RETRANSPLANTATION

Prof. M.A. Bakr (MD)
Urology and Nephrology Center
Mansoura University, Egypt.

AGENDA

I.BACKGROUND

II.CHALLENGES

III. MANSOURA EXPERIENCE

IV. TAKE HOME MESSAGE

RETRANSPLANTATION

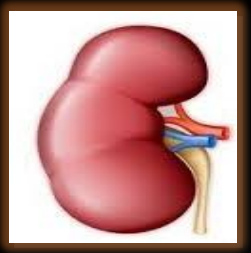
I. Background

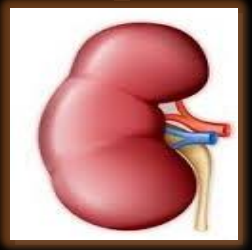
RETRANSPLANTATION

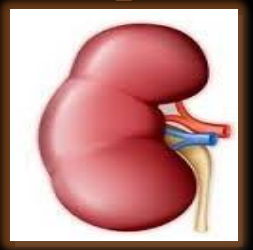
I. Background:

Achievements

- **IS**
- **Tissue matching**
- **Short term outcome**







RETRANSPLANTATION

I. Background:

- **Patients move from waiting list through transplantation and back to dialysis or retransplantation after graft failure.** ***(Wong et al., Transplantation, 2015)***
- **The number of patients with ESRD being relisted for a second kidney transplant is increasing worldwide.** ***(Kousoulas et al., Transplantation, 2015)***

RETRANSPLANTATION

I. Background:

- **In 2007, retransplantation rate was:**
  - ✓ **LD : 7.1%**
  - ✓ **DD : 9.7%**

  (Magee et al., Am J Transplant, 2007)
- **In 2011 : 11.8%**

  (OPTN/ SRTR, 2011)
- **In 2013 : 14.5%**

  (Heaphy et al., Am J Transplant, 2014)
- **In 2015 : 15.0%**

  (Graves and Fine, Pediatr Nephrol, 2016)

RETRANSPLANTATION

II. Challenges

II. Challenges:

1. Outcome
2. Graft nephrectomy
3. Ipsilateral transplant
4. Donor selection
5. Preemptive transplants
6. Immunologic factor
7. Immunosuppression
8. BK virus
9. Cancer risk
10. Pediatrics
11. Others

II. Challenges

11

1/11. Outcome

?

II. Challenges:

1. Outcome

- **50 recipients of second grafts who were slowly rejecting first kidney and did not require prior graft nephrectomy.**
- **Outcome was highly dependent upon:**
  - ✓ **Source of donor (LD Vs DD).**
  - ✓ **Functional duration of first graft.**
  - ✓ **Elapsed time between first and second graft.**

(Casali et al., Ann Surg, 1976)

II. Challenges:

1. Outcome

Expectations

- **Comparable outcome**
- **Inferior outcome**

II. Challenges:

1. Outcome

- 233 retransplants.
- Similar graft survival rates at 1,5 and 10 years (89% 76% and 53%) of first and second grafts.
- Significant risk factors:
  - ✓ Number of AR.
  - ✓ S.creatinine at 12 M.
  - ✓ HLA- DR mismatches.

(Couple et al., Kid Int, 2003)

II. Challenges:

1. Outcome

- **100 retransplants.**

Survival	Patients	Graft
One year	100%	85%
Five years	96%	72%
Ten years	92%	53%

- **Good outcome with allocation based on induction therapy and anti HLA antibody identification.**

(Barocci et al., Transplant Proc, 2009)

II. Challenges:

1. Outcome

- **Retrospective study (370 first transplants Vs 45 retransplants).**

	Patients		Graft	
Survival	**F**	**R**	**F**	**R**
Three years	**98%**	**97%**	**89%**	**88%**
Five years	**96%**	**97%**	**84%**	**85%**

- **Similar outcome.**

(Abad et al., Arch Esp Urol, 2011)

II. Challenges:

1. Outcome

- **116 retranplants versus 3337 first transplants.**
- **Retransplants:**
  - ✓ **ATG induction (18.3% Vs 4.3%).**
  - ✓ **Older age (46.2±12.8 Vs 42.2±12.3 y).**
  - ✓ **Anti IL2RA induction (60% Vs 32.6%).**
  - ✓ **Similar LD and male gender percentage.**
  - ✓ **High immunologic risk (14%Vs 3%, P:0.001).**

(Ingsathit et al., Transplant Proc, 2013)

II. Challenges:

1. Outcome

	Patient		Graft	
Survival	F	R	F	R
One year	96%	95%	95%	89%
Five years	91%	95%	87%	87%
Ten years	84%	91%	71%	74%
P	0.42		0.63	

- *Comparable results.*

(Ingsathit et al., Transplant Proc, 2013)

II. Challenges:

1. Outcome

- 62 retransplants.

Survival	Patients	Graft
One year	97%	85%
Five years	80%	67%
Ten years	80%	67%

- Acceptable outcome for retransplantions at 10 years.
- AR was 17.6%, mean S.creatinine was 1.92 ± 0.5mg%.
- Encourage retransplant for better QOL compared to dialysis.

(Gumber et al., Saudi J Kidney Dis Transplant, 2013)

II. Challenges:

1. Outcome

Expectations

- **Comparable outcome**
- **Inferior outcome**

II. Challenges:

1. Outcome

- **108 retransplants Vs 216 first transplants.**

Survival	Patient		Graft	
	F	R	F	R
One year	96%	93%	91%	81%
Three years	92%	91%	90%	79%
Five years	88%	87%	85%	74%
P	0.63		0.0037	

(Gholi et al., Tranplant Proc, 2005)

II. Challenges:

1. Outcome

- **61 retransplants.**
- **Inferior outcomes should be expected among:**
  - ✓ **Elderly patients.**
  - ✓ **Hyperimmunized recipients.**
  - ✓ **Multiple operations at transplantation site.**

(Kousoulas et al., Transplantation, 2015)

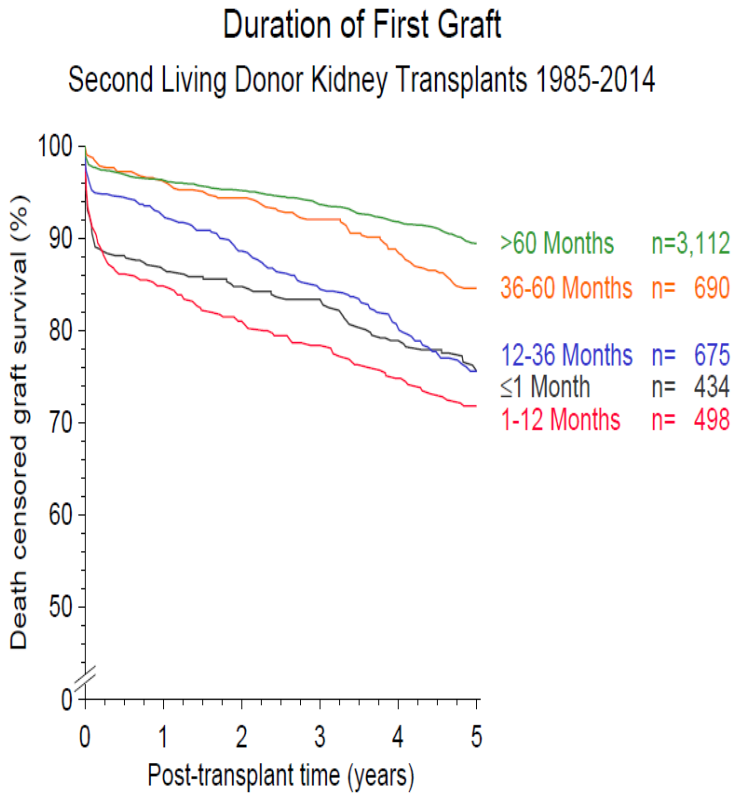
II. Challenges:

