How to manage domino transplantation
The Dutch living donation program

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The Netherlands
some facts and figures

- 16.6 million inhabitants
- 2011: 860 kidney transplantations; 50% living donors
- 31-12-2011: 883 patients on the active waiting list
- mean waiting time: 4-5 years
Nijmegen – number of kidney transplantations per year

- Deceased donor
- Living donor
Kidney transplantations with living donor kidneys

- Genetically related
- Unrelated
Kidney only living transplant death censored graft survival rates stratified by Center, Country, ET. Transplants: 01.01.2001 to 01.01.2011

Center: NNYTP
Country: Netherlands
Database date: 2012-07-18
Hurdles in living donor transplantation

- Donor and recipient are blood type ABO incompatible
- Positive cross match between donor and recipient
  CDC cross match with current or historic sera (IgG)

→ 15-20 % of all couples
Options when living donor is ABO-incompatible or crossmatch between donor and recipient is positive

- Removal of anti-A / anti-B / anti-HLA antibodies
  - Immunoadsorption, plasma exchange, IVIG, Rituximab

- Kidney-paired donation

- Live donor list exchange
Cross-over donation = kidney exchange = kidney-paired donation
Options when living donor is ABO-incompatible or crossmatch between donor and recipient is positive:

• Removal of anti-A / anti-B / anti-HLA antibodies
  Immunoadsorption, plasma exchange, IVIG, Rituximab

• Kidney-paired donation

• Live donor list exchange
Living donor list exchange

Donor A → Recipient X (waiting list)

Recipient A → Donor Y (deceased)

unequal chances for wait-list patients with different blood groups
Dutch kidney exchange program

- Initiated in 2004
- Cooperation of all Dutch kidney transplant centers
- Allocation of kidneys by Dutch Transplant Foundation
- Surgery is performed simultaneously
- Donor travels to recipient center
- Strict anonymity
Dutch kidney exchange program – allocation

• All couples are registered at Dutch Transplant Foundation
• Central histocompatibility lab for crossmatching of potential new couples
• Allocation according to a computerized algorithm:
  1. selection of couples based on blood group compatibility and avoidance of non-acceptable mismatches
  2. within selection, priority is based on:
     ▪ blood group identity
     ▪ match probability
     ▪ short chain length
     ▪ distribution over centers
     ▪ waiting time of recipients
• Match round every 3 months
Dutch kidney exchange program
Results from January 2004 – December 2011

<table>
<thead>
<tr>
<th></th>
<th>Pairs enrolled</th>
<th>Transplantations</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABO incompatible</td>
<td>269</td>
<td>83 (31%)</td>
</tr>
<tr>
<td>Positive cross match</td>
<td>203</td>
<td>104 (51%)</td>
</tr>
<tr>
<td>Total</td>
<td>472*</td>
<td>187 (40%)</td>
</tr>
</tbody>
</table>

* 5 / month ~ 15 / match round

5-year graft survival (uncensored) 85%
5-year graft survival censored for death 89%
Kidney only living transplant death censored graft survival rates stratified by Center, Country, ET. Transplants: 01.01.2001 to 01.01.2011

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Success rate of living donor exchange program is different for ABOi versus positive cross match pairs

![Graph showing success rates for different match types](image)

-de Klerk et al. Transplantation 2006;82:1616
Succes rate of kidney exchange program