



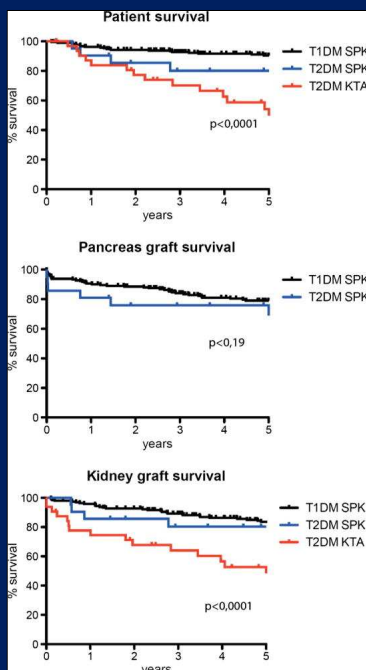
# TRAPIANTO DI RENE-PANCREAS

Luigi Biancone

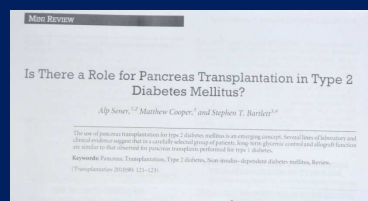
SC Nefrologia-Dialisi-Trapianto U  
AOU Città della Salute e della Scienza di Torino

## Il Diabete Mellito (DM) di tipo 1

- Definito anche come Diabete Mellito Insulino-Dipendente (IDDM)
- Prevalenza globale calcolata pari a 3 pazienti ogni 1000 abitanti
- Insorgenza età pediatrica / giovanile
- Eziologia autoimmune (prevalenza) o idiopatica
- Distruzione selettiva delle cellule  $\beta$  del pancreas endocrino
- Deficit totale di insulina e assoluta dipendenza dall'insulina esogena
- Aumento di mortalità, morbidità e diminuzione qualità della vita



**Combined Pancreas-Kidney Transplantation for Patients With End-Stage Nephropathy Caused by Type-2 Diabetes Mellitus.**  
 Margreiter, Christian; Resch, Thomas; Oberhuber, Rupert; Aigner, Felix; Maier, Herbert; Sucher, Robert; Schneeberger, Stefan; Ulmer, Hanno; Bossmüller, Claudia; Margreiter, Raimund; Pratschke, Johann; Ollinger, Robert  
 Transplantation. 95(8):1030-1036, April 27, 2013.  
 DOI: 10.1097/TP.0b013e3182861945



8.2% di trapianti di pancreas in DM2 negli USA

SRTR & OPTN Annual Data Report 2012

FIGURE 1. Patient survival and pancreas and kidney graft survivals in the T1DM SPK, T2DM SPK, and T2DM KTA groups.

## Tipi di Trapianto di Pancreas

### Simultaneous Pancreas Kidney (SPK) (80%)

- Nefropatia diabetica in I.R.C.
- Vantaggio immunologico (unico donatore)
- Funzione “sentinella” del rene

### Pancreas Transplant Alone (PTA) (6%)

- Frequenti e rischiose crisi Ipo- / Iper-glicemiche
- Se funzionalità renale buona
  - ✳ BCrs >50 ml/min
  - ✳ Proteinuria < 1 g/24h
- Miglioramento della nefropatia diabetica  
 (NEngJourMed1998;339:69-75.)

continua...

## Tipi di Trapianto di Pancreas /2

### Pancreas After Kidney (PAK) (13%)

- Tecnica in via di abbandono
- Impedisce la recidiva di nefropatia diabetica
- Non unico donatore

### Trapianti particolari (1%)

- Simultaneous Pancreas Liver Transplant (SPLT)
- Trapianti multi-organo esclusi quelli di rene
- Donatori viventi

## EFFETTO DEL TRAPIANTO DI PANCREAS SULLE COMPLICANZE

Nephrol Dial Transplant (2009) 24: Editorial Comments

2027

**Table 1.** Impact of glycaemic control on diabetic lesions (modified after [1])

| Diabetic lesion/investigated parameter            | Type of transplantation | Effect              | Observation period | Reference |
|---------------------------------------------------|-------------------------|---------------------|--------------------|-----------|
| Diabetic nephropathy                              | PTA                     | No effect           | 5 years            | [10]      |
| Diabetic nephropathy                              | PTA                     | Improved            | 10 years           | [9]       |
| Diabetic nephropathy (of the renal allograft)     | SPK                     | Inhibited           | 2–3 years          | [11]      |
| Diabetic retinopathy                              | SPK                     | Stabilized/improved | 6–60 months        | [16]      |
| Peripheral and autonomic diabetic neuropathy      | SPK                     | Improved            | 6–48 months        | [17]      |
| Peripheral diabetic neuropathy (action potential) | SPK                     | Improved            | Up to 8 years      | [18]      |
| Autonomic diabetic neuropathy                     | SPK                     | Improved            | 12 months          | [19]      |
| Peripheral and autonomic diabetic neuropathy      | SPK, PAK, PTA           | Improved            | 1–10 years         | [20]      |
| Blood pressure, pulse pressure, cholesterol       | SPK                     | Reduced             | 1–12 years         | [21]      |
| Progression of coronary artery disease            | SPK                     | Decelerated         | 3.9 years (mean)   | [22]      |
| Left ventricular ejection fraction                | SPK                     | Improved            | 4 years            | [23]      |

SPK, simultaneous pancreas–kidney transplantation; PAK, pancreas after kidney transplantation; PTA, pancreas transplantation alone.

## Microvascular Damage in Type 1 Diabetic Patients Is Reversed in the First Year After Simultaneous Pancreas–Kidney Transplantation

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B. M. van den Berg<sup>a,b</sup>, E. Lievers<sup>a</sup>,  
H. C. de Boer<sup>a,b</sup>, A. F. M. Schaapherder<sup>a</sup>,  
M. J. K. Mallat<sup>a</sup>, J. I. Rotmans<sup>a,b</sup>,  
P. J. M. van der Boog<sup>a</sup>, A. J. van Zonneveld<sup>a,b</sup>,  
J. W. de Fijter<sup>a</sup>, T. J. Rabelink<sup>a,b</sup>  
and M. E. J. Reinders<sup>a,b</sup>

<sup>a</sup>Department of Nephrology, <sup>b</sup>Eindhoven Laboratory for  
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Surgery, Liden University Medical Center, the  
Netherlands.  
\*Corresponding author: Meriem Khairoun,  
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Abbreviations: Ang-1, angiotensin-1; Ang-2,  
angiotensin-2; AUC, area under the curve; BMI,  
body mass index; CAD, coronary artery disease; DM,  
diabetes mellitus type 1; DN, diabetic nephropathy;  
ELISA, enzyme-linked immuno sorbent assay; eGFR,  
estimated glomerular filtration rate; KTx, kidney  
transplantation; MDRD, modification of diet in renal  
disease; MMF, mycophenolate mofetil; SDF, side-  
streamdarkfield; SEM, standard error of the mean;  
SPK, simultaneous pancreas–kidney transplantation;  
SPKTx, simultaneous pancreas–kidney transplan-  
tation follow-up; sTNF, soluble tumor necrosis factor.

Received 12 July 2012, revised 28 December 2012 and  
accepted for publication 02 January 2013

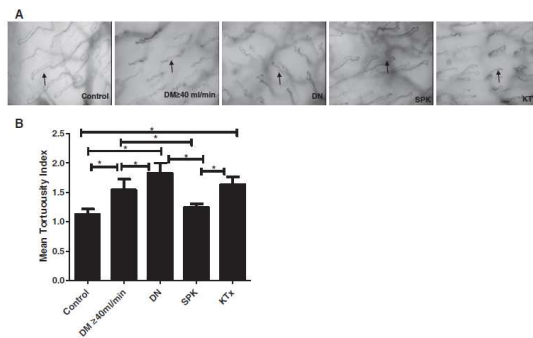
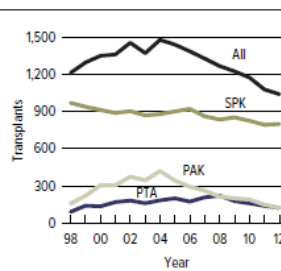


Figure 1: (A) Side-streamdarkfield images of the oral mucosa visualizing the microvascular capillaries of a representative patient in the control, DM ≥ 40 mU/min, DN, SPK and KTx group. Black arrows: capillary loops. (B) Mean tortuosity index of microvascular capillaries in the control (n = 20), DM ≥ 40 mU/min (n = 15), DN (n = 26), SPK (n = 38) and KTx (n = 16) group. Data shown are mean ± SEM. \*p < 0.05.

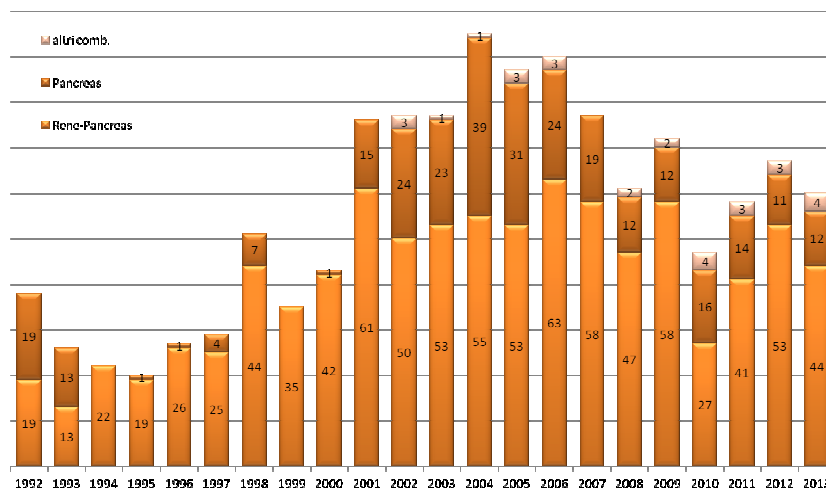
## SRTR & OPTN Annual Data Report 2012



### PA 3.1 Total pancreas transplants

Patients receiving a transplant, including multi-organ transplants and pediatrics. Retransplants are counted.

## Trapianti di PANCREAS – Anni 1992-2012\*



FONTE DATI: Reports CIR



\* Dati preliminari al 31 Ottobre 2013

## Liste di Attesa al 30 Giugno 2013\*

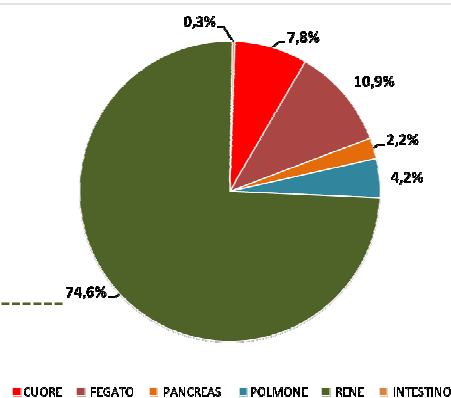
PAZIENTI in lista d'attesa in ITALIA al 30/06/2013 :

8564

|           |         |
|-----------|---------|
| Rene      | 6507 ** |
| Fegato    | 947     |
| Cuore     | 682     |
| Polmone   | 367     |
| Pancreas  | 196     |
| Intestino | 22      |