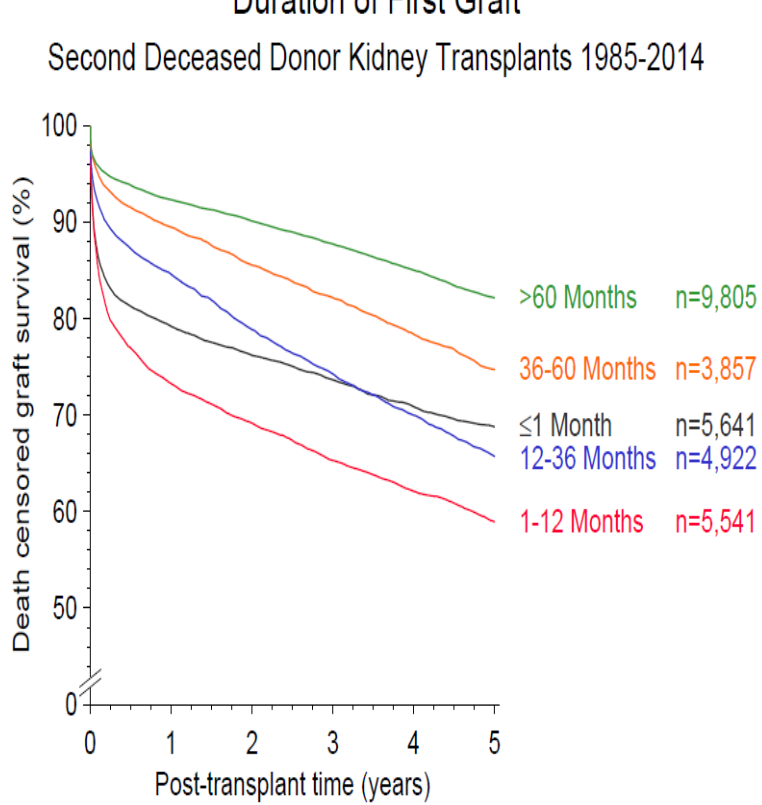
1.Outcome

*Special issues

II. Challenges:

1. Outcome





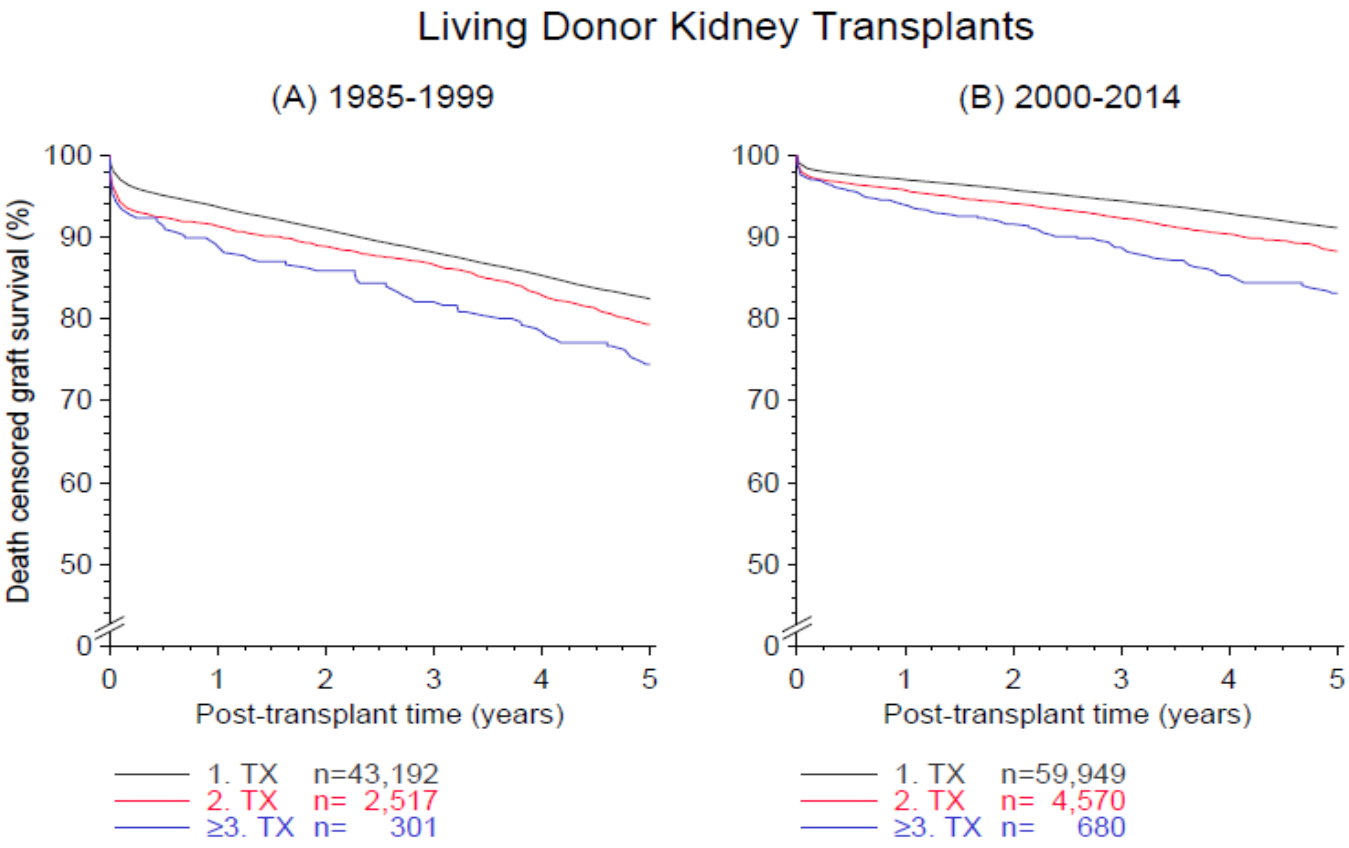
(CTS, 2015)

