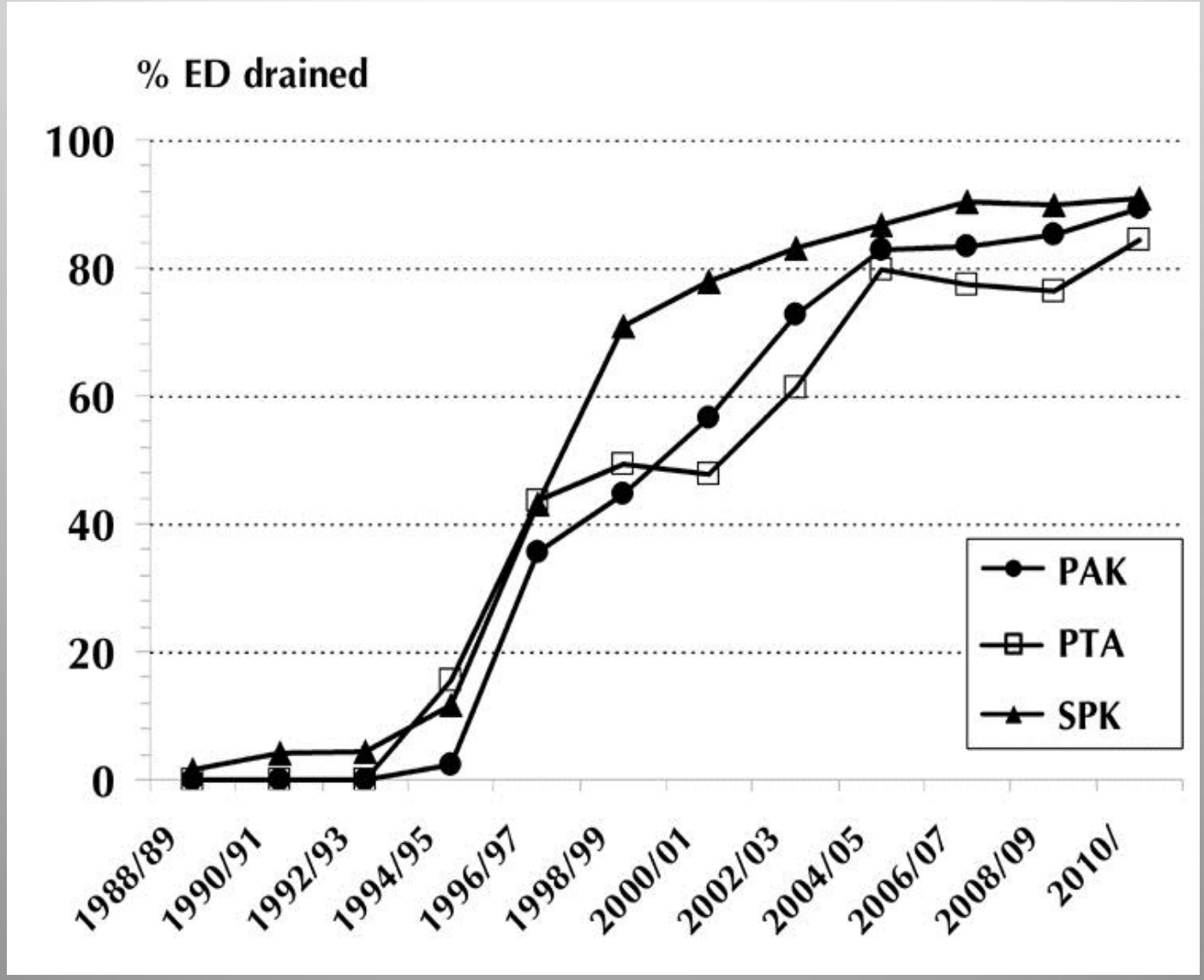
Bladder drainage – minority of programs

Advantages

- ***monitor urinary amylase (isolated tx's)***
- ***improved blood pressure control***
- ***early and late leaks easily managed***

Disadvantages

- ***need for enteric conversion (50% of time at Wisconsin, 7% at OSU)***


% ED drained
100
80
60
40
20
0
1988/89
1990/91
1992/93
1994/95
1996/97
1998/99
2000/01
2002/03
2004/05
2006/07
2008/09
2010/
PAK
PTA
SPK

Pancreas Transplantation

Technical considerations: enteric vs bladder

- ***Tx Procedure - orientation and arterial and venous considerations***

- ***Enteric drainage - head pointing cephalad***
  Artery – ext or cm iliac, aorta, others
  Vein – iliacs or vena cava - mesenteric veins
  GI – side-to-side, or defunctionalized loop

- ***Bladder drainage - head pointing caudad***
  - ***Artery – external or common iliac art***
  - ***Vein – external iliac vein***

Pancreas Transplantation

Technical considerations: enteric vs bladder

- ***Tx Procedure - duodenal anastomosis***

- ***Enteric drainage***
  GI – side-to-side, or defunctionalized loop
  Side-to-side – suture probably not important, some have stapled (may have increased incidence of bleeding)