Iscrizioni rene  
8095 \*\*

\*\* Per il rene ogni paziente può avere più di una iscrizione

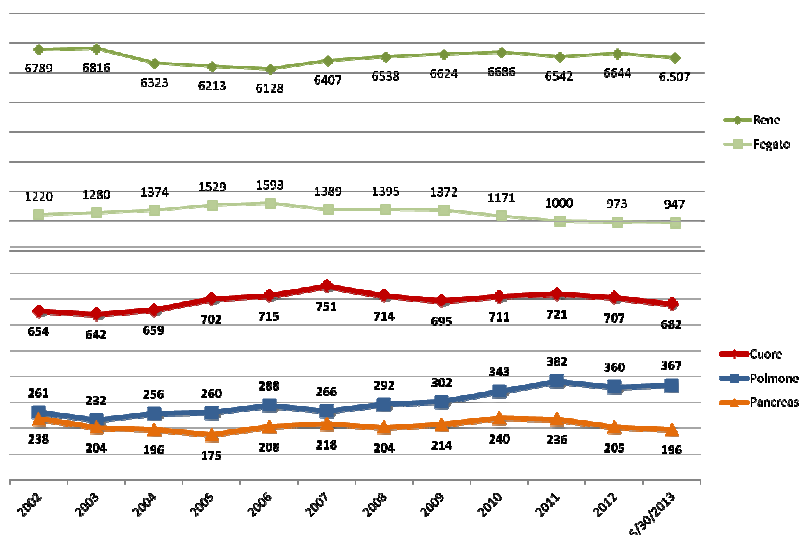


\* Dati SIT al 15 Luglio 2013



## Andamento Liste di Attesa 2002 -2013\*

### Pazienti iscritti in lista



\* Dati SIT al 15 Luglio 2013

## Terapia Medica o Trapianto ?

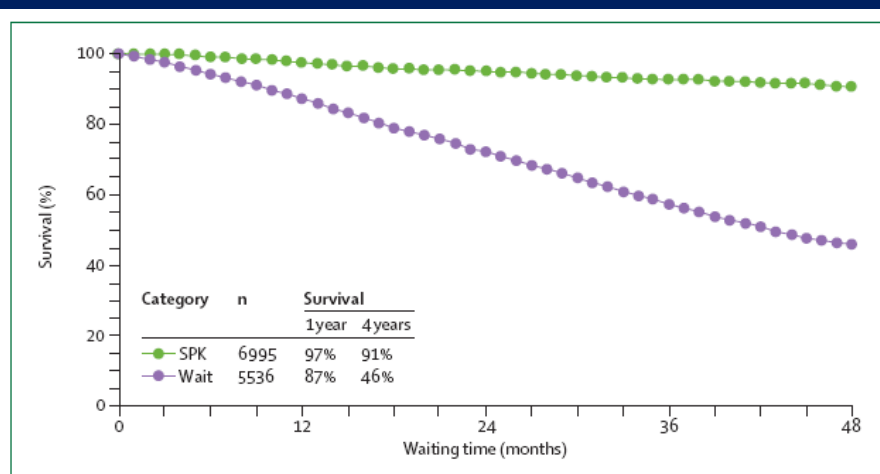
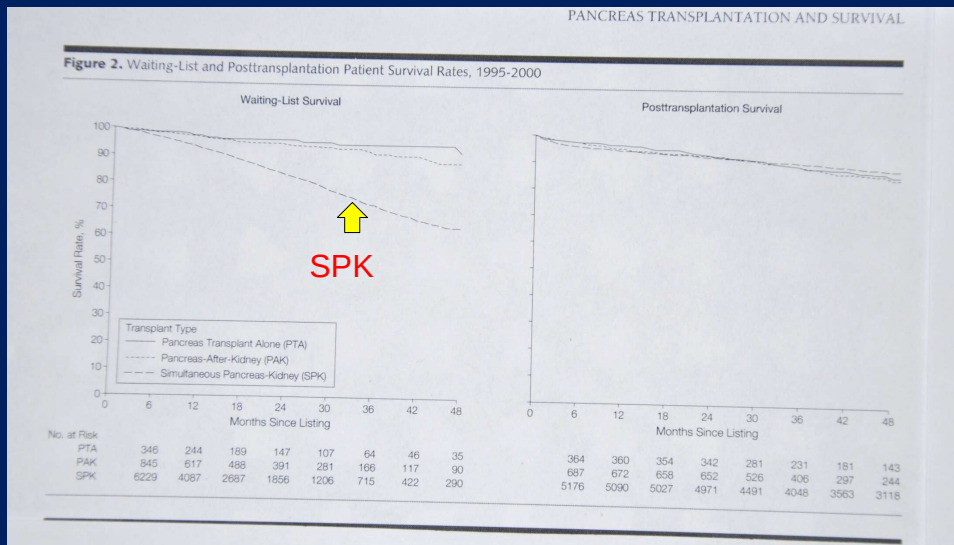


Figure 3: Survival of patients after simultaneous pancreas and kidney transplantation (SPK) versus those waiting for a pancreas transplant  
Month 0 is time of SPK and entry to waiting list for those waiting for a transplant.

White SA, Shaw JA,  
Sutherland DE.  
Pancreas transplantation.  
Lancet. 2009 May  
23;373(9677):1808-18.

## SOPRAVVIVENZA IN LISTA DI PTA vs PAK vs SPK



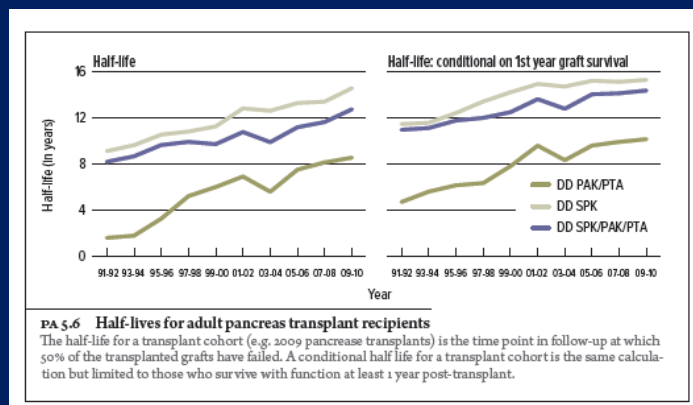
**JAMA**<sup>®</sup>

Online article and related content  
current as of September 14, 2010.

### Survival After Pancreas Transplantation in Patients With Diabetes and Preserved Kidney Function

Jeffrey M. Venstrom; Maureen A. McBride; Kristina I. Rother; et al.  
JAMA. 2003;290(21):2817-2823 (doi:10.1001/jama.290.21.2817)  
<http://jama.ama-assn.org/cgi/content/full/290/21/2817>

## SRTR & OPTN Annual Data Report 2012



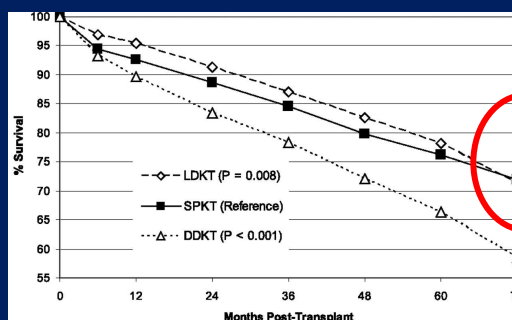
## VALUTAZIONE DEL TRAPIANTO DI PANCREAS RISPETTO AD ALTRI TRATTAMENTI NEL DIABETICO UREMICO

- Non possibili trials randomizzati prospettici
- Studi retrospettivi/di registro
- Nella comparazione tra diverse modalità trapiantologiche (es. SPK vs KA) esistono fattori confondenti:
  - Legati al donatore
  - legati al ricevente
- Numerosi altri bias (es tx sequenziali)
- Importanza dei dati a lungo termine vs nuove ere trapiantologiche

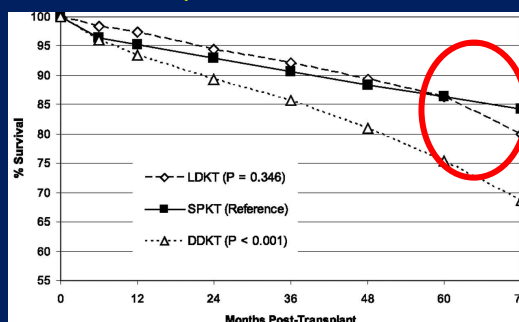
## SIMULTANEOUS PANCREAS- KIDNEY TRANSPLANT vs KIDNEY TRANSPLANT ALONE

## SOPRAVVIVENZA DEL GRAFT E DEL PAZIENTE: LDKT vs SPKT vs DOKT

kidney graft survival



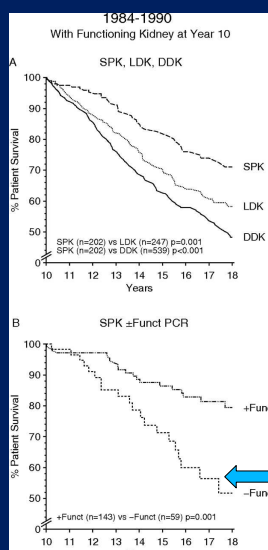
patient survival



CJASN

Young, B. Y. et al. Clin J Am Soc Nephrol 2009;4:845-852

## (A) Patient survival after the 10th posttransplantation year for recipients with a functioning kidney allograft at year 10 after transplantation

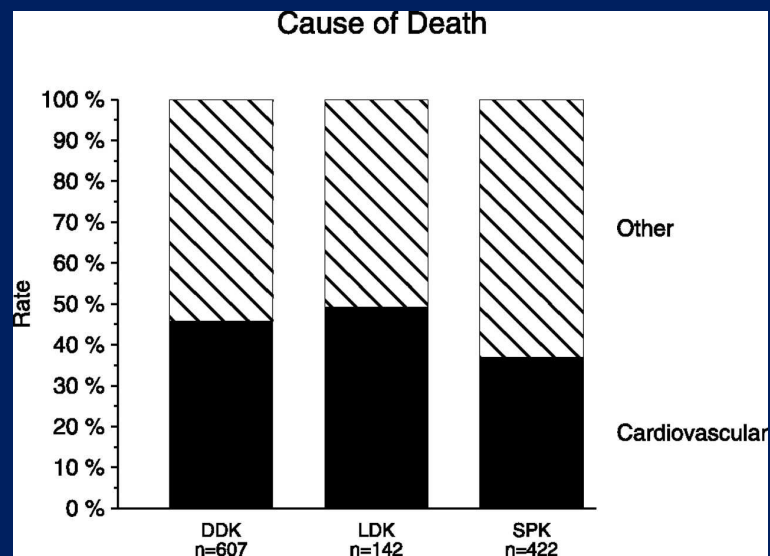


1984-1990  
SPK con > 10aa

Quando il pancreas smette di funzionare.....

Morath, C. et al. J Am Soc Nephrol 2008;19:1557-1563

## MORTALITA' CARDIOVASCOLARE DOPO DDK, LDK O SPK NEI TRAPIANTI ESEGUITI TRA IL 1991 E 2000

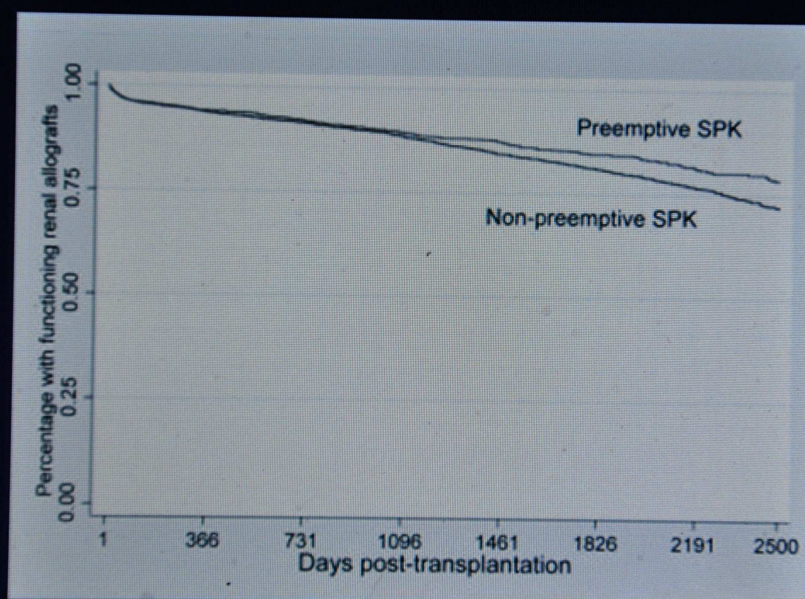


Morath, C. et al. J Am Soc Nephrol 2008;19:1557-1563

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JASN

## Pre-emptive SPK transplant results in better renal allograft outcomes



**13%  
reduction  
in risk for  
graft loss**

Israni AK, et al, AJT 2005; 5:374

## IN SINTESI.....

Curr Opin Org Transplant 2005; 10: 385-391  
DOI: 10.1007/s11902-005-0030-8

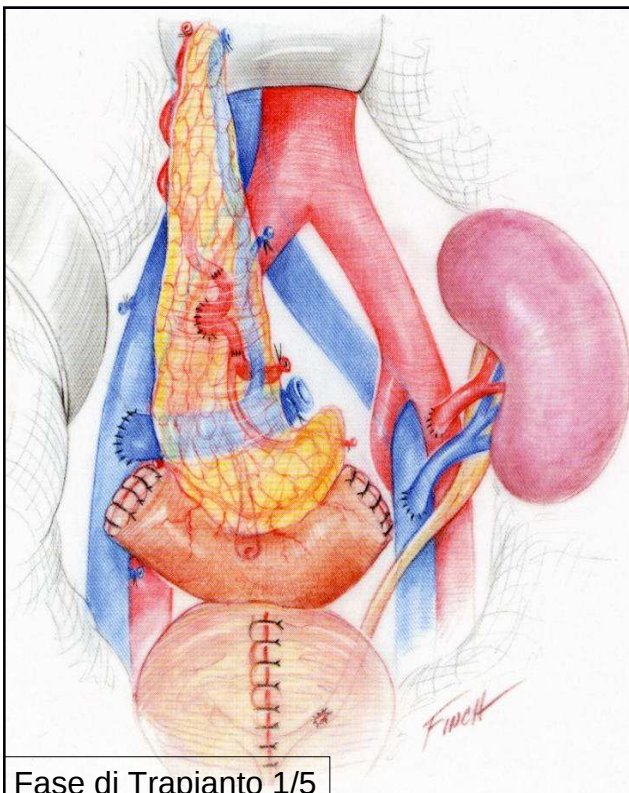
### The Role of Kidney-Pancreas Transplantation in Diabetic Kidney Disease