M A Bakr

Mansoura- Egypt

II. Challenges:

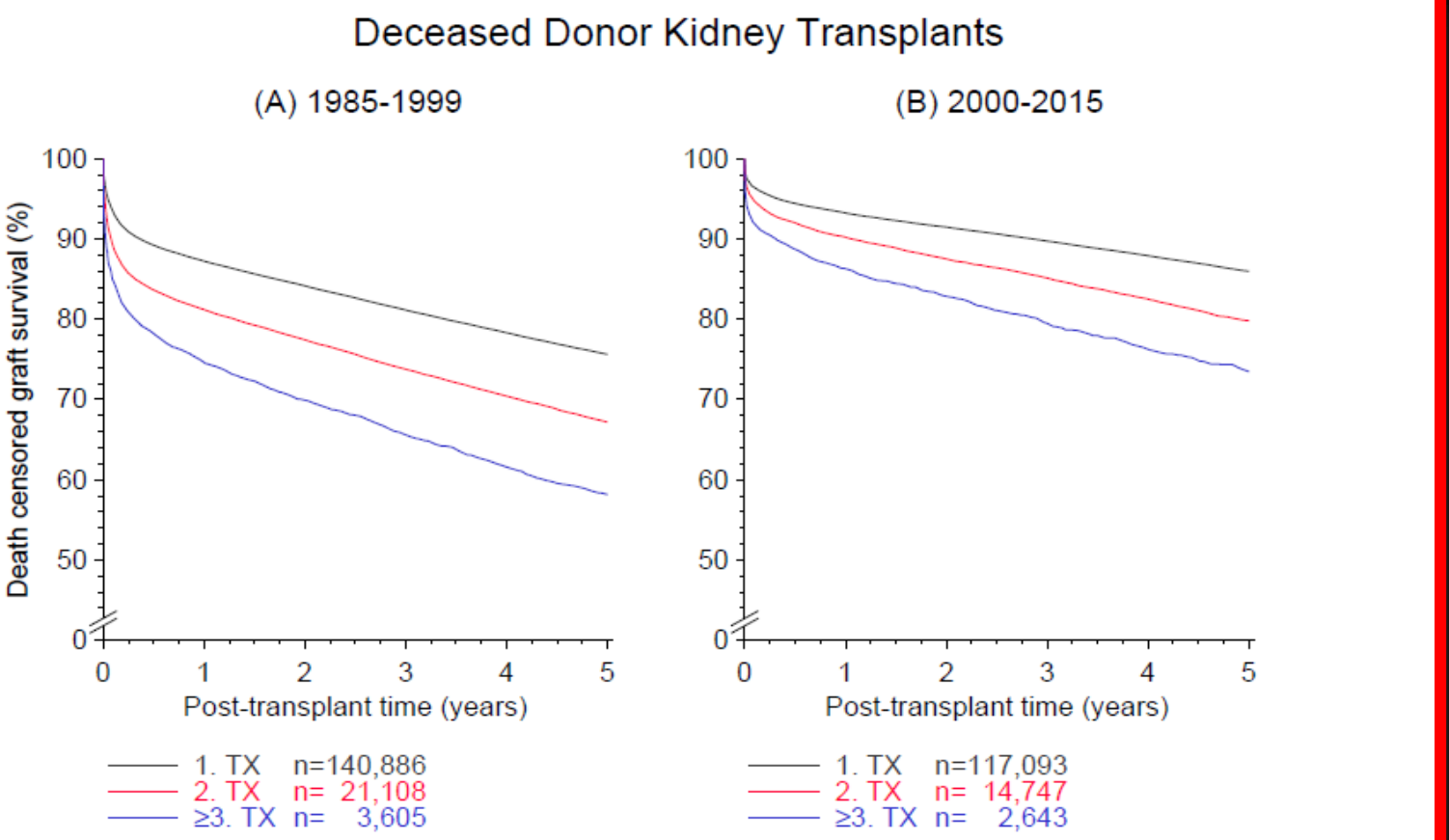
1. Outcome



(CTS, 2016)

II. Challenges:

1. Outcome



(CTS, 2016)

II. Challenges:

1. Outcome

- **Higher GFR after first transplant was associated with increased GFR post retransplant:**

AS

- **Adjusted hazard of graft loss following retransplantation was inversely associated with GFR after primary transplant.**

(Heaphy et al., Am J Transplant, 2014)

II. Challenges:

1. Outcome

- **Factor with significant impact on patient survival was:**
  - ✓ **Age at time of last transplantation.**
- **Factors with significant impact on graft survival were:**
  - ✓ **Need for reoperation.**
  - ✓ **Acute rejection episodes.**
  - ✓ **Primary graft nonfunction.**
  - ✓ **Type of immunosuppression.**
  - ✓ **Number of HLA mismatches.**
  - ✓ **Number of surgical complications.**

(Kousoulas et al., Transplantation, 2015)

II. Challenges:

1. Outcome

- **Long term graft survival decreases with subsequent retransplants.**
- **Factors affecting outcome:**
  - ✓ **Status of failed graft.**
  - ✓ **Prevention of recurrence.**
  - ✓ **Etiology of prior graft failure.**
  - ✓ **Correction of technical impediments.**
  - ✓ **Reduce potential for recidivism of non adherence.**

(Graves and Fine, Pediatr Nephrol,2016)

II. Challenges

11

2/11. Graft nephrectomy

?

II. Challenges:

2. Graft nephrectomy

- **Indications:**

  - ✓ **Clinical symptoms:**

    - Arterial HTN. **-Pronounced proteinuria.**

    - Persistent UTI. **- Graft related pain.**

  - ✓ **Desire to eliminate continued IS on dialysis.**

(Gustafsson et al., Surg Gynecol Obestet, 2011)

II. Challenges:

2. Graft nephrectomy

- **Concern:**
  - ✓ **Development of anti HLA antibodies.**
- **Question:**
  - ✓ **Does retained graft absorb or stimulate antibodies production?**
  - ✓ **Limited data.**

(Graves and Fine, Pediatr Nephrol, 2016)

II. Challenges:

2. Graft nephrectomy

- **Management of asymptomatic failed graft is controversial.**
- **Prior graft nephrectomy in 121 recipients (GI).**
- **No graft nephrectomy in 45 patients (GII).**
- **GI patients had significant:**
  - ✓ **increased PRA (P:0.02).**
  - ✓ **increase of primary non function (P:0.05).**

(Schleicher et al., Transpl Int, 2011)

II. Challenges:

2. *Graft nephrectomy*

- ✓ **increase of AR (P:0.04).**
- ✓ **worse graft survival (P:0.03) with no impact on patient survival (P:0.6).**

- **Graft nephrectomy had negative impact on graft function and survival after retransplantation.**

(Schleicher et al., Transpl Int, 2011)

II. Challenges:

2. Graft nephrectomy

	GI	GII	P- Value
Patients	43	48	--
Graft nephrectomy	Yes	No	--
AR episodes	5%	12%	0.3
Graft failure	14%	17%	0.4
5-Y graft survival	91%	83 %	0.2
10-Y graft survival	85 %	69 %	0.2

(Surgo et al., Int Urol Nephrol, 2013)

II. Challenges:

2. Graft nephrectomy

- **Conclusion:**
  - ✓ **Nephrectomy does not seem to significantly influence the survival of the second graft.**
  - ✓ **Nephrectomy decision should be based on clinical indications.**

(Dinis et al., Transplant Proc, 2014)

II. Challenges

11

3/11. Ipsilateral retransplantation

?

II. Challenges:

3. Ipsilateral retransplantation

- **99 patients ipsilateral, Vs 270 contralateral retransplant:**
  - ✓ **Significant more blood loss.**
  - ✓ **Significant longer operative time.**
  - ✓ **Significant higher vascular complications.**
  - ✓ **Inferior graft survival at 10 years (47% Vs, 57%).**
  - ✓ **Comparable patient survival at 10 years(64% Vs,77%).**
- **Recommendation for contralateral retransplantion.**

(Ooms et al., Am J Transplant, 2015)

II. Challenges

11

4/11. Donor selection

?

II. Challenges:

4. Donor selection

- **Expanded criteria donor for first (25.508) and for retransplants (1658) Vs standard criteria donor for retransplant (17.130).**
- **Retransplant with ECD:**
  - ✓ **Higher risk of graft failure (HR 1.19, 1.76).**
  - ✓ **Higher mortality than others (HR 1.45, 1.79).**
  - ✓ **Worse patient survival than reSCD (HR:1.82).**
  - ✓ **Better patient survival than frist ECD (HR:0.89).**

(Panchal et al., Transplant Int, 2015)

II. Challenges:

4. Donor selection

- **Overall 5-years survival of LRD transplant were 56%, 21% for first and second transplants.**
- **Patient survival after LURD retransplant was less than that after first transplant.**
- **LRD transplant and retransplant had comparable 5-year survival rates.**

(Husberg et al., Arch Surg, 2011)