- ***Bladder drainage***
  - ***Side-to-side – absorbable suture for mucosa, second layer not important***

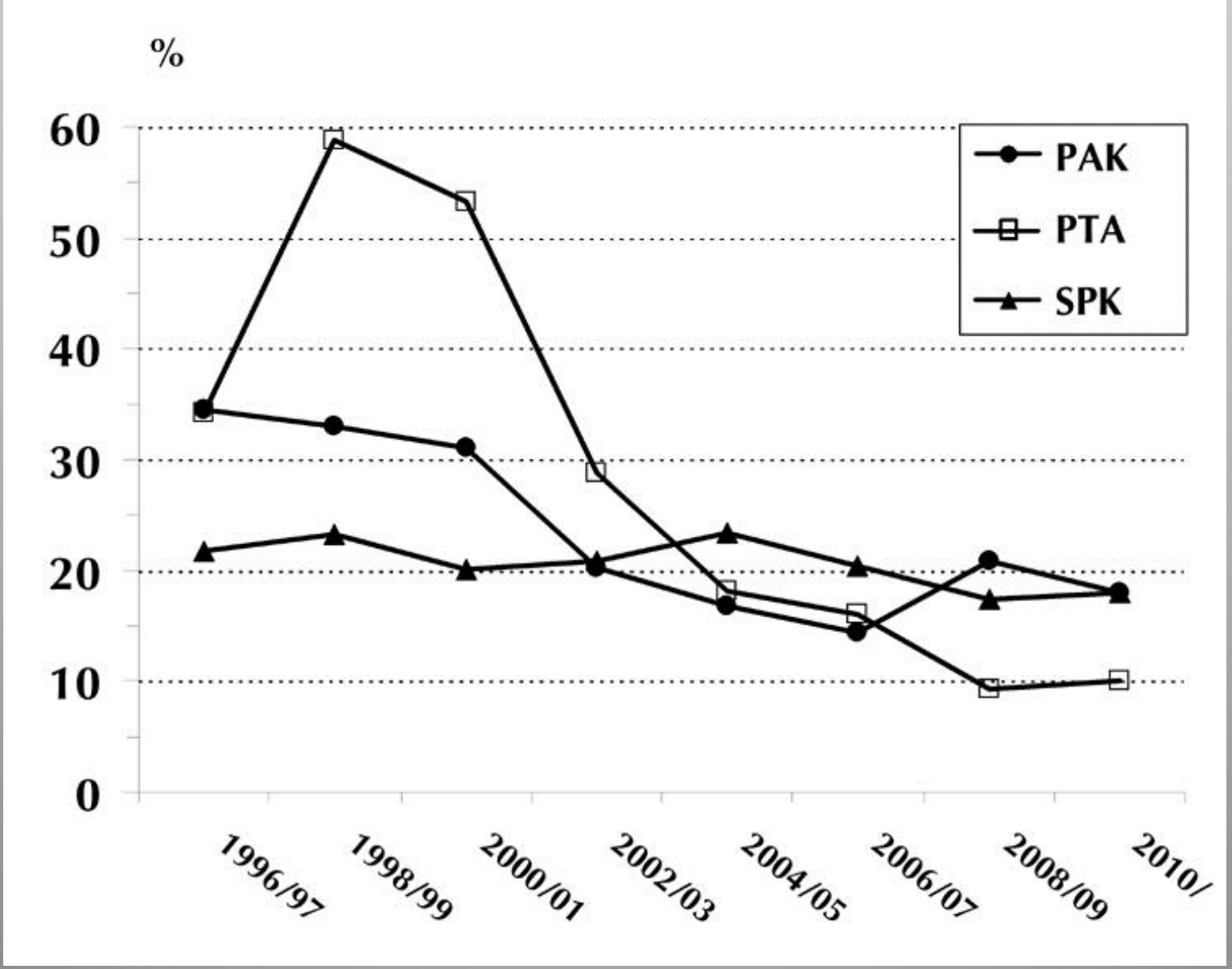
Pancreas Transplantation

Technical considerations: venous drainage

- ***Tx Procedure – Portal/mesenteric versus systemic venous drainage of pancreas***

- ***Portal venous drainage - "physiologic"***
- ***Systemic drainage - hyperinsulinemia***
  -Non-tx patients - accelerated atherosclerosis

  - ***No evidence to prove an advantage***
  - ***Currently done infrequently***



Portal drainage over time

Pancreas Transplantation

Technical considerations:

- ***Tx Procedure***

- ***Incision - Initially bilateral retroperitoneal***
  Midline vs low transverse

- ***SPK***
  - Pancreas first - watch for bleeding,
  adequate perfusion
  - Kidney second

Pancreas Transplantation

Technical considerations: Miscellaneous

- ***Spleen - prefer to leave on at transplant***
  - ***Works as a "handle" during procedure***
  - ***Doubles initial flows during reperfusion***