Alexander C. Wiseman

**Table 1** Summary of advantages and disadvantages of transplant options for diabetic kidney disease

|      | Advantages                                                                                                                          | Disadvantages                                                                                                                                                                         |
|------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DDKA | Provides better survival than dialysis options                                                                                      | Inferior to other transplant options with respect to kidney graft survival and patient survival                                                                                       |
| LDKA | Minimizes waiting time, time spent on dialysis<br>Very low early morbidity and mortality<br>Better survival initially than with SPK | No normalization of blood glucose<br>Inferior patient survival over time when compared with SPK recipients with functioning grafts                                                    |
| SPK  | Glycemic control, with recent median pancreas graft survival of >10 years<br>High-quality, deceased donor kidney transplant.        | Higher morbidity and mortality due to larger operation<br>If pancreas fails within the first year, outcomes are worse than LDKA                                                       |
| PAK  | Glycemic control<br><br>If living donor kidney transplant, comparable/better patient and kidney graft survival than LDKA            | Two separate surgical procedures, increased mortality early postoperatively following pancreas transplant<br>Historically inferior pancreas graft survival (35% at 10 years) than SPK |

DDKA deceased donor kidney alone, LDKA living donor kidney alone, PAK pancreas after kidney transplant, SPK simultaneous pancreas-kidney transplant



Fase di Trapianto 1/5

### Drenaggio del Pancreas

**Venoso: Sistemico**

**Esocrino: Vescicale**

**Tecnica classica  
quasi abbandonata  
30% di conversioni  
in drenaggio  
enterico**

**Simultaneo  
trapianto di rene**



### Drenaggio del Pancreas

**Venoso: Sistemico**

**Esocrino: Enterico**

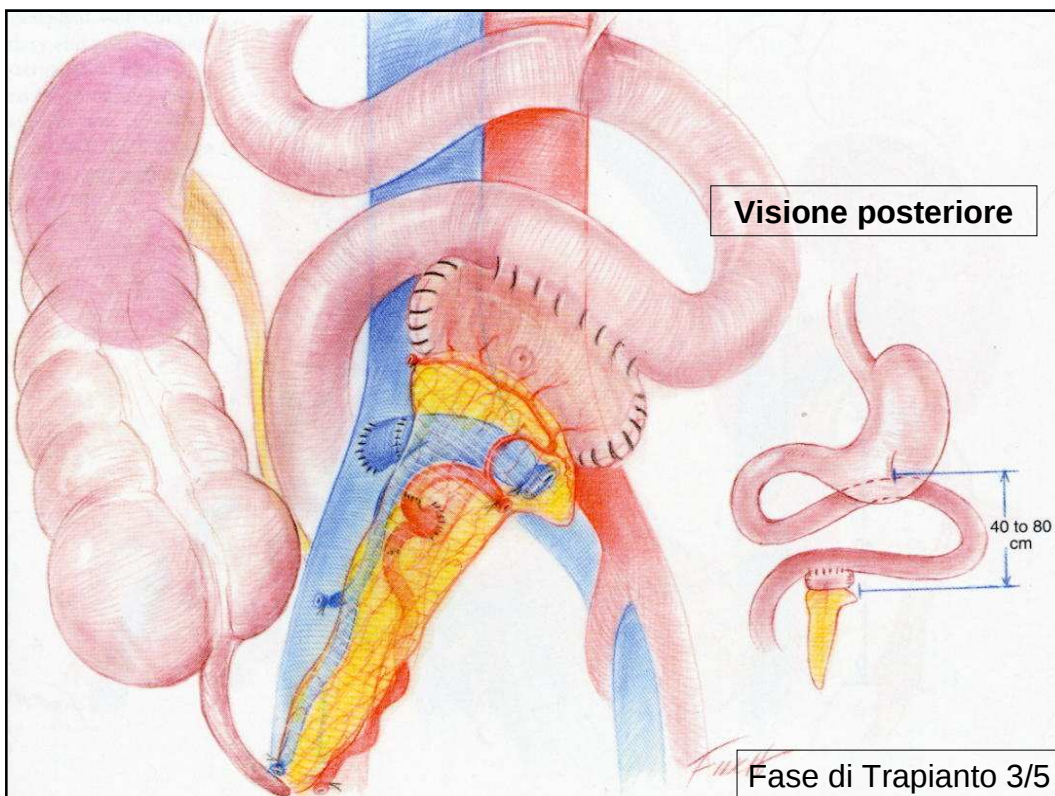
**Tecnica maggiormente  
utilizzata oggi**

**pancreas posizionato  
dietro il colon destro**

**riduzione del rischio  
della sutura sul  
duodeno trapiantato se  
tempo di ischemia breve  
(8 ore)**

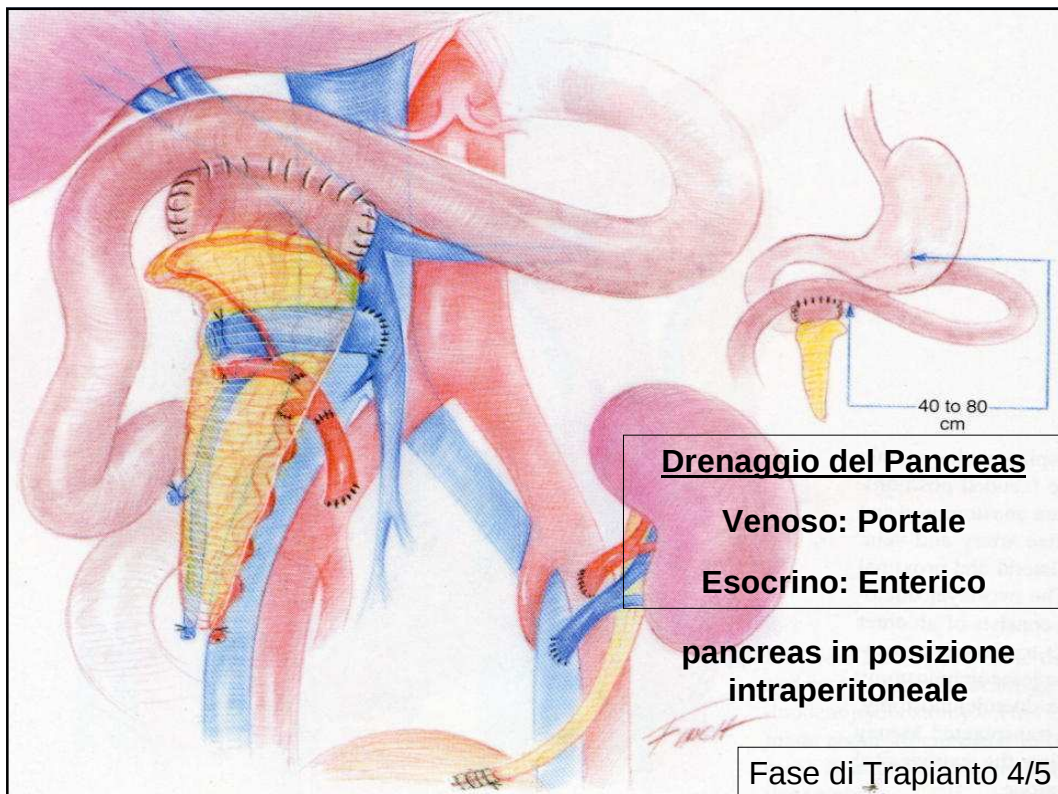
**iper-C-peptidemia**

Fase di Trapianto 2/5



**Visione posteriore**

Fase di Trapianto 3/5



## Tecnica Chirurgica utilizzata nel Centro Trapianti di Torino

- **Sede del trapianto**  
Fossa iliaca destra posizione retro-colica
- **Anastomosi arteriosa**  
Sulla arteria iliaca comune destra con interposizione di protesi iliaca a Y
- **Drenaggio venoso**  
*Sistemico → Tra la vena porta del graft e la vena cava inferiore del ricevente*
- **Drenaggio delle secrezioni esocrine del pancreas**  
*Via enterica → anastomosi tra il duodeno del graft e il digiuno del ricevente*

## Centro Trapianti di Torino

### Casistica dal 1999 a Gennaio 2014

| Numero Trapianti | Pazienti | Vivi | Organi Funzionanti (insulin free) |
|------------------|----------|------|-----------------------------------|
| 47               | 46       | 44   | 40/47                             |

| Eventi Sfavorevoli | SPK                                           | PTA                       | SPLT            | PAK | Re TxP         | Totale |
|--------------------|-----------------------------------------------|---------------------------|-----------------|-----|----------------|--------|
| Perdita del Graft  | 3/39                                          | 2/4                       | 1/2             | 0/1 | 1/1            | 7 / 47 |
| Causa              | Decesso, Rigetto cronico, Pancreat. Calcifica | Rigetto 12 mesi e 33 mesi | Necrosi Precoce |     | Rigetto 3 mesi |        |

## Complicanze Chirurgiche

- **Necessitanti di revisione chirurgica**
  - **Due revisioni (4 Pazienti)**
    - Ematoma retroperitoneale destro (2 casi)
    - Fistola pancreatica (amilasi su drenaggio peritoneale >10000 UI/L)
    - Raccolta pericavale infetta
    - Colecistite e raccolta periepatica
  - **Una Revisione (6 pazienti)**
    - Diastasi della laparotomia con eviscerazione (3 Casi)
    - Sanguinamento dal peduncolo mesenteriale del pancreas trapiantato
    - Sanguinamento a livello dell'anastomosi arteriosa
    - Emoperitoneo di natura non determinata
- **Degenza postoperatoria globale 22 gg ± 13 (11-73 gg)**
  - Nessun decesso perioperatorio

# Rigetti

## • Rigetti Acuti trattati

### ➤ Diagnosi Anatomopatologica su biopsia

- 2 casi Su Biopsia Renale (tutti SPK)
- 5 casi Su Biopsia Pancreatica (3 PTA, 1 PAK, 1 SPK)

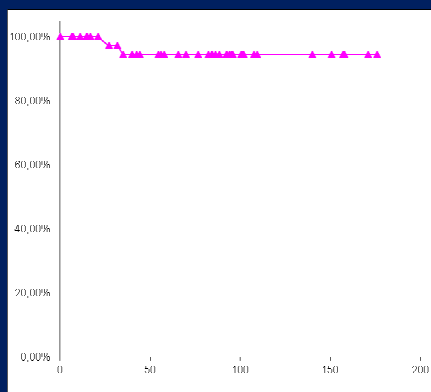
### ➤ Diagnosi Clinica

- 2 casi (1 SPK e 1 PTA)

## • Rigetto Cronico (2 PTA, 1 ReTxP, 1 SPK)

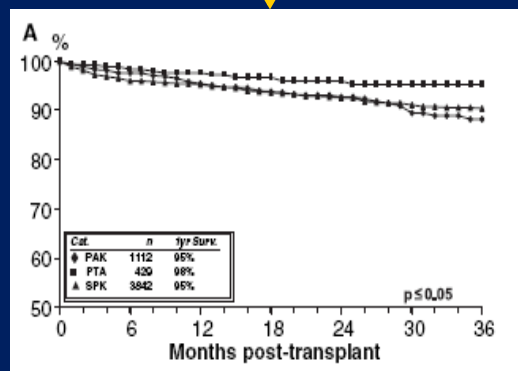
- *Rigetto cronico persistente di 4° grado*  
(*Drachenberg Transplantation* 1997;63(11):1579-86.)  
che ha condotto alla perdita funzionale del graft

# Sopravvivenza Pazienti



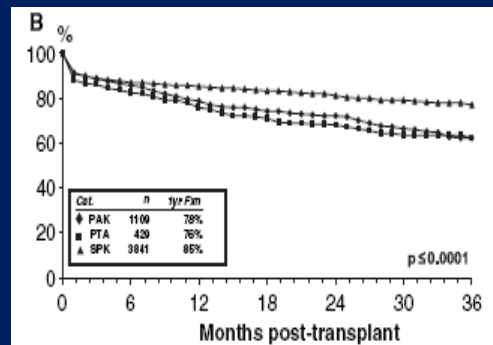
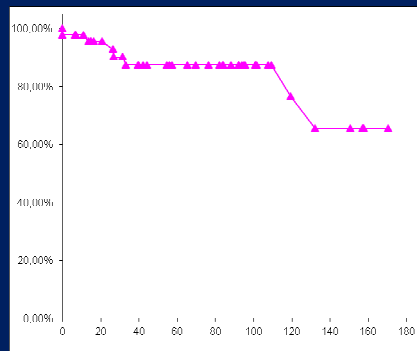
Curva di Kaplan Meier.  
Sopravvivenza dei pazienti del  
Centro Trapianti di Torino

Curva reale di sopravvivenza  
dei pazienti  
Trapiantati di Pancreas  
2000/2004 IPTR e UNOS



# Sopravvivenza Graft

Curva di Kaplan Meier.  
Sopravvivenza degli Organi del  
Centro Trapianti di Torino  
intesi come pazienti liberi da Terapia insulinica



Curva reale di sopravvivenza  
degli Organi Trapiantati  
2000/2004 IPTR e UNOS

Gruessner AC, Sutherland DE. Pancreas transplant outcomes for United States (US) and non-US cases as reported to the United Network for Organ Sharing (UNOS) and the International Pancreas Transplant Registry (IPTR) as of June 2004. Clin Transplant. 2005 Aug;19(4):433-55.