II. Challenges

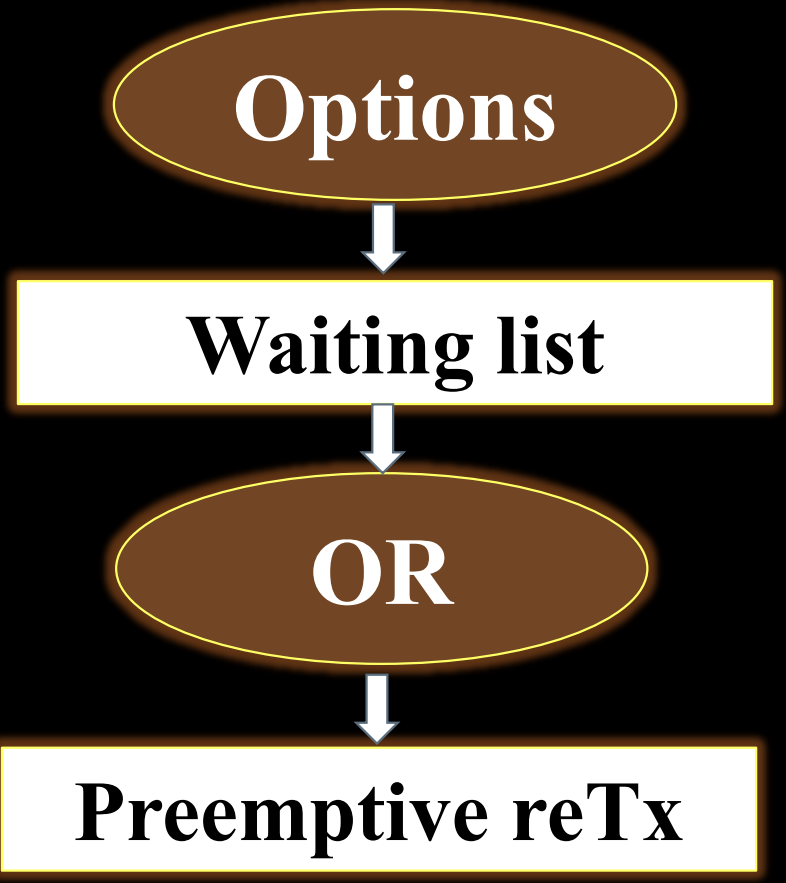
11

5/11. Preemptive retransplantation

?

II. Challenges:

5. *Preemptive retransplantation*



II. Challenges:

5. *Preemptive retransplantation*

- **911 retransplants.**
- **Increasing waiting time, independent of donor, recipient and immunologic factors, is associated with:**
  - ✓ **All- cause mortality (P:0.001).**
  - ✓ **Overall graft failure (P:0.001).**
  - ✓ **Increased risk of early AR (P:0.001).**
  - ✓ **Death with functioning graft (P:0.001).**
  - ✓ **Severe vascular/ humoral rejection (P:0.011).**

(Wong et al., Transplantation, 2015)

II. Challenges:

5. Preemptive retransplantation

- **Conclusion: Prolonged waiting time for a second graft was associated with inferior patient and graft outcomes.**

(Wong et al., Transplantation, 2015)

II. Challenges:

5. *Preemptive retransplantation*

- **Two groups:**

  GI: 18 patients (pre-retx).

  GII: 83 recipients (retx):

  - ✓ **26% PRA >10% (P:0.014).**
  - ✓ **54% historical PRA >10% (P:0.001).**
  - ✓ **Rejection rate was 27% Vs 11% (P:0.227).**

(Florit et al., Transplant Proc, 2015)

II. Challenges:

5. *Preemptive retransplantation.*

	G1	G11
5 Y Patient survival	88%	100%
5Y Graft survival	65%	89%
S. Creat. (mg%)	1.6±0.7	1.4±0.4
Proteinuria (mg/d)	198	252

- **preemptive retransplantation is feasible option with acceptable results.**
  - ✓ **May help to minimize dialysis reinitiation.**

(Florit et al., Transplant Proc, 2015)

II. Challenges

11

6/11. Immunologic factor

?

II. Challenges:

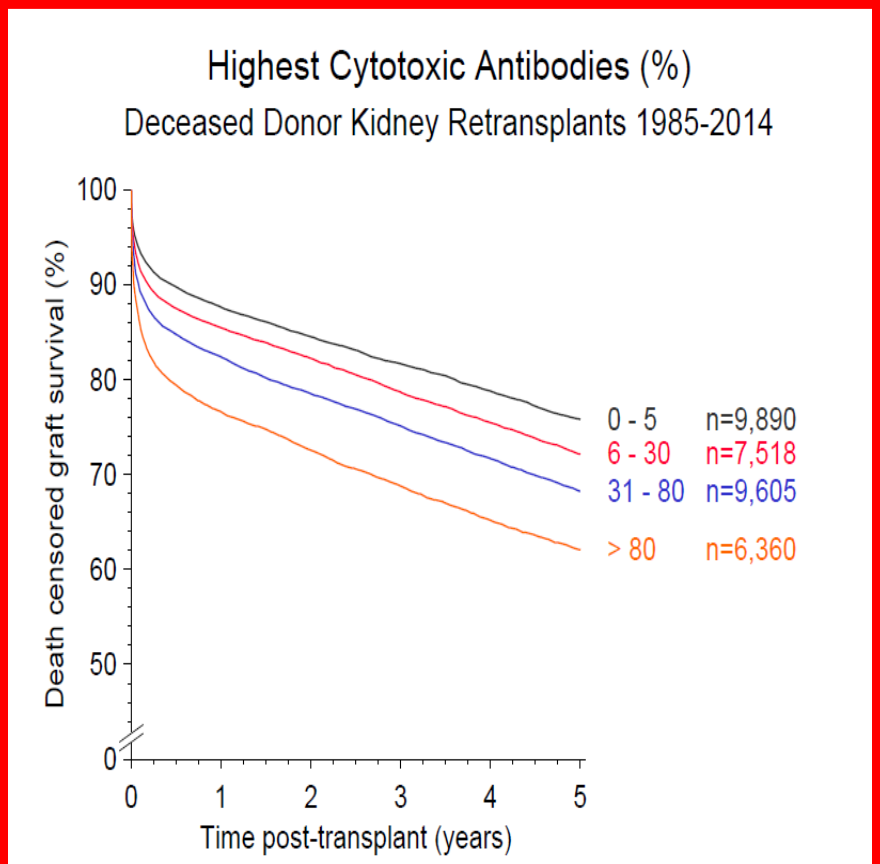
6. Immunologic factor

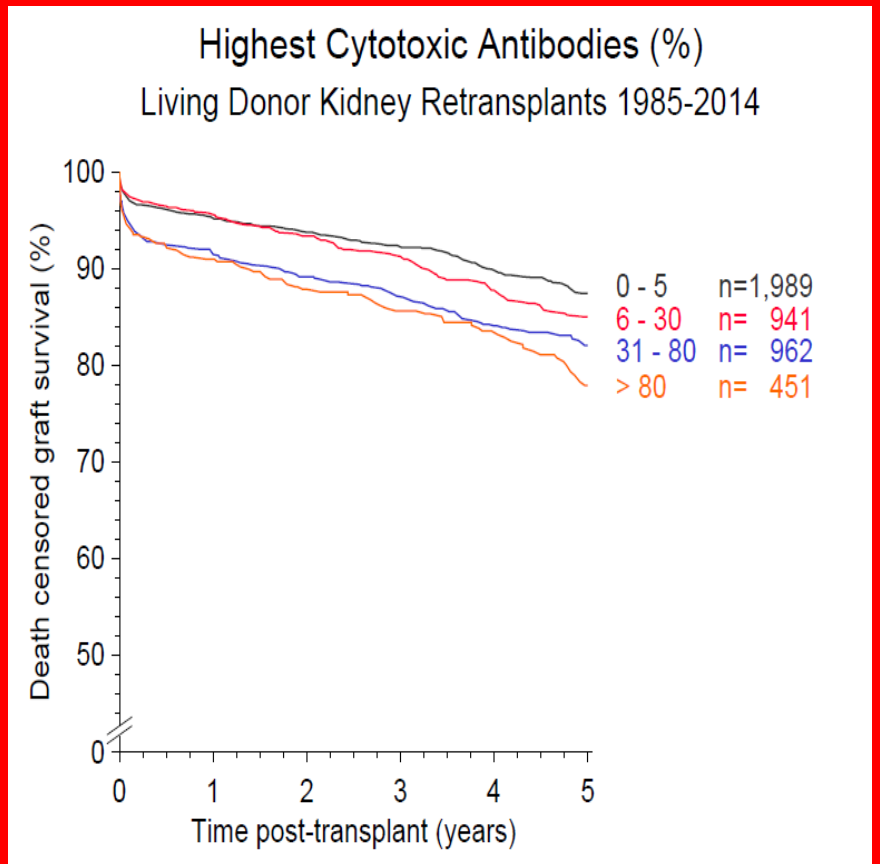
- **Recipient evaluation for antibodies with sensitive assays is mandatory before retransplantation.**
- **Highly sensitized patients to HLA of potential LD had low possibility to find proper DD.**