- ***Intra- versus Extra- peritoneal placement***
  - ***Initially placed retro- in kidney tx incision, not a good idea***
  - ***Some still advocate placing in a retro-peritoneal position at end of procedure***
- ***Use peritoneal clearance to your advantage***

- ***Perioperative insulin - no + evidence***

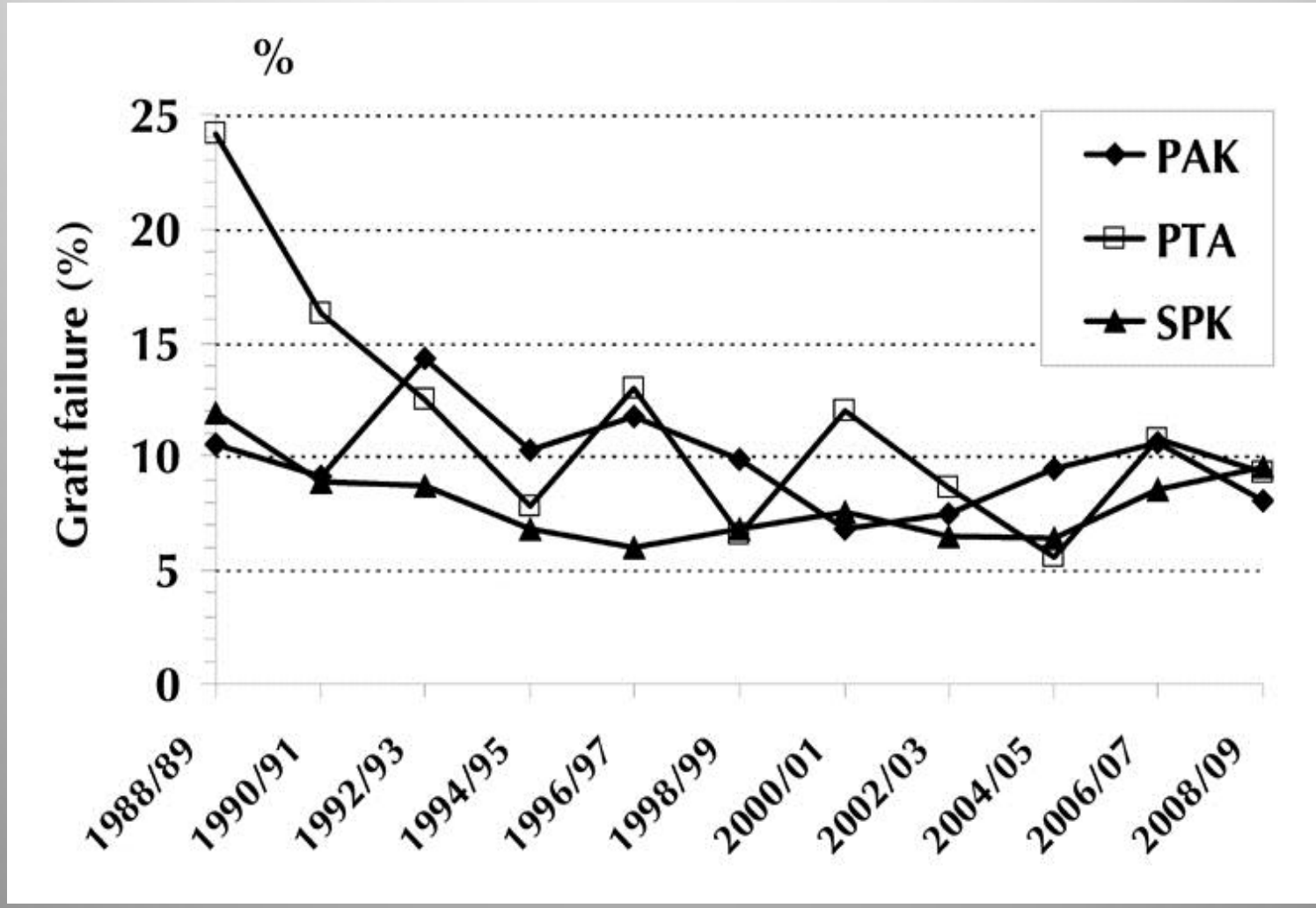
Pancreas Transplantation

Technical considerations:

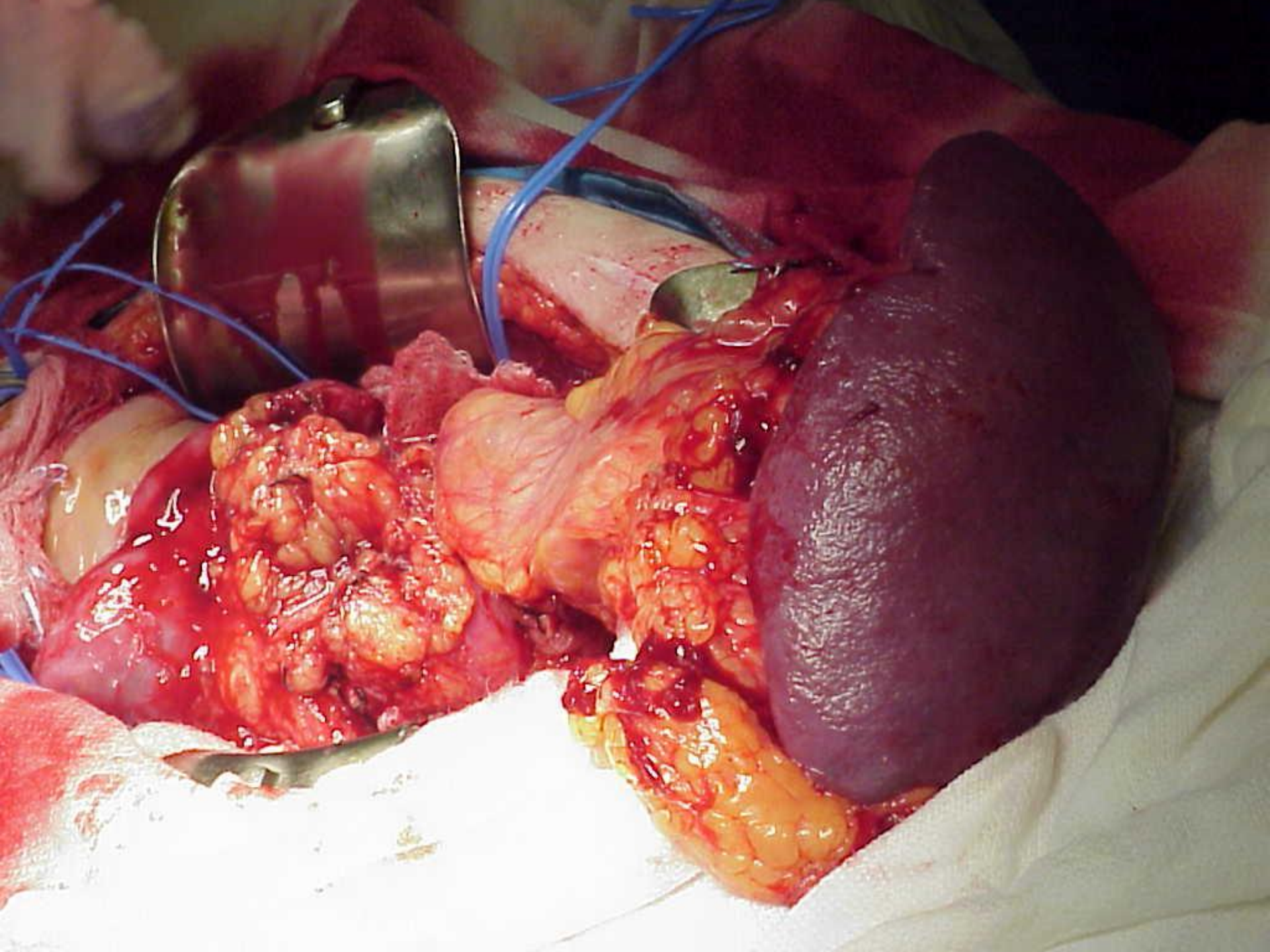
- ***"Technical failures"***
  Approximately 8-10% - mostly thrombosis

- ***Fairly constant over recent times***
- ***No good evidence to say heparin, ASA, other plt inhibitors make a difference***