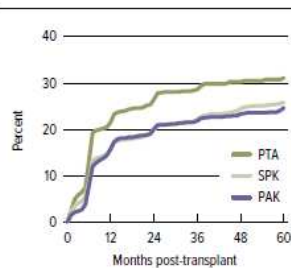
## IMMUNOSOPPRESSIONE NEL TRAPIANTO DI PANCREAS

## In pancreas transplantation ...

- Because of the higher rejection , a more potent immunosopressive regimen is mandatory
- Careful use of diabetogenic drugs as steroids and calcineurin inhibitors is of particular importance

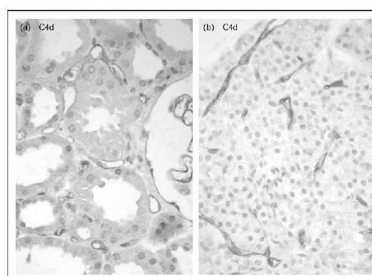
Schmied BM et al Clin Transplant 2006;20( S 17) 44-50

SRTR & OPTN Annual Data Report 2012



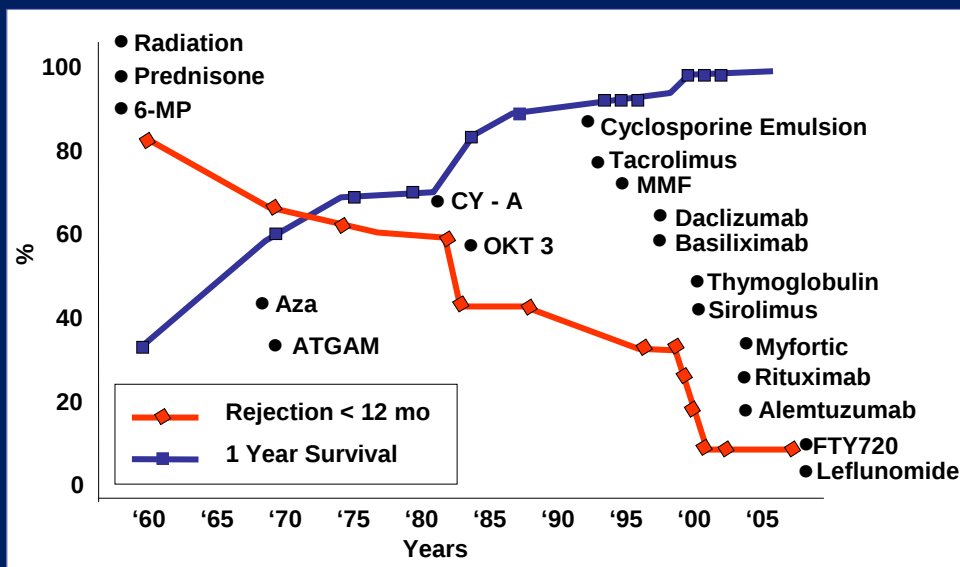
**PA 5.8 Incidence of first acute rejection among adult patients receiving a pancreas transplant in 2006-2010**

Acute rejection defined as a record of acute or hyperacute rejection, or a record of an anti-rejection drug being administered on either the Transplant Recipient Registration form or the Transplant Recipient Follow-up form. Only the first rejection event is counted. Cumulative incidence, defined as the probability of acute rejection at any time prior to the given time, is estimated using Kaplan-Meier competing risk methods.



**FIGURE 1.** C4d staining of peritubular capillaries of a kidney allograft (a), and interacinar capillaries of a pancreas allograft (b).

## Rigetto e Sopravvivenza del Graft (1 anno)

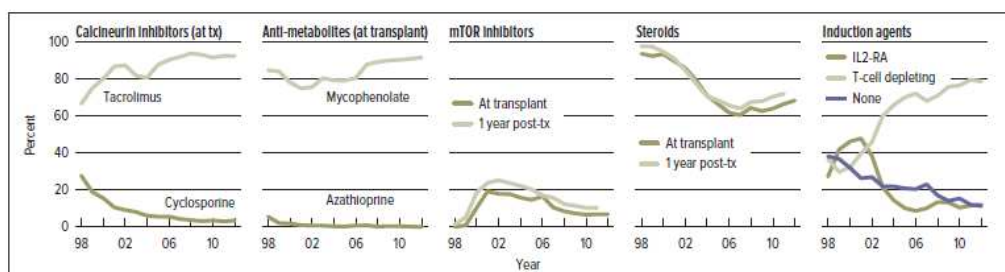


Zand M, Seminars in Dialysis, 2005 35

## Le ere del trapianto di pancreas

|              |                                  |                                  |
|--------------|----------------------------------|----------------------------------|
| 1966-73      | SPK e PTA<br>segmentario/intero  | P -AZA                           |
| 1978-86      | PAK e PTA<br>donatore vivente ** | ATGM + P +AZA<br>☐ CyA           |
| 1986 –<br>94 | SPK, PAK,PTA                     | ATGM + P +AZA+<br>CyA            |
| 1994-98      | SPK, PAK,PTA                     | ATGM + P +FK +<br>MMF            |
| 1998☐        | SPK, PAK,PTA                     | ATGM + P +FK +<br>MMF + antiCD25 |

Da “ Lesson learned from more than 1.000 pancreas tranplants at a single institution” D. E.R. Sutherland et al Ann Surg 2001 233(4)463-501



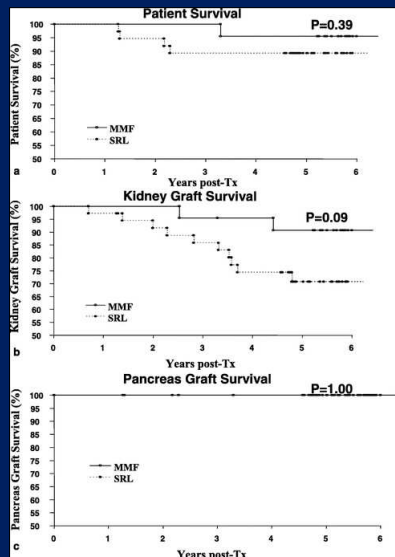
**PA 3.7 Immunosuppression use in adult pancreas transplant recipients**

One-year post-transplant data limited to patients alive with graft function one year post-transplant. Mycophenolate group includes mycophenolate mofetil and mycophenolate sodium.

**Table 1. Effect of immunosuppressive drugs on diabetes and islet cell function (tab001dgo)**

| Immunosuppressive drug | Effect on diabetes or $\beta$ -cell function                                                                                                                                                                                                                                                                                       |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cyclosporin            | <p>Diabetogenic</p> <p>Increased rate of infection and/or malignancy</p> <p>Reduces insulin secretion (via calmodulin?)</p> <p>Structural changes to <math>\beta</math> cells</p>                                                                                                                                                  |
| Tacrolimus (FK 506)    | <p>Diabetogenic</p> <p>Increased rate of infection and/or malignancy</p> <p>Structural changes to <math>\beta</math> cells</p>                                                                                                                                                                                                     |
| Corticosteroids        | <p>Diabetogenic</p> <p>Reduces insulin secretion (via calmodulin?)</p> <p>Inhibits insulin secretion and synthesis</p> <p>Reduces numbers of insulin receptors</p> <p>Reduces the affinity of insulin receptors</p> <p>Impairs glucose uptake</p> <p>Activates glucose-free fatty acid cycle</p> <p>Induces insulin resistance</p> |
| 15-deoxyspergualin     | No $\beta$ -cell toxicity (used successfully in islet cell transplantation)                                                                                                                                                                                                                                                        |
| Mycophenolate mofetil  | No diabetogenic activity in vivo                                                                                                                                                                                                                                                                                                   |
| Rapamycin              | Associated with diabetes development (at high dosage)                                                                                                                                                                                                                                                                              |
| Leflunamide            | No islet toxicity in animal models                                                                                                                                                                                                                                                                                                 |
| Pravastatin            | Successful use in animal models                                                                                                                                                                                                                                                                                                    |

## mTOR-inhibitori



Long-Term Renal Transplant Function in Recipient of Simultaneous Kidney and Pancreas Transplant Maintained With Two Prednisone-Free Maintenance Immunosuppressive Combinations: Tacrolimus/Mycophenolate Mofetil Versus Tacrolimus/Sirolimus.

Gallón, Lorenzo; Winoto, Johan; Chhabra, Darshika; Parker, Michele; Leventhal, Joseph; Kaufman, Dixon

Transplantation. 83(10):1324-1329, May 27, 2007.

DOI: 10.1097/01.tp.0000264189.58324.91

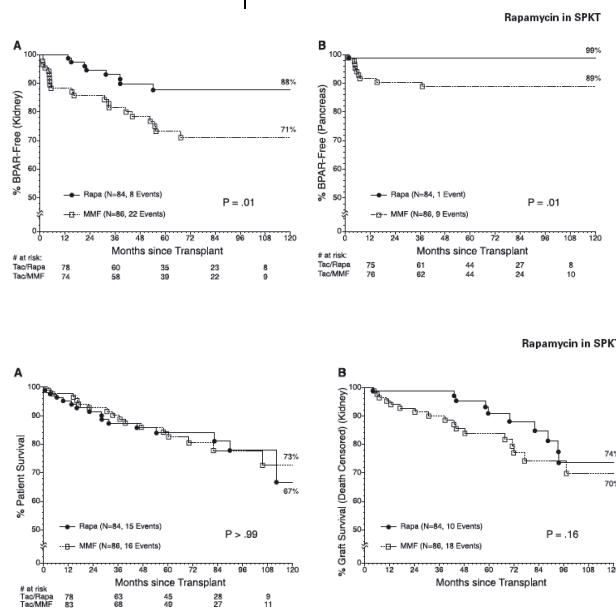
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American Journal of Transplantation 2012; 12: 3985-3990  
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doi: 10.1111/j.1600-6143.2012.04295.x

### Advantage of Rapamycin Over Mycophenolate Mofetil When Used With Tacrolimus for Simultaneous Pancreas Kidney Transplants: Randomized, Single-Center Trial at 10 Years

G. Ciancio<sup>a</sup>, J. Sageshima<sup>a</sup>, L. Chen<sup>a</sup>,  
J. J. Gaynor<sup>a</sup>, L. Hanson<sup>a</sup>, L. Tueros<sup>a</sup>,  
E. Montenegro-Valadez<sup>a</sup>, C. Gomez<sup>a</sup>, W. Kupin<sup>a</sup>,  
G. Guerra<sup>a</sup>, A. Mattiazzi<sup>a</sup>, A. Fomon<sup>a,b</sup>,  
A. Pugliese<sup>a</sup>, D. Roth<sup>a</sup>, M. Wolf<sup>a</sup> and  
G. W. Burke III<sup>a,c,\*</sup>



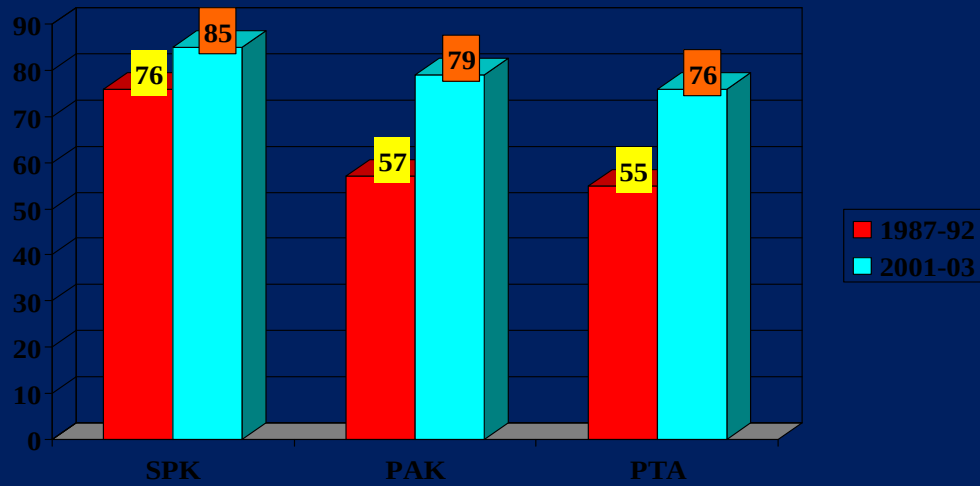
## Considerazioni conclusive

- Il trapianto di rene-pancreas è una opzione consolidata nel trattamento del diabetico uremico e ha usufruito di migliorie nelle tecniche chirurgiche di trapianto e nella terapia immunosoppressiva.
- Diverse modalità di trapianto rene e pancreas (SPK, PAK, PALK) sono disponibili con risultati che sono oggetto di continue rivalutazioni.
- Dai dati disponibili in questo momento il trapianto simultaneo di rene-pancreas risulta la miglior opzione a lungo termine per la sopravvivenza del paziente diabetico uremico.

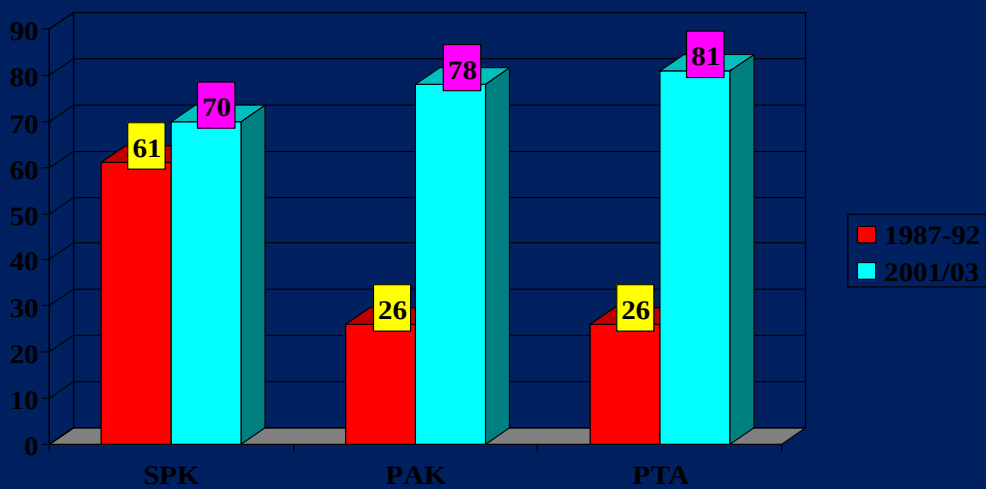
• Basiliximab-

FK-MMF-ST

incremento per Era della sopravvivenza (%) del  
pancreas al I° anno

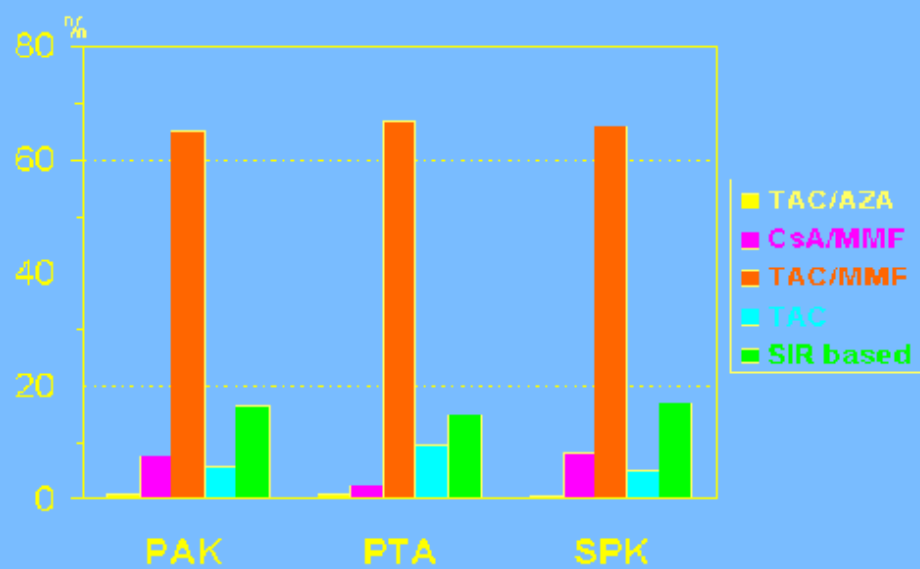


incremento per Era della sopravvivenza (%) del  
pancreas al V° anno



## Major Immunosuppressive Protocols

USA Primary DD Pancreas Transplants 1/1/2000 - 6/6/2004

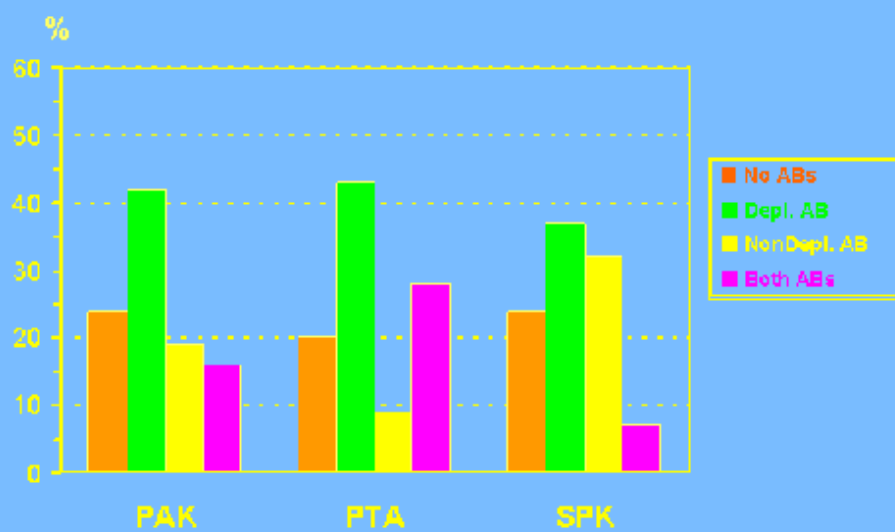


SPK

IPR/UNOS

## Antibody Therapy

USA DD Primary Pancreas Transplants 1/1/2000 - 6/6/2004



SPK

IPR/UNOS

**Table 3. CUMULATIVE INCIDENCE OF REVERSIBLE REJECTION EPISODES IN TECHNICALLY SUCCESSFUL TRANSPLANT BY ERA AND RECIPIENT CATEGORY**

|          | Era 2 | Era 3 | Era 4 | P Value* |
|----------|-------|-------|-------|----------|
| SPK (n)* | (165) | (106) | (76)  |          |
| 3 months | 46%   | 22%   | 13%   | <.0001   |
| 1 year   | 51%   | 34%   | 25%   | .001     |
| PAK (n)  | (46)  | (69)  | (89)  |          |
| 3 months | 41%   | 32%   | 19%   | .13      |
| 1 year   | 51%   | 50%   | 44%   | NS       |
| PTA (n)  | (60)  | (28)  | (39)  |          |
| 3 months | 58%   | 41%   | 22%   | .01      |
| 1 year   | 78%   | 68%   | 56%   | .01      |

\* In each era, the incidence of rejection episodes was also significantly different between categories ( $P \leq .01$ ).  
SPK, simultaneous pancreas-kidney; PAK, pancreas after kidney; PTA, pancreas transplant alone.

- Anticorpi policlonali = Thymoglobulina
- Anticorpi monoclonale = anti CD 25
- Ciclosporina
- Prograf
- Micofenolato di mofetile/acido micofenolico
- Rapamicina
- Azatioprina
- Steroide

## **Tecnica Chirurgica utilizzata nel Centro Trapianti di Torino**

- **Sede del trapianto**

Fossa iliaca destra posizione retro-colica

- **Anastomosi arteriosa**

Sulla arteria iliaca comune destra con  
interposizione di protesi iliaca a Y

- **Drenaggio venoso**

*Sistemico → Tra la vena porta del graft e la vena  
cava inferiore del ricevente*

- **Drenaggio delle secrezioni esocrine del pancreas**

*Via enterica → anastomosi tra il duodeno del graft e  
il digiuno del ricevente*

## Centro Trapianti di Torino Casistica dal 1999 al maggio 2010

| <b>Numero Trapianti</b> | <b>Pazienti</b> | <b>Vivi</b> | <b>Organi Funzionanti (insulin free)</b> |
|-------------------------|-----------------|-------------|------------------------------------------|
| <b>33</b>               | <b>32</b>       | <b>31</b>   | <b>29/33</b>                             |

| <b>Eventi Sfavorevoli</b> | <b>SPK</b>               | <b>PTA</b>      | <b>SPLT</b>     | <b>PAK</b> | <b>Re TxP</b>  | <b>Totale</b> |
|---------------------------|--------------------------|-----------------|-----------------|------------|----------------|---------------|
| <b>Perdita del Graft</b>  | 1/28                     | 1/2             | 1/1             | 0/1        | 1/1            | 4 / 33        |
| <b>Causa</b>              | Decesso per IMA a 2 anni | Rigetto 12 mesi | Necrosi Precoce |            | Rigetto 3 mesi |               |

## Complicanze Chirurgiche

- **Necessitanti di revisione chirurgica**
  - **Due revisioni (3 Pazienti)**
    - ematoma retroperitoneale destro
    - fistola pancreatica (amilasi su drenaggio peritoneale >10000 UI/L)
    - raccolta pericavale infetta
    - Colecistite e raccolta periepatica
  - **Una Revisione (6 pazienti)**
    - diastasi della laparotomia con eviscerazione (3 Casi)
    - sanguinamento dal peduncolo mesenteriale del pancreas trapiantato
    - sanguinamento a livello dell'anastomosi arteriosa
    - emoperitoneo di natura non determinata
- **Degenza postoperatoria globale 24 gg  $\pm$  14 (13-69 gg)**
  - *nessun decesso perioperatorio*

# Rigetti

## • Rigetti Acuti trattati

### ➢ Diagnosi Anatomopatologica su biopsia

- 2 casi Su Biopsia Renale (tutti SPK)
- 3 casi Su Biopsia Pancreatica (1 PTA, 1 PAK, 1 SPK)

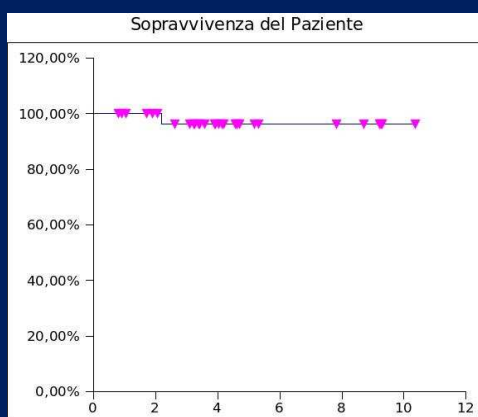
### ➢ Diagnosi Clinica

- 2 casi (1 SPK e 1 PTA)

## • Rigetto Cronico (1 PTA, 1 ReTxP)

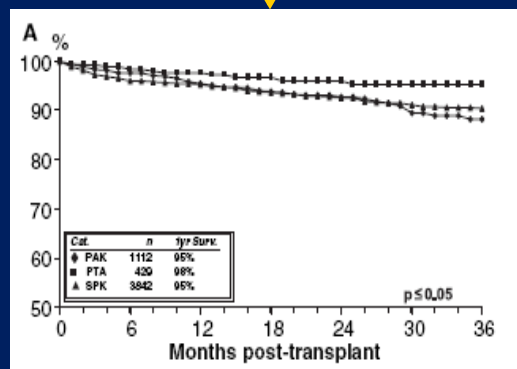
- *Rigetto cronico persistente di 4° grado (Drachenberg Transplantation 1997;63(11):1579-86.)* che ha condotto alla perdita funzionale del graft