(Arnold et al., Tissue Antigens, 2005)

II. Challenges:

6. Immunologic factor





(CTS, 2015)

II. Challenges:

6. *Immunologic factor*

- **Matching for DR is beneficial in retransplant graft survival, whereas matching for HLA A, B has no effect.**
- **Specific HLA presensitization in absence of positive direct cross match does not contraindicate retransplantation.**

(Husberg et al., Arch Surg, 2011)

II. Challenges:

6. Immunologic factor

- **HLA DR matching of initial transplant in pediatrics had an impact on retransplant outcome.**
- **Two DR mismatches with the initial graft had an adverse effect on the timing and outcome of retransplantation.**

(Graves and Fine, Pediatr Nephrol,2016)

II. Challenges:

6. Immunologic factor

❑ Case Report:

- **First transplant: acute accelerated SRR.**
- **Alloreactive T cells against 2,11 HLA typed controls.**
- **Exclusion of these two alleles in the allocation of second graft.**
- **Successful retransplantation.**

(Leyking et al., Transplant Proc, 2015)

II. Challenges:

6. Immunologic factor

- **10 patients underwent third transplants.**
- **Desensitization for all.**
- **Complications:**
  - ✓ **DGF 30%.**
  - ✓ **Surgical 30%.**
  - ✓ **Rejection:40%.**
- **10 year graft survival rate was 42.9%.**

(Kim et al.,KJIM,2015)

II. Challenges:

6. Immunologic factor

- **Third transplantation may be accepted, although aggressive pretransplantation immune monitoring and patient selection may be required to reduce the risk of AR and surgical complications.**

(Kim et al.,KJIM,2015)

II. Challenges

11

7/11. Immunosuppression

?

II. Challenges:

7. Immunosuppression

- **Trail of 12- month single arm pilot study to evaluate efficacy and safety of SIR-Tac in high risk patients including retransplants (28 patients).**
- **Retrospective control Tac- MMF (69 recipients).**
- **Basiliximab induction for all.**

(Lee et al., JKMS, 2015)

II. Challenges:

7. Immunosuppression

- **SIR group:**
  - ✓ **Higher non significant AR.**
  - ✓ **Lower non significant GFR.**
  - ✓ **Higher lymphocele (P:0.020).**
  - ✓ **Higher dyslipidemia (P:0.004).**
  - ✓ **Higher significant BKV (P:0.031).**
- **Decision was: premature termination of the study.**

(Lee et al., JKMS, 2015)

II. Challenges:

7. Immunosuppression

- **Improving the survival rates after retransplantation reflects mostly the impact of the efficacy of new immunosuppressive drugs.**

(Husberg et al., Arch Surg, 2011)

II. Challenges

11

8/11. BK virus

?

II. Challenges:

8. BK virus

- **BKV has emerged as a major complication of kidney transplantation.**
- **Among all kidney transplants, 3-8% were associated with BKV.**
- **Major cause for graft loss according to UNOS data.**

(Dhamidharka et al., Am J Transplant, 2010)

II. Challenges:

8. BK virus

- **Controversy before retransplantation of BKVN:**
  - ✓ **Graft nephrectomy.**
  - ✓ **Viral clearance.**
- **BKVN leads to graft loss in 10-80%.**
- ***Some studies:*** **Successful retransplanation without nephrectomy if viremia is cleared before retransplantation.**
- ***Other studies:*** **Successful retransplant in presence of active viremia without graft nephrectomy.**

(Huang et al., J Nephrol, 2015)

II. Challenges:

8. BK virus

- **126 retransplant in UNOS.**
- **Frist graft was lost either to transplant BKV or BKV attributed.**
- **TBKV was reported in 17.5% of retransplants.**
- **One year acute rejection was 7%.**
- **Graft survival at 1,3 years were 98.5, 93.6%.**
- **Median GFR was 68.4 ml/min.**
- **Retransplantation after BKV appears to be associated with good results.**

(Dhamidharka et al., Am J Transplant, 2010)

II. Challenges:

8. BK virus

- ***Case report:*** **Successful retransplant with high grade viremia and fulminant hepatic failure without graft nephrectomy under the setting of simultaneous liver- kidney transplant.**
- ***Case report:*** **Successful retransplant for two cases in presence of active viremia with graft nephrectomy at retransplant.**

(Huang et al., J Nephrol, 2015)

II. Challenges:

8. BK virus

- **Frist graft loss from BKVN or consequent to EBV related PTLD does not adversely impact retransplantation.**
- **Scarce data are available on pediatric recipients.**
- **Recurrence of both viruses after retransplant is limited.**

(Graves and Fine, Pediatr Nephrol, 2016)

II. Challenges

11

9/11. Cancer risk

?

II. Challenges:

9. Cancer risk

- **Limited data of cancer risk in retransplantation.**
- **Primary transplants (109.224 patients) versus retransplants (6621 recipients).**
- **Similar incidence of cancer (5.2% for primary Vs 3.7% for retransplants).**
- **RCC was higher among retransplant (0.6% Vs 0.47%, RR 2.03, 95% CI 1.45-2.77).**

(Kalil et al., Clin Transpl, 2015)

II. Challenges:

9. Cancer risk

- **Overall cancer risk did not differ among transplants and retransplants.**
- **Increased RCC in retarnsplants:**
  - ✓ **Time spent on dialysis till retransplant.**
  - ✓ **Presence of acquired cystic kidney disease.**
  - ✓ **Develop with additional time with kidney disease.**

(Kalil et al., Clin Transpl, 2015)

II. Challenges:

9. Cancer risk

- **Retransplantation for prior PTLD.**
- **Trigger PTLD relapse after retransplantation.**
- **8 patients were retransplanted after successful treatment of PTLD.**
- **Median time of retransplant was 55.5 M after PTLD:**
  - ✓ **No recurrence of PTLD.**
  - ✓ **Graft survival was 87.5% at 5 Y.**
  - ✓ **Three mortalities other than PTLD.**

(Rouphael et al., Clin Transpl 2016)

II. Challenges:

9. Cancer risk

- **Retransplantion appears to be safe in patient with prior PLTD without major risk of haematologic recurrence provided that PTLD has remitted.**

(Rouphael et al., Clin Transpl 2016)

II. Challenges

11

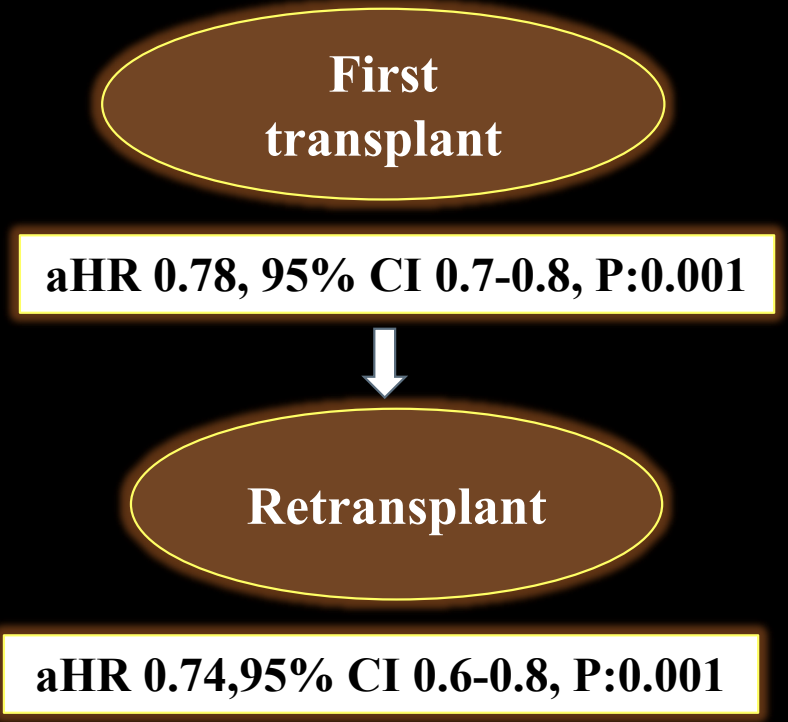
10/11. Pediatrics

?

II. Challenges:

10. Pediatrics

- 25% of pediatric recipients required retransplant within 7 years .
- LD graft had longer survival compared to DD.



(Kyle et al., Transplantation 96:487, 2013)

II. Challenges:

10.Pediatrics

- **DD transplantation in pediatric recipients followed by LD retransplantation does not negatively impact LD graft survival advantage and provides similar cumulative graft life compared to LD followed by DD retransplant.**

(Kyle et al., Transplantation; 96:487, 2013)

II. Challenges:

10. Pediatrics

- **Excellent graft survival can be achieved with retransplant despite poor survival of previous graft .**
- **Racial and socioeconomic disparities exit with regard to retransplant among pediatric recipients.**

(Kyle et al., Transplantation; 96:487, 2013)

II. Challenges:

10. Pediatrics

Tranplants	NO.	%
One transplant	11.717	79.2
Two transplants	2.634	17.8
Three transplants	400	2.7

(Kyle et al., Transplantation ;95:1360, 2013)

II. Challenges:

10. Pediatrics

Graft survival	Frist %	Second %	Third %	Fourth %
• One year	92%	90%	89%	85%
• Five years	75%	65%	62%	47%
• Ten years	56%	44%	39%	20%
• Median survival (Y)	11.7	8.5	7.7	4.5

(Kyle et al., Transplantation 95:1360, 2013)

II. Challenges:

10. Pediatrics

- **Frist transplant had lower risk graft loss.**

Compared to Second

aHR 0.7, 95% c1 0.6-5.8, P:0.001

Compared to third

aHR 0.6, 95% c1 0.5-0.7,

Compared to fourth

aHR 0.4, 95% c1 0.2-0.7, P:0.005

(Kyle et al., Transplantation 95:1360, 2013)

II. Challenges:

10. Pediatrics

- **Counseling parents of a child with ESRD regarding the optimal approach to assure longevity for their child is dilemma.**
- **More families will apt for initial DD (with reduced waiting time) graft and utilize LRD for retransplant.**

(Kyle et al., Transplantation; 96:487, 2013)

II. Challenges:

10. Pediatrics

- **Retransplantation is an increasing clinical challenge to those caring of pediatric recipients.**

(Graves and Fine, Pediatr Nephrol, 2016)

II. Challenges

11

11/11. Others

?

II. Challenges:

11.Others, urological complications:

- **Incidence is 6.4%.**
- **Acceptable and comparable with first transplant group.**
- **Leakage (3.8%), ureteral stenosis (1.3%), lymphocele (1.3%).**
- **Same management procedures.**
- **Encourage retransplantation.**

(Baston et al., Revista Romona de Urologie,2015)

II. Challenges:

11.Others, non adherence:

- No recent data on pediatric retransplanted recipients that recidivism of poor compliance adversely impact retransplantation graft survival rates.

(Graves and Fine, Pediatr Nephrol, 2016)

II. Challenges:

11.Others, recurrence:

- **Reported incidence is quite variable.**
- **Surveillance is highly recommended following retransplant with treatment to suppress or remove the putative agent to avoid recurrence.**

(Graves and fine, Pediatr Nephrol, 2016)

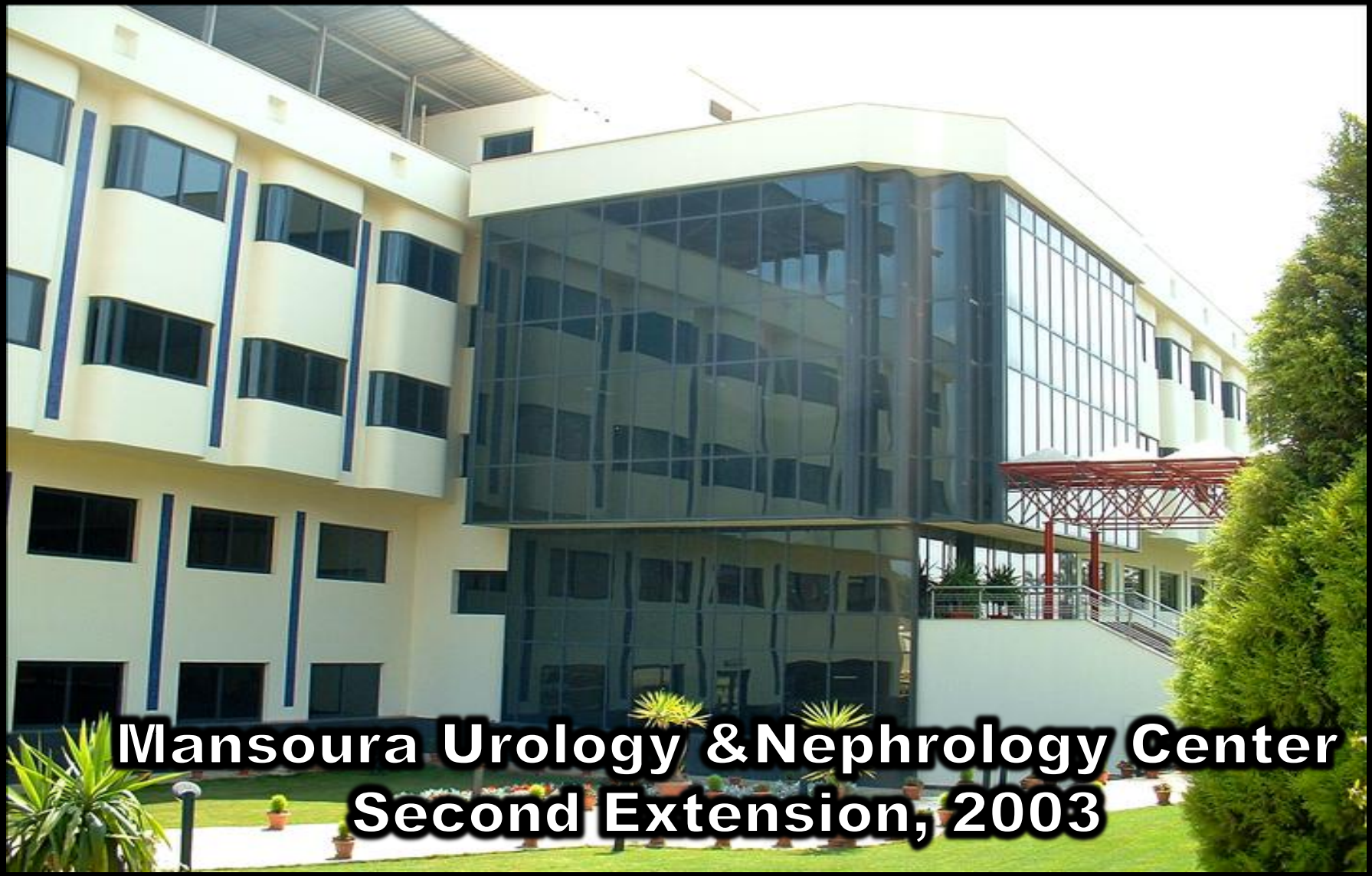
II. Challenges:

11.Others, recurrence:

- **FSGS is the most common disease that recur, with higher recurrence rate after retransplantation.**
- **No unequivocal intervention is effective in preventing transplant recurrence.**

(Graves and fine, Pediatric Nephrol, 2016)

RETRANSPLANTATION



III: Mansoura Experience

III. Mansoura Experience:

Upper Urinary Tract

Living–donor kidney retransplantation: risk factors and outcome

AMGAD E. EL–AGROUDY, EHAB W. WAFA, MOHAMED A. BAKR, AHMED F. DONIA, AMANI M. ISMAIL, AHMED A. SHOKEIR, AHMED B. SHEHAB EL–DEIN and MOHAMED A. GHONEIM
Urology & Nephrology Centre, Mansoura University, Mansoura, Egypt

Accepted for publication 26 April 2004

BJU International, 94:369-373, 2004

III. Mansoura Experience:

- 1976-2002.
- 54 retransplants among 1406 transplants.
- Duration of first graft was:
- Mean±SD : 49.1±45.9 months.
- Range : 1-192 months.

(Mansoura team, BJU International, 2004)

III. Mansoura Experience:

Clinical outcome	N (%)
• Living with functioning graft	39(72)
• Living on dialysis	5(9)
• Died with functioning graft	5(9)
• Died on dialysis	5(9)

(Mansoura team, BJU International,2004)

III. Mansoura Experience:

Grading of functioning grafts	N (%)
• Excellent (S.Creatinine < 1.5mg%)	18 (46%)
• Good (S.Creatinine≤1.5-3 mg%)	19 (49%)
• Poor (S.Creatinine≥3 mg%)	2 (5%)

(Mansoura team, BJU International, 2004)

III. Mansoura Experience:

Univariate analysis	P- value
• Donor relationship	0.001
• Times to first graft loss	0.001
• Primary immunosuppression	0.001
• Total steroid dose (at 3 months)	0.034
• Mean serum creatinine at 1 year	0.024

(Mansoura team, BJU International, 2004)

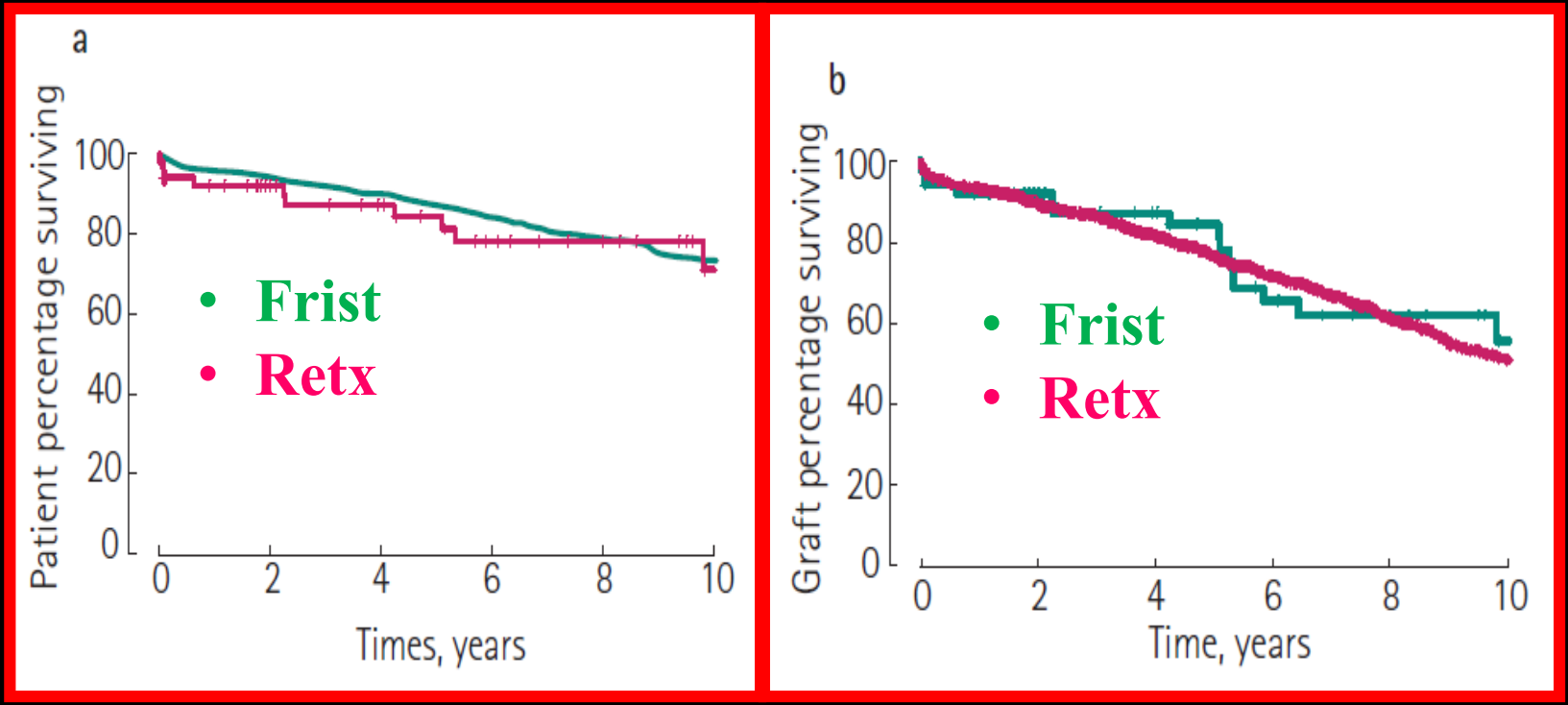
III. Mansoura Experience:

Multivariate analysis	P -value
• Consanguinity	0.006
• Time to first graft loss	0.004
• Primary immunosuppression	0.001
• Mean serum creatinine at 1 year	0.001

(Mansoura team, BJU International, 2004)

III. Mansoura Experience:

- Actuarial survival



(Mansoura team, BJU International, 2004)

III. Mansoura Experience:

- **Retransplantation is the treatment of choice for patients suffering from ESKD after graft failure.**

(Mansoura team, BJU International, 2004)

III. Mansoura Experience:

Hindawi Publishing Corporation
BioMed Research International
Volume 2013, Article ID 912413, 9 pages
http://dx.doi.org/10.1155/2013/912413

Factors Affecting Graft Survival among Patients Receiving Kidneys from Live Donors: A Single-Center Experience

Mohamed A. Ghoneim,[1] Mohamed A. Bakr,[2] Ayman F. Refaie,[2] Ahmed I. Akl,[2] Ahmed A. Shokeir,[1] Ahmed B. Shehab El-Dein,[1] Hesham M. Ammar,[2] Amani M. Ismail,[3] Hussein A. Sheashaa,[2] and Mahmoud A. El-Baz[4]