- ***Time to retire the term and move on***



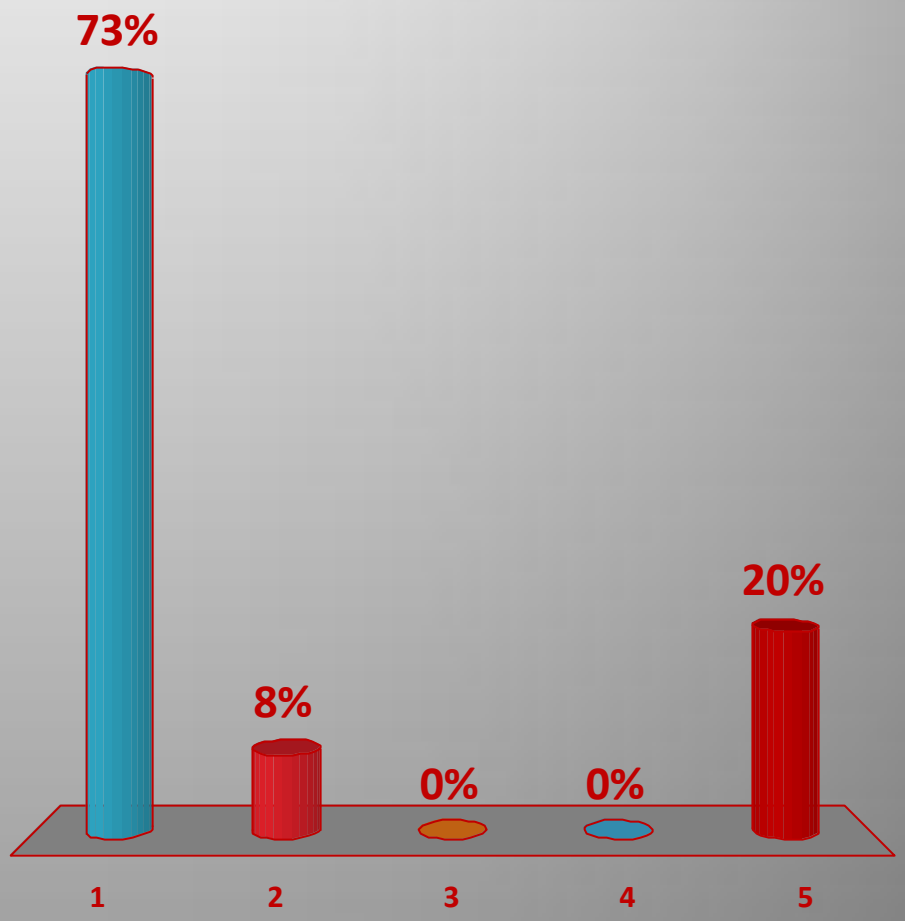
Technical failure over time



OHIO STATE
BUCKEYES

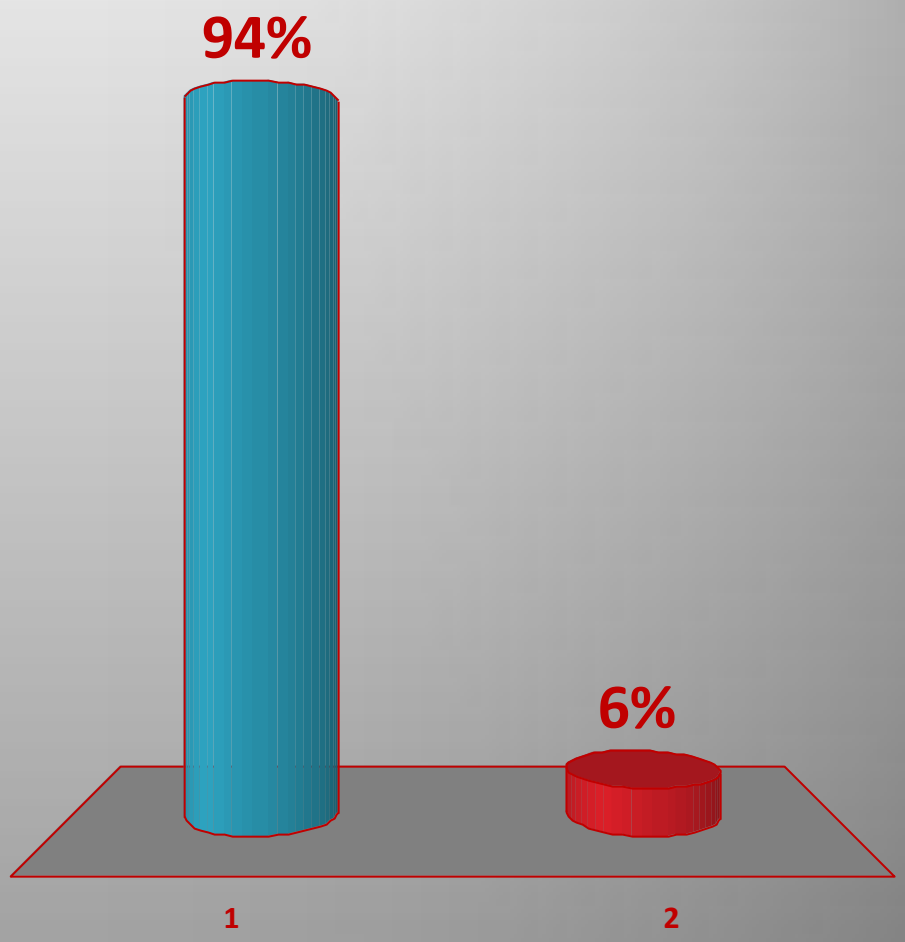
Exocrine drainage should be:

1. Enteric only
2. Bladder only
3. Only bladder for isolated pancreas tx
4. Revert to duct injection
5. Test the 2 methods in a randomized, prospective multicenter trial