# Sopravvivenza Pazienti



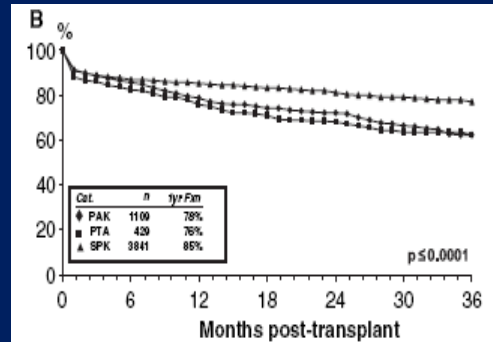
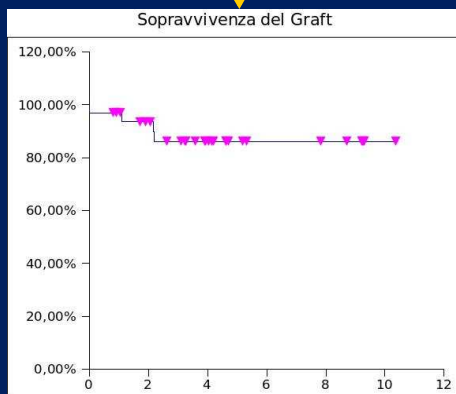
Curva di Kaplan Meier.  
Sopravvivenza dei pazienti del  
Centro Trapianti di Torino

Curva reale di sopravvivenza  
dei pazienti  
Trapiantati di Pancreas  
2000/2004 IPTR e UNOS



# Sopravvivenza Graft

Curva di Kaplan Meier.  
Sopravvivenza degli Organi del  
Centro Trapianti di Torino  
(intesi come pazienti liberi da Terapia insulinica)



Curva reale di sopravvivenza  
degli Organi Trapiantati  
2000/2004 IPTR e UNOS

Gruessner AC, Sutherland DE. Pancreas transplant outcomes for United States (US) and non-US cases as reported to the United Network for Organ Sharing (UNOS) and the International Pancreas Transplant Registry (IPTR) as of June 2004. Clin Transplant. 2005 Aug;19(4):433-55.



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TABLE 1

| A. Quantitative patient characteristics |                     |      |                    |      |                    |      |
|-----------------------------------------|---------------------|------|--------------------|------|--------------------|------|
|                                         | T1DM SPK<br>(n=195) |      | T2DM SPK<br>(n=21) |      | T2DM KTA<br>(n=32) |      |
|                                         | Mean                | SD   | Mean               | SD   | Mean               | SD   |
| Recipient age, y                        | 41.6                | 8.2  | 53.6               | 3.9  | 65.5               | 5.6  |
| PRA, %                                  | 2.4                 | 9.1  | 3.6                | 11.0 | 0.5                | 2.3  |
| Donor age, y                            | 31.3                | 10.8 | 34.2               | 11.7 | 52.4               | 17.0 |
| LT, hr                                  | 13.1                | 3.1  | 13.6               | 3.5  | 15.8               | 4.1  |
| Waiting time, mo                        | 6.2                 | 7.1  | 7.6                | 9.1  | 24.6               | 20.5 |
| BMI, kg/m <sup>2</sup>                  | 23.4                | 3.1  | 25.1               | 3.3  | 26.6               | 2.5  |
| Cholesterol, mg/dL                      | 195                 | 45   | 188                | 50   | 193                | 55   |
| Triglycerides, mg/dL                    | 147                 | 78   | 144                | 69   | 173                | 96   |
| HDL, mg/dL                              | 59                  | 20   | 51                 | 14   | 53                 | 19   |
| LDL, mg/dL                              | 106                 | 38   | 102                | 47   | 113                | 48   |
| Systolic blood pressure, mm Hg          | 131                 | 11   | 138                | 24   | 136                | 12   |
| Diastolic blood pressure, mm Hg         | 77                  | 7    | 82                 | 9    | 78                 | 8    |
| HbA1c pretransplantation, %             | 7.5                 | 1.2  | 8.6                | 1.5  | —                  | —    |
| Age at onset, y                         | 17.6                | 12.5 | 37.8               | 6.7  | 48.4               | 9.0  |
| B. Qualitative patient characteristics  |                     |      |                    |      |                    |      |
|                                         | T1DM SPK, n (%)     |      | T2DM SPK, n (%)    |      | T2DM KTA, n (%)    |      |
| Gender                                  |                     |      |                    |      |                    |      |
| Male                                    | 130 (66.6)          |      | 17 (80.9)          |      | 29 (90.6)          |      |
| Female                                  | 65 (33.4)           |      | 4 (19.1)           |      | 3 (9.4)            |      |
| Arterial obstructive disease            |                     |      |                    |      |                    |      |
| Yes                                     | 46 (23.6)           |      | 16 (76.2)          |      | 19 (59.4)          |      |
| No                                      | 149 (76.4)          |      | 5 (23.8)           |      | 13 (40.6)          |      |
| Retinopathy                             |                     |      |                    |      |                    |      |
| Yes                                     | 28 (13.4)           |      | 16 (76.1)          |      | 16 (50.0)          |      |
| No                                      | 169 (86.6)          |      | 5 (23.9)           |      | 16 (50.0)          |      |
| Neuropathy                              |                     |      |                    |      |                    |      |
| Yes                                     | 15 (7.7)            |      | 15 (71.4)          |      | 5 (15.6)           |      |
| No                                      | 180 (92.3)          |      | 6 (28.6)           |      | 27 (84.4)          |      |
| Nephropathy                             |                     |      |                    |      |                    |      |
| Yes                                     | 195 (100)           |      | 21 (100)           |      | 32 (100)           |      |
| No                                      | 0 (0)               |      | 0 (0)              |      | 0 (0)              |      |
| Number of antihypertensive drugs        |                     |      |                    |      |                    |      |
| 0                                       | 66 (33.9)           |      | 0 (0)              |      | 0 (0)              |      |
| 1                                       | 75 (38.5)           |      | 5 (23.8)           |      | 5 (15.6)           |      |
| 2                                       | 41 (21.0)           |      | 5 (23.8)           |      | 17 (53.1)          |      |
| 3                                       | 12 (6.1)            |      | 8 (38.1)           |      | 8 (25.0)           |      |
| 4                                       | 1 (0.5)             |      | 3 (14.3)           |      | 2 (6.3)            |      |
| Coronary heart disease                  |                     |      |                    |      |                    |      |
| Yes                                     | 59 (30.3)           |      | 12 (57.1)          |      | 26 (81.2)          |      |
| No                                      | 136 (69.7)          |      | 9 (42.9)           |      | 6 (18.8)           |      |
| CABG/vent                               |                     |      |                    |      |                    |      |
| Yes                                     | 6 (3.1)             |      | 2 (9.5)            |      | 18 (56.2)          |      |
| No                                      | 189 (96.9)          |      | 19 (90.5)          |      | 14 (43.8)          |      |

BMI, body mass index; CABG, coronary artery bypass graft; CIT, cold ischemic time; HDL, high-density lipoprotein; KTA, kidney transplant alone; LDL, low-density lipoprotein; NA, not applicable; PRA, panel reactive antibodies; SPK, simultaneous pancreas-kidney; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

#### Combined Pancreas-Kidney Transplantation for Patients With End-Stage Nephropathy Caused by Type-2 Diabetes Mellitus.

Margreiter, Christian; Resch, Thomas; Oberhuber, Rupert; Aigner, Felix; Maier, Herbert; Sucher, Robert; Schneeberger, Stefan; Ulmer, Hanno; Bosmuller, Claudia; Margreiter, Raimund; Pratschke, Johann; Ollinger, Robert

Transplantation. 95(8):1030-1036, April 27, 2013.  
DOI: 10.1097/TP.0b013e3182861945

TABLE 1 Quantitative and qualitative patient characteristics at baseline according to study group

TABLE 2

|                                           | T1DM SPK, n (%) | T2DM SPK, n (%) | T2DM KTA, n (%) | P       |
|-------------------------------------------|-----------------|-----------------|-----------------|---------|
| Surgical complications                    |                 |                 |                 |         |
| Male                                      | 38 (19.5)       | 7 (33.3)        | 8 (25)          | 0.294   |
| Female                                    | 157 (80.5)      | 14 (66.7)       | 24 (75)         |         |
| Acute rejection                           |                 |                 |                 |         |
| Yes                                       | 18 (9.3)        | 2 (10.0)        | 3 (9.4)         | 0.994   |
| No                                        | 177 (90.7)      | 18 (80.0)       | 29 (90.6)       |         |
| Infectious complications                  |                 |                 |                 |         |
| Yes                                       | 32 (16.3)       | 4 (19.0)        | 9 (28.9)        | 0.272   |
| No                                        | 164 (83.7)      | 17 (81.0)       | 23 (71.9)       |         |
| DGF pancreas                              |                 |                 |                 |         |
| Yes                                       | 32 (16.4)       | 3 (15.0)        | NA              | 0.872   |
| No                                        | 163 (83.5)      | 17 (85.0)       |                 |         |
| DGF kidney                                |                 |                 |                 |         |
| Yes                                       | 24 (12.3)       | 3 (15.0)        | 19 (59.4)       | <0.001  |
| No                                        | 171 (87.7)      | 18 (85.7)       | 13 (40.6)       |         |
| Steroid-free after 12 months              |                 |                 |                 |         |
| Yes                                       | 150 (76.9)      | 13 (61.9)       | 12 (37.5)       | <0.0001 |
| No                                        | 45 (23.1)       | 8 (38.1)        | 20 (62.5)       |         |
| C-peptide at discharge, mean (SD), ng/mL  | 5.6 (3.5)       | 4.2 (2.1)       | —               | 0.131   |
| Creatinine at discharge, mean (SD), mg/dL | 1.0 (0.4)       | 1.1 (0.3)       | 1.9 (1.3)       | 0.021   |

DGF, delayed graft function; KTA, kidney transplant alone; NA, not applicable; SPK, simultaneous pancreas-kidney; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

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TABLE 2 Clinical data of the study groups

TABLE 3

| T1DM SPK, %             |      | T2DM SPK, % |      | T2DM KTA, % |      | P      |         |      |
|-------------------------|------|-------------|------|-------------|------|--------|---------|------|
| Patient survival        |      |             |      |             |      |        |         |      |
| 1-y                     | 96.9 |             | 90.5 |             | 87.1 | <0.001 |         |      |
| 3-y                     | 94.2 |             | 80.1 |             | 70.2 |        |         |      |
| 5-y                     | 91.6 |             | 80.1 |             | 54.2 |        |         |      |
| Pancreas graft survival |      |             |      |             |      |        |         |      |
|                         | NCFD | DC          | NCFD | DC          | NCFD | DC     | NCFD    | DC   |
| 1-y                     | 92.6 | 93.2        | 81.0 | 85.7        |      |        | 0.19    | 0.35 |
| 3-y                     | 85.8 | 89.1        | 75.9 | 85.7        | NA   |        |         |      |
| 5-y                     | 80.7 | 85.0        | 75.9 | 85.7        |      |        |         |      |
| Kidney graft survival   |      |             |      |             |      |        |         |      |
|                         | NCFD | DC          | NCFD | DC          | NCFD | DC     | NCFD    | DC   |
| 1-y                     | 95.9 | 98.4        | 85.7 | 90.2        | 77.7 | 80.6   | <0.0001 | 0.09 |
| 3-y                     | 89.3 | 94.5        | 80.4 | 90.2        | 64.0 | 80.6   |         |      |
| 5-y                     | 83.6 | 89.8        | 80.4 | 90.2        | 52.7 | 80.6   |         |      |

DC, death-censored; KTA, kidney transplant alone; NA, not applicable; NCFD, not censored for death; SPK, simultaneous pancreas-kidney; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

DC, death-censored; KTA, kidney transplant alone; NA, not applicable; NCFD, not censored for death; SPK, simultaneous pancreas-kidney; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

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TABLE 3 Summary of patient and graft survival rates

TABLE 4

|                              | T1DM SPK, n (%) | T2DM SPK, n (%) | T2DM KTA, n (%) |
|------------------------------|-----------------|-----------------|-----------------|
| Cause of death               |                 |                 |                 |
| MI                           | 9 (4.6)         | 1 (0.5)         | 8 (25)          |
| Malignancy                   | 4 (2.0)         | 1 (0.5)         | 1 (3.1)         |
| Pulmonary infection          | 4 (2.0)         | 2 (9.5)         | 4 (12.5)        |
| Sepsis                       | 4 (2.0)         | 1 (0.5)         | 1 (3.1)         |
| Stroke                       | 2 (1)           | 1 (0.5)         | —               |
| Hemorrhage                   | 1 (0.5)         | —               | —               |
| Cause of pancreas graft loss |                 |                 |                 |
| Patient death                | 18 (9.3)        | 3 (14.3)        | NA              |
| Rejection                    | 35 (17.8)       | 1 (4.7)         |                 |
| Thrombosis                   | 9 (4.6)         | 2 (9.5)         |                 |
| Graft infection              | 3 (1.5)         | 1 (4.7)         |                 |
| Bleeding                     | 1 (0.5)         | —               |                 |
| Pancreatitis                 | —               | 1 (4.7)         |                 |
| Cause of kidney graft loss   |                 |                 |                 |
| Patient death                | 17 (8.8)        | 4 (19)          | 9 (27.3)        |
| Rejection                    | 19 (9.7)        | 3 (14.3)        | 3 (9.3)         |
| Thrombosis                   | 3 (1.5)         | —               | —               |
| Infection                    | 1 (0.5)         | 1 (4.7)         | 1 (3.1)         |
| Recurrence of GN             | 1 (0.5)         | —               | —               |
| Hemorrhage                   | 1 (0.5)         | —               | —               |
| Primary nonfunction          | —               | —               | 3 (9.3)         |

GN, glomerulonephritis; KTA, kidney transplant alone; MI, myocardial infarction; NA, not applicable; SPK, simultaneous pancreas-kidney; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

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Transplantation. 95(8):1030-1036, April 27, 2013.  
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TABLE 4 Causes of death and causes of graft loss

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TABLE 1

|                        | SPK (n=123) | PAK (n=49)  | P      |
|------------------------|-------------|-------------|--------|
| Donor age (yr)         | 30.1±10.8*  | 22.9±10.2   | 0.0001 |
| Male (%)               | 63.7        | 55.6        | NS     |
| CMV positive (%)       | 42.3        | 39.6        | NS     |
| Weight (kg)            | 72.1±14.5   | 67.5±12.9   | NS     |
| Kidney CIT (h)         | 8.5±2.7     | N/A         | N/A    |
| Kidney WIT (min)       | 32.3±10.8   | N/A         | N/A    |
| Pancreas CIT (h)       | 10.2±2.6    | 9.2±2.8     | NS     |
| Pancreas WIT (min)     | 31.8±7      | 32.8±9      | NS     |
| Recipient Age (yr)     | 41.7±7.5    | 43.8±6.9    | NS     |
| Male (%)               | 63.4        | 55.1        | NS     |
| CMV positive (%)       | 37.2        | 40.8        | NS     |
| BMI (pre-tx)           | 25.4±3.9    | 26.6±3.8    | NS     |
| LD kidney grafts (%)   | 0           | 65          | <0.05  |
| Years of diabetes      | 29.3±6.9    | 32.8±7.1    | 0.004  |
| Peak PRA (%)           | 8±16.9      | 11.7±19.5   | NS     |
| HLA mismatches         | 4.6±1.1     | 4.2±1.6     | NS     |
| CMV mismatches (%)     | 27.6        | 22.4        | NS     |
| Pancreas F/U (mo)      | 48.99±26.99 | 42.61±29.44 | NS     |
| Patient F/U (mo)       | 52.64±25.5  | 46.04±28.16 | NS     |
| Induction: ATG (%)     | 77          | 98          |        |
| Basiliximab (%)        | 20          | 2           | 0.0046 |
| None (%)               | 3           | 0           |        |
| Steroids withdrawn (n) | 16          | 7           | NS     |

\* ± values are mean ± standard deviation.

**Pancreas-After-Kidney Versus Synchronous Pancreas-Kidney Transplantation: Comparison of Intermediate-Term Results.**  
Bazerbachi, Fateh; Selzner, Markus; Marquez, Max; Norgate, Andrea; McGilvray, Ian; Schiff, Jeffrey; Cattra, Mark

Transplantation. 95(3):489-494, February 15, 2013.  
DOI: 10.1097/TP.0b013e318274ab1a

TABLE 1 Donor and recipient characteristics

TABLE 2

|                                   | SPK<br>(n=123) | PAK<br>(n=49) | P     |
|-----------------------------------|----------------|---------------|-------|
| LOH (median [range]) (days)       | 11 (5–96)      | 9 (5–29)      | 0.006 |
| Overall complications (%)         | 44.7           | 28.6          | 0.51  |
| Abscess (%)                       | 5.7            | 2             | 0.3   |
| Gastrointestinal bleeding (%)     | 8.9            | 2             | 0.1   |
| Myocardial infarction (%)         | 6.5            | 0             | 0.06  |
| Cerebrovascular accident (%)      | 0.8            | 0             | 0.5   |
| Wound infection (%)               | 4              | 2             | 0.36  |
| Delayed kidney graft function (%) | 8.9            | N/A           | N/A   |
| Urinary tract infections (%)      | 17.9           | 18.4          | 0.9   |
| Sepsis (%)                        | 4.1            | 2             | 0.5   |

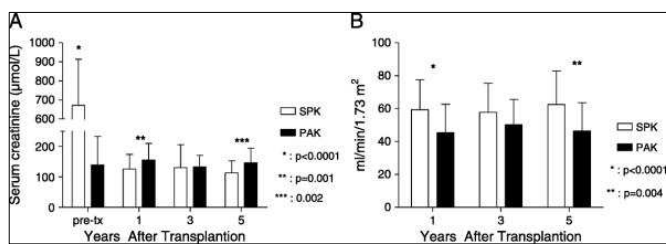
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TABLE 2 Complications during first 3 months after transplant

FIGURE 1



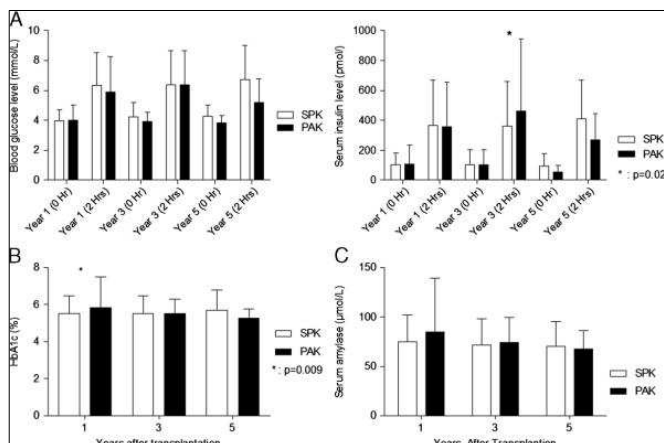
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FIGURE 1. Kidney graft evaluation. A, Serum creatinine levels before and after pancreas transplant in SPK versus PAK recipients. B, MDRD eGFR values after pancreas transplantation in SPK versus PAK recipients.

FIGURE 2



**Pancreas-After-Kidney Versus Synchronous Pancreas-Kidney Transplantation: Comparison of Intermediate-Term Results.**

Bazerbachi, Fateh; Selzner, Markus; Marquez, Max; Norgate, Andrea; McGilvray, Ian; Schiff, Jeffrey; Cattral, Mark

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FIGURE 2. Pancreas graft evaluation. A, OGTT results in SPK versus PAK recipients, at years 1, 3, and 5 after pancreas transplant. (Left) Blood glucose levels at baseline (0 hour) and 2 hours after administration of 75 glucose load. (Right) Serum insulin levels at baseline (0 hour) and 2 hours after administration of 75 glucose load. B, HbA1c ratio during follow-up in SPK and PAK recipients. C, Serum amylase levels during follow-up in SPK versus PAK recipients.

# Thank You

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TABLE 1

| Recipient variable       | 2hapLDK<br>(n=205) | Non-2hapLDK<br>(n=1779) | MMDDK<br>(n=228) | MMSPK<br>(n=964)  | OMDDPK<br>(n=215) | OMSPK<br>(n=1895) |
|--------------------------|--------------------|-------------------------|------------------|-------------------|-------------------|-------------------|
| Age, median (IQR, range) | 39 (34, 43)        | 40 (34, 46)             | 40 (34, 47)      | 41 (34, 48)       | 40 (34, 47)       | 39 (34, 45)       |
| Male, %                  | 93.2               | 92.3                    | 92.7             | 93.6              | 93.6              | 93.7              |
| Race, %                  |                    |                         |                  |                   |                   |                   |
| White                    | 82.4 <sup>a</sup>  | 82.4 <sup>a</sup>       | 92.1             | 75.7 <sup>a</sup> | 92.1              | 75.4 <sup>a</sup> |
| Black                    | 8.4                | 8.5 <sup>a</sup>        | 3.5              | 15.6 <sup>a</sup> | 4.2               | 13.7 <sup>a</sup> |
| Hispanic                 | 6.3                | 7.8                     | 4.4              | 7.3               | 3.2               | 7.3               |
| Other                    | 2.9 <sup>a</sup>   | 1.3                     | 0.6              | 1.9 <sup>a</sup>  | 0.3               | 1.7 <sup>a</sup>  |
| Haptotype, %             |                    |                         |                  |                   |                   |                   |
| Missing                  | 22.5 <sup>a</sup>  | 22.5 <sup>a</sup>       | 7.4              | 8.9               | 45.7 <sup>a</sup> | 34.8 <sup>a</sup> |
| CMV <sup>b</sup>         | 40.3               | 40.8                    | 46.9             | 47.3              | 39.7 <sup>a</sup> | 52.2 <sup>a</sup> |
| +DRB1                    | 13.2 <sup>a</sup>  | 16.9 <sup>a</sup>       | 23.7             | 23.8              | 15.6 <sup>a</sup> | 7.7 <sup>a</sup>  |
| +DRB3                    | 5.13               | 6.4                     | 6.23             | 7.4               | 6.13              | 6.73              |
| +DRB4                    | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB5                    | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB6                    | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB7                    | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB8                    | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB9                    | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB10                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB11                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB12                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB13                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB14                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB15                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB16                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB17                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB18                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB19                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB20                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB21                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB22                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB23                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB24                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB25                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB26                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB27                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB28                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB29                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB30                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB31                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB32                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB33                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB34                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB35                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB36                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB37                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB38                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB39                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB40                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB41                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB42                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB43                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB44                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB45                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB46                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB47                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB48                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB49                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB50                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB51                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB52                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB53                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB54                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB55                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB56                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB57                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB58                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB59                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB60                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB61                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB62                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB63                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB64                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB65                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB66                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB67                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB68                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB69                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB70                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB71                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB72                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB73                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB74                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB75                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB76                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB77                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB78                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB79                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB80                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB81                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB82                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB83                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB84                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB85                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB86                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB87                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB88                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB89                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB90                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB91                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB92                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB93                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB94                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB95                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB96                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB97                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB98                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB99                   | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |
| +DRB100                  | 1.0                | 1.0                     | 1.0              | 1.0               | 1.0               | 1.0               |

**Zero-Mismatch Deceased-Donor Kidney Versus Simultaneous Pancreas-Kidney Transplantation.** Kamgar, Mandana; Huang, Edmund; Kamgar, Mohammad; Nata, Naowanit; Leeaphorn, Napat; Kalantar-Zadeh, Kamyar; Bunnapradist, Suphamai

Transplantation. 94(8):822-829, October 27, 2012.  
DOI: 10.1097/TP.0b013e31826334a6

TABLE 1 Baseline characteristics

TABLE 2

|                            | Unadjusted       | P            | +Recipient Factors <sup>a</sup> | P            | +Donor Factors <sup>b</sup> | P           | +Transplant Factors <sup>c</sup> | P           |
|----------------------------|------------------|--------------|---------------------------------|--------------|-----------------------------|-------------|----------------------------------|-------------|
| Patient death              |                  |              |                                 |              |                             |             |                                  |             |
| 0MMDDK                     | Reference        | —            | Reference                       | —            | Reference                   | —           | Reference                        | —           |
| MMDDK                      | 1.94 (1.27–2.95) | <b>0.002</b> | 1.82 (1.20–2.77)                | <b>0.005</b> | 1.75 (1.15–2.66)            | <b>0.01</b> | 1.73 (1.14–2.64)                 | <b>0.01</b> |
| OMMSPK                     | 1.39 (0.84–2.32) | 0.20         | 1.41 (0.85–2.34)                | 0.19         | 1.50 (0.90–2.51)            | 0.12        | 1.59 (0.95–2.65)                 | 0.07        |
| MMSPK                      | 1.19 (0.80–1.77) | 0.88         | 1.22 (0.82–1.81)                | 0.33         | 1.27 (0.85–1.90)            | 0.23        | 1.35 (0.90–2.02)                 | 0.14        |
| 2hapLDK                    | 0.73 (0.39–1.38) | 0.34         | 0.79 (0.42–1.48)                | 0.46         | 0.76 (0.40–1.43)            | 0.39        | 0.85 (0.45–1.61)                 | 0.62        |
| Non-2hapLDK                | 1.10 (0.73–1.67) | 0.65         | 1.17 (0.77–1.77)                | 0.47         | 1.12 (0.73–1.71)            | 0.60        | 1.28 (0.83–1.96)                 | 0.27        |
| Overall kidney loss        |                  |              |                                 |              |                             |             |                                  |             |
| 0MMDDK                     | Reference        | —            | Reference                       | —            | Reference                   | —           | Reference                        | —           |
| MMDDK                      | 1.50 (1.11–2.02) | <b>0.01</b>  | 1.45 (1.07–1.96)                | <b>0.02</b>  | 1.38 (1.02–1.86)            | <b>0.04</b> | 1.37 (1.01–1.85)                 | <b>0.04</b> |
| OMMSPK                     | 0.97 (0.66–1.43) | 0.89         | 0.98 (0.66–1.44)                | 0.90         | 1.06 (0.71–1.56)            | 0.78        | 1.11 (0.75–1.64)                 | 0.60        |
| MMSPK                      | 1.06 (0.80–1.41) | 0.66         | 1.05 (0.79–1.39)                | 0.72         | 1.12 (0.84–1.49)            | 0.42        | 1.17 (0.88–1.56)                 | 0.27        |
| 2hapLDK                    | 0.66 (0.42–1.04) | 0.07         | 0.69 (0.43–1.08)                | 0.11         | 0.65 (0.41–1.04)            | 0.07        | 0.70 (0.44–1.12)                 | 0.13        |
| Non-2hapLDK                | 1.01 (0.76–1.37) | 0.90         | 1.04 (0.78–1.41)                | 0.77         | 0.98 (0.73–1.33)            | 0.92        | 1.06 (0.78–1.44)                 | 0.70        |
| Death-censored kidney loss |                  |              |                                 |              |                             |             |                                  |             |
| 0MMDDK                     | Reference        | —            | Reference                       | —            | Reference                   | —           | Reference                        | —           |
| MMDDK                      | 1.32 (0.88–1.99) | 0.17         | 1.32 (0.87–1.98)                | 0.18         | 1.25 (0.83–1.89)            | 0.28        | 1.24 (0.82–1.87)                 | 0.30        |
| OMMSPK                     | 0.83 (0.48–1.42) | 0.49         | 0.82 (0.48–1.41)                | 0.47         | 0.89 (0.52–1.53)            | 0.67        | 0.93 (0.54–1.60)                 | 0.80        |
| MMSPK                      | 1.23 (0.84–1.78) | 0.28         | 1.17 (0.80–1.70)                | 0.42         | 1.27 (0.87–1.85)            | 0.22        | 1.32 (0.90–1.93)                 | 0.15        |
| 2hapLDK                    | 0.66 (0.35–1.20) | 0.17         | 0.66 (0.36–1.22)                | 0.17         | 0.62 (0.34–1.16)            | 0.14        | 0.66 (0.35–1.23)                 | 0.19        |
| Non-2hapLDK                | 1.03 (0.70–1.54) | 0.87         | 1.02 (0.70–1.53)                | 0.89         | 0.95 (0.63–1.43)            | 0.81        | 1.00 (0.67–1.52)                 | 0.98        |

Bold values indicate P<0.05.  
<sup>a</sup> Adjusted for recipient age, race/ethnicity, gender, BMI, preemptive, and PRA.  
<sup>b</sup> Adjusted for all of the above plus donor age, race/ethnicity, gender, BMI, and hypertension.  
<sup>c</sup> Adjusted for all of the above plus induction therapy, CMV serostatus, transplant year, and transplant region.  
 0MMDDK, kidney transplant from zero HLA mismatched deceased donors; OMMSPK, kidney-pancreas transplant from zero HLA mismatched deceased donors; 2hapLDK, kidney transplant from living donors sharing 2 haplotypes with recipients; BMI, body mass index; CMV, cytomegalovirus; MMDDK, kidney transplant from deceased donors with any degree of HLA mismatch with recipients; MMSPK, kidney-pancreas transplant from deceased donors with any degree of HLA mismatch with recipients; Non-2hapLDK, kidney transplant from non-HLA identical living donors; PRA, panel reactive antibody.

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Transplantation. 94(8):822-829, October 27, 2012.  
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TABLE 2 Cox analysis of risk factors for patient death and kidney graft loss

## Complicanze del DM e Terapia medica

- **Complicanze**

- Acute

- Coma iperglicemico / ipoglicemico

- Croniche

- Nefropatia → Insufficienza Renale Cronica → Dialisi.
    - Cardiopatie, neuropatie, infezioni, oculopatie.

- **Terapia medica**

- Schema Convenzionale (in disuso) Hb1Ac 9%

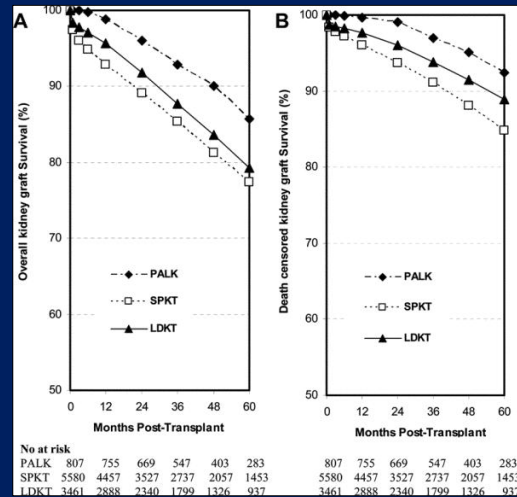
- Schema Intensivo (quadriniettivo) Hb1Ac 7%

- Alternativa → Trapianto di Pancreas**

*NEJM*  
1993;  
329 (14):  
977-986.

TRAPIANTO DI PANCREAS  
DOPO TRAPIANTO DI RENE DA  
DONATORE VIVENTE

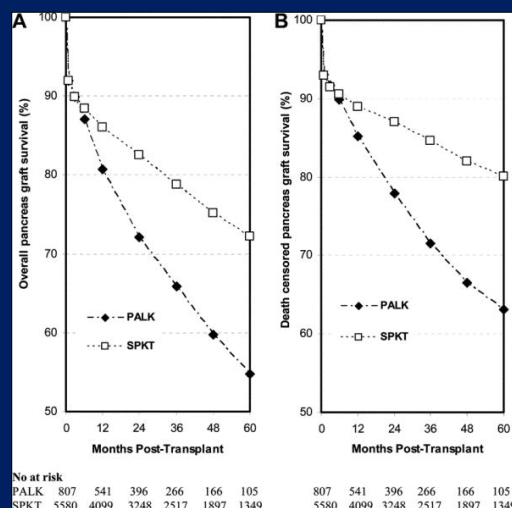
# SOPRAVVIVENZA DEL RENE SPK vs PALK vs LDKT



Pancreas After Living Donor Kidney Versus Simultaneous Pancreas-Kidney Transplant: An Analysis of the Organ Procurement Transplant Network/United Network of Organ Sharing Database.  
Poommipanit, Neda; Sampaio, MS; Cho, Yong; Young, Brian; Shah, Tariq; Pham, Phuong-Thu; Wilkinson, Alan; Danovitch, Gabriel; Bunnapradist, Suphamai

Transplantation. 89(12):1496-1503, June 27, 2010.  
DOI: 10.1097/TP.0b013e3181dd3587

# SOPRAVVIVENZA DEL PANCREAS SPK vs PALK

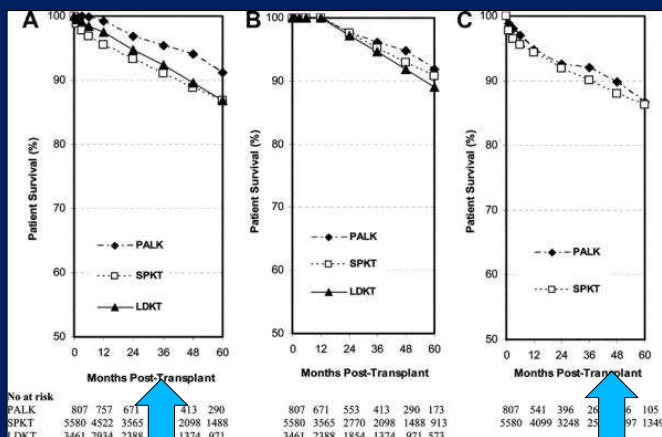


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Transplantation. 89(12):1496-1503, June 27, 2010.  
DOI: 10.1097/TP.0b013e3181dd3587

-Trombosi  
-Rigetto

# SOPRAVVIVENZA DEL PAZIENTE SPK vs PALK vs LDKT

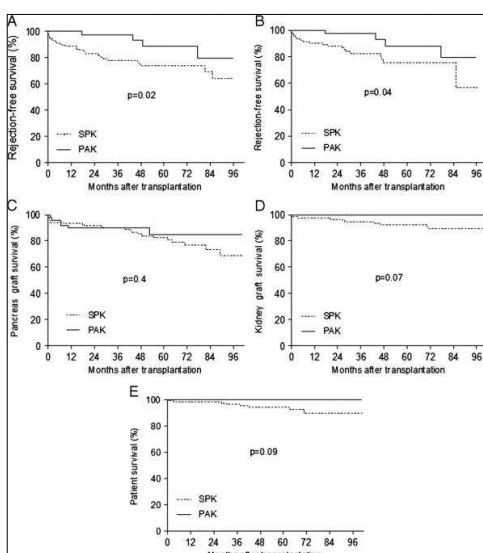


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Poommipanit, Neda; Sampaio, MS; Cho, Yong; Young, Brian; Shah, Tariq; Pham, Phuong-Thu; Wilkinson, Alan; Danovitch, Gabriel; Bunnapradist, Suphamai  
Transplantation. 89(12):1496-1503, June 27, 2010.  
DOI: 10.1097/TP.0b013e3181dd3587

DAL TX RENE

DAL TX PANCREAS

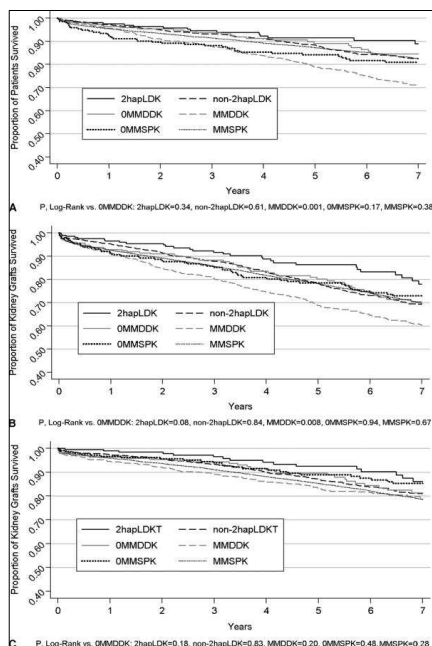
FIGURE 3



Pancreas-After-Kidney Versus Synchronous Pancreas-Kidney Transplantation: Comparison of Intermediate-Term Results.  
Bazerbachi, Fateh; Selzner, Markus; Marquez, Max; Norgate, Andrea; McGilvray, Ian; Schiff, Jeffrey; Cattral, Mark  
Transplantation. 95(3):489-494, February 15, 2013.  
DOI: 10.1097/TP.0b013e318274ab1a

FIGURE 3. Kaplan-Meier plots after pancreas transplantation in SPK versus PAK recipients. A, Rejection-free survival of kidney and pancreas grafts in patients who received ATG and basiliximab. B, Rejection-free survival of kidney and pancreas grafts in patients who received ATG. C, Death-uncensored pancreas graft survival. D, Death-uncensored kidney graft survival since pancreas survival. E, Patient survival.

FIGURE 1



**Zero-Mismatch Deceased-Donor Kidney Versus Simultaneous Pancreas-Kidney Transplantation.**  
 Kamgar, Mandana; Huang, Edmund; Kamgar, Mohammad; Nata, Naowanit; Leeaphorn, Napat; Kalantar-Zadeh, Kamyar; Bunnapradist, Suphamai  
 Transplantation. 94(8):822-829, October 27, 2012.  
 DOI: 10.1097/TP.0b013e31826334a6

FIGURE 1. Kaplan-Meier survival curves. A, Patient survival; B, Overall kidney survival; C, Death-censored kidney survival.

# Il Trapianto di Pancreas

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Centro Trapianti Epatici

Prof. M. Salizzoni

## TECNICA DI TRAPIANTO