III. Mansoura Experience:

- Univariate analysis

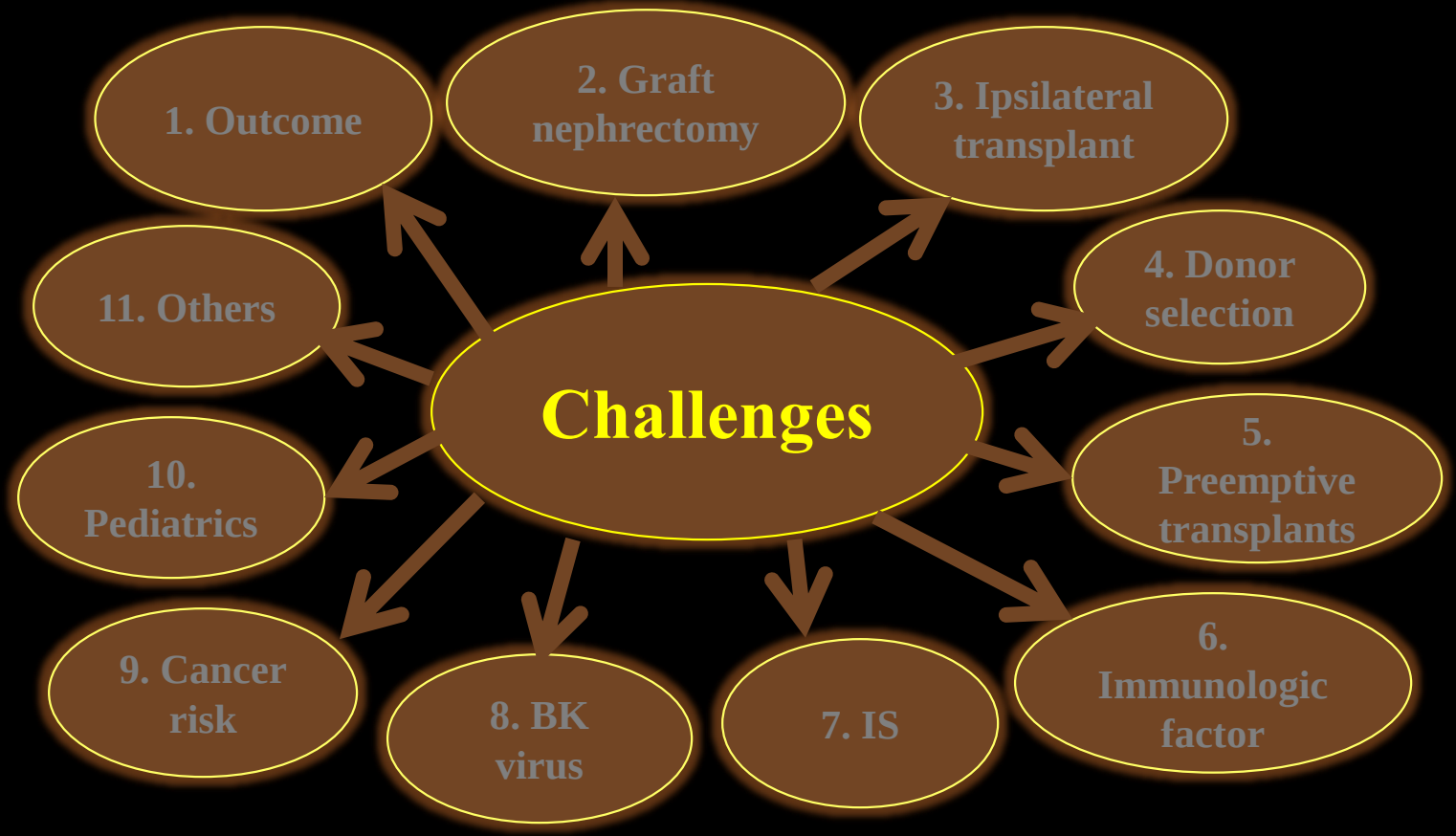
Transplants	No of patients	5 Y graft survival	10Y graft survival	P-value
I. Frist	1891	86.0%	65.1%	
II. Second	73	90.0%	77.8%	0.242
III. Third	3	–	–	

(Mansoura Team, Biomed Res Int, 2013)

RETRANSPLANTATION

IV. Take Home Message

IV. Take Home message



IV. Take Home Message

- **Despite the increased relative risks associated with retransplantation, patients receive a significant survival benefit, better Qol and low health care costs as opposed to remaining on dialysis after a failed transplant.**

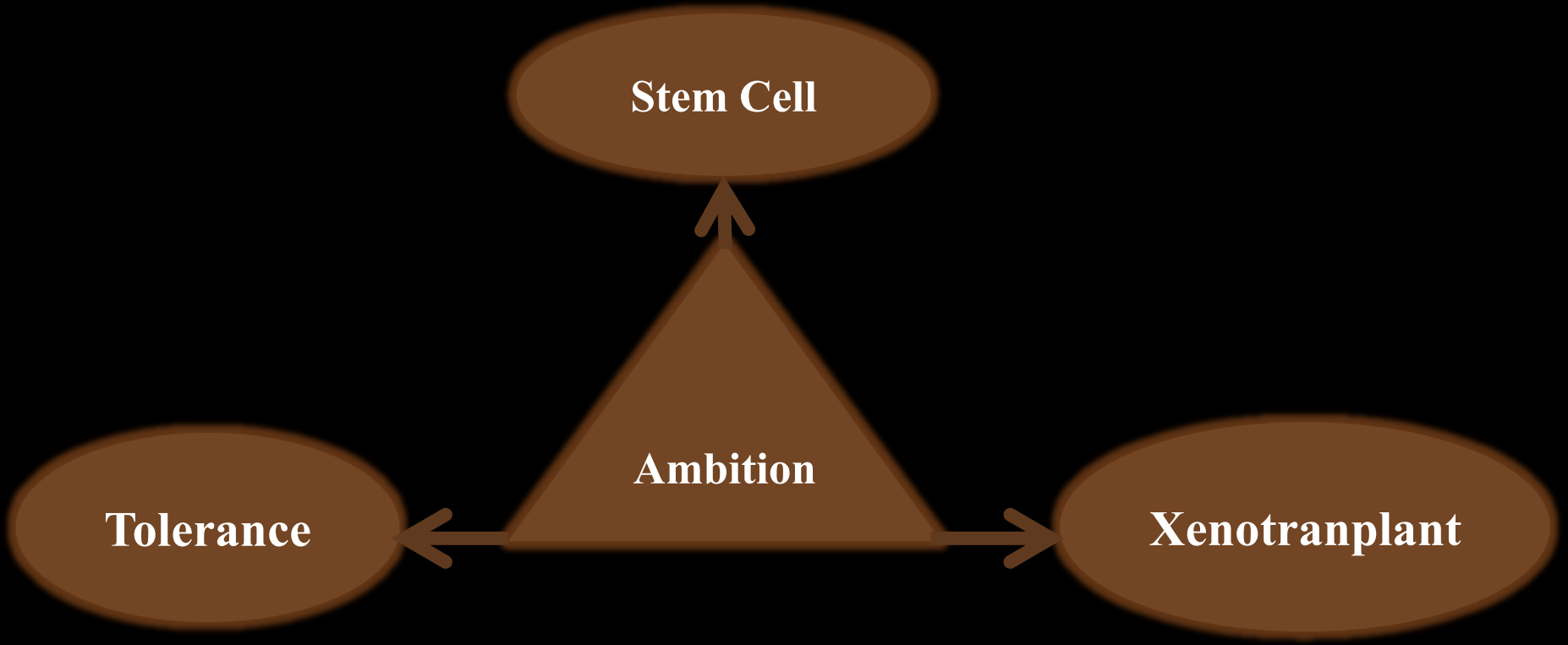
(Kousoulas et al., Transplantation, 2015)

Challenges for Renal Retransplant: An Overview

Mohamed Adel Bakr, Ahmed Abdelfattah Denewar,
Mohamed Hamed Abbas

Experimental and Clinical Transplantation (2016) Suppl 3: 21-26

IV. Take Home message



RETRANSPLANTATION

THANK YOU