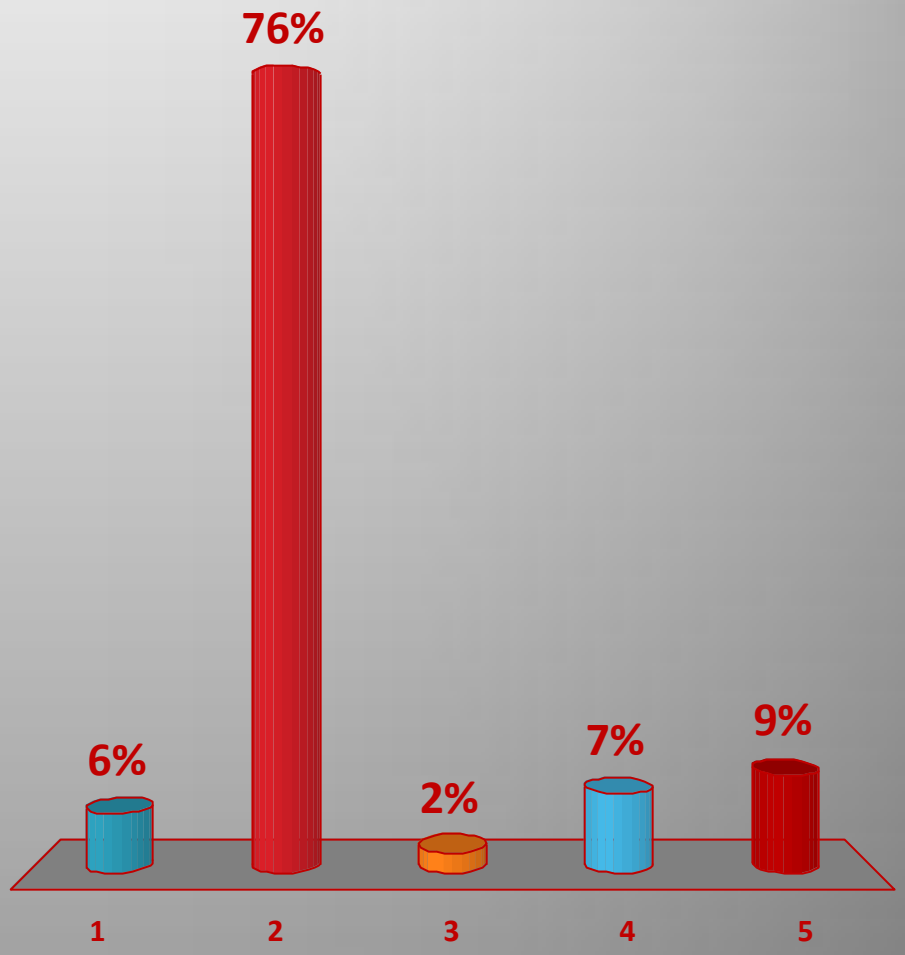
With enteric drainage, we use:

1. In continuity, side-side anastomosis
2. A defunctionalized segment



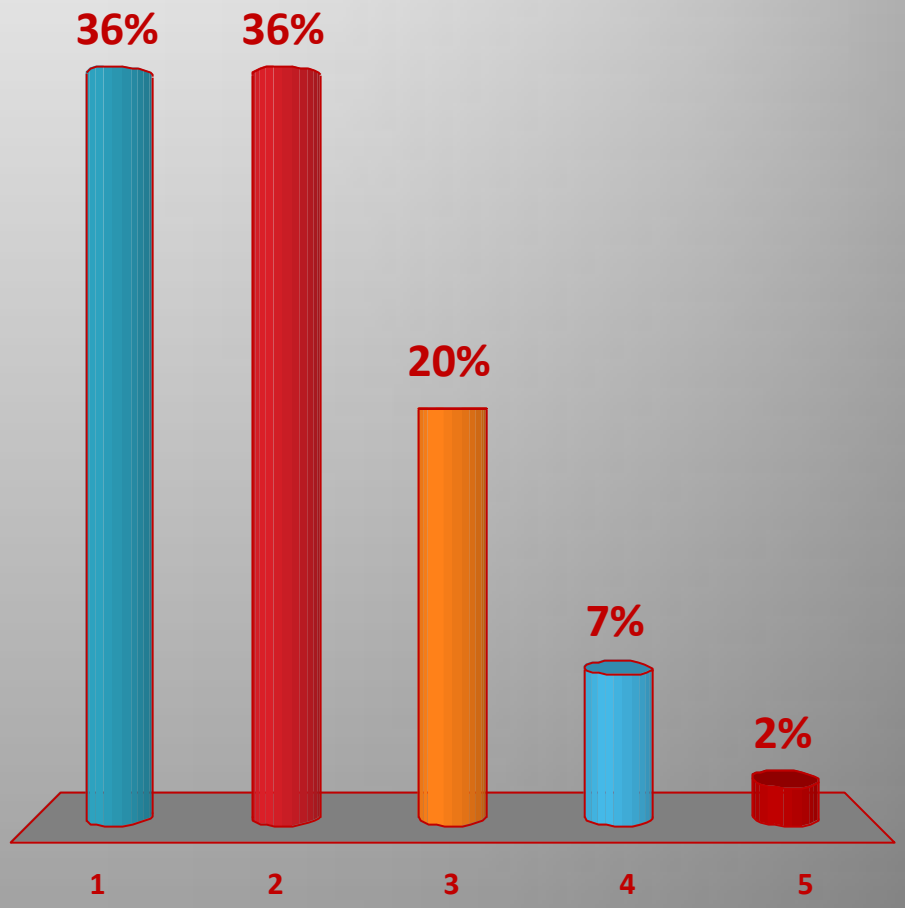
Venous drainage should be:

1. Systemic with vein graft
2. Systemic w/o vein graft
3. Portal/mesenteric with graft
4. Portal/mesenteric with graft
5. Whatever is most convenient at the time



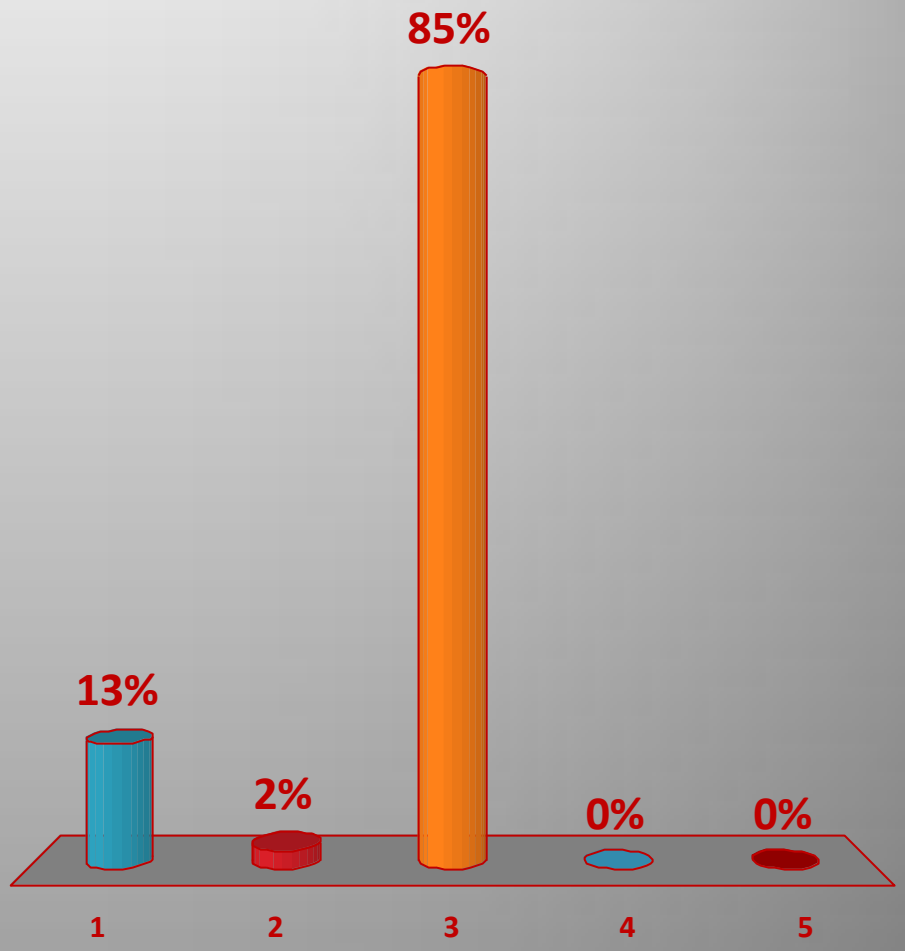
In your program, reexploration after SPK occurs:

1. < 5 % of the time
2. 5 - 10 %
3. 10 - 20%
4. 20 - 30%
5. > 30%



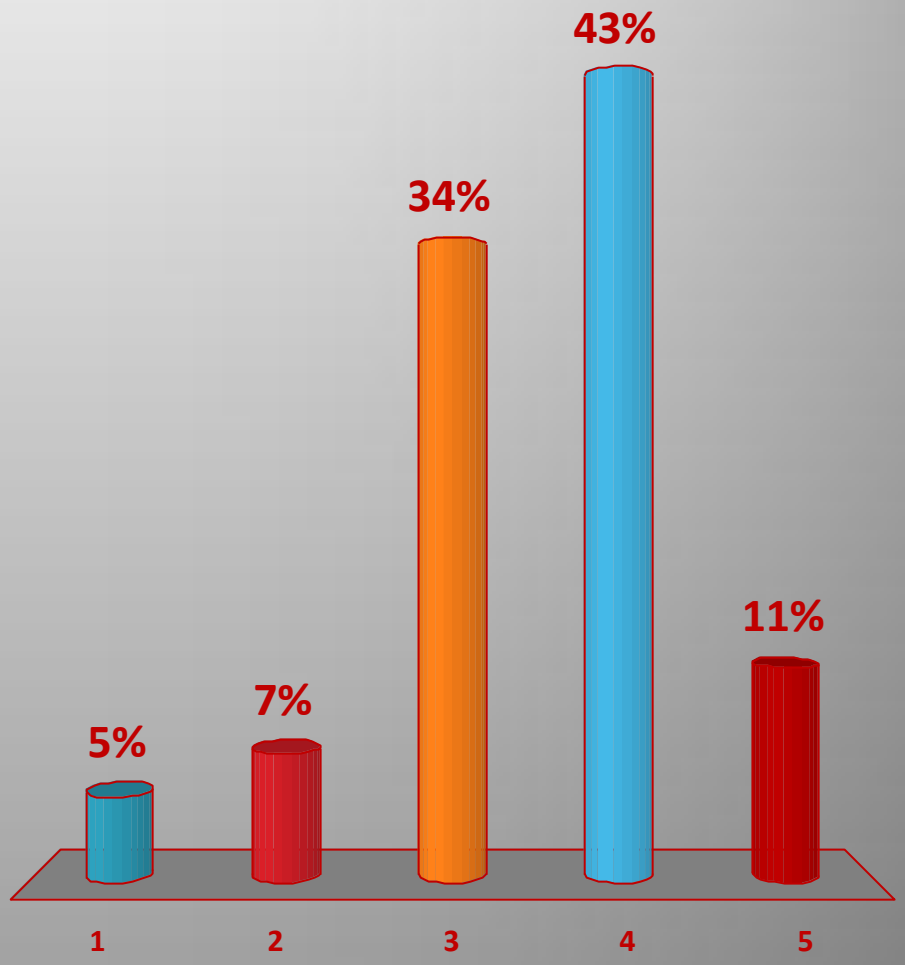
In an appropriate donor, the pancreas should be procured:

1. Only with “normal” arterial anatomy
2. For islets if there is a replaced right heaptic
3. With essentially all arteral anatomic variants
4. For islets if there is a replaced right hepatic
5. Only if the right and left donor iliac system is normal



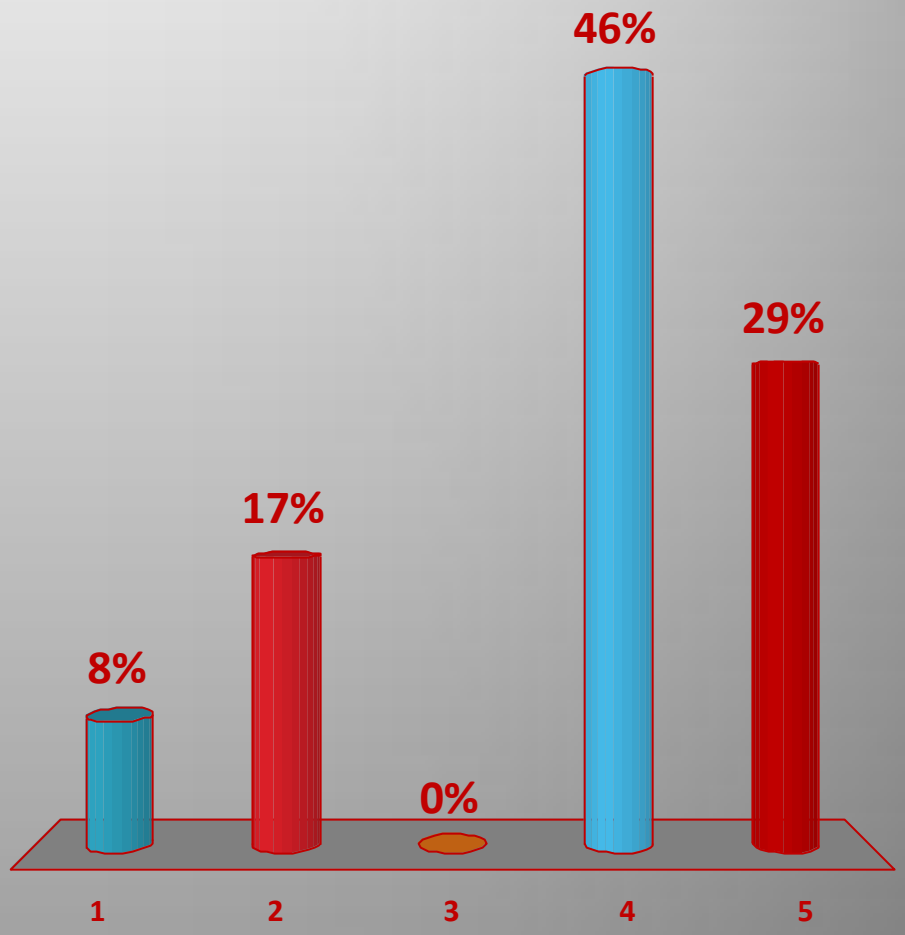
During back table preparation, appropriate manipulations of the portal vein draining the pancreas might be:

1. Lengthening with a graft
2. Extensively dissected from the parenchyma
3. Shortened
4. 1 & 3
5. All of the above



Pancreas transplantation has been associated with:

1. Hyperinsulinemia
2. Small bowel obstruction
3. Accelerated atherosclerosis
4. 1 & 2
5. 1, 2 & 3



The following issues in pancreas transplantation are true:

1. Enteric drainage is particularly important with isolated pancreas tx
2. Enteric drained prancreata should be placed as proximal as possible to utilize exocrine secretions
3. The spleen should always be removed on the backtable
4. Bladder drainage contributes to hypertension
5. Thrombosis occurs approximately 10% of the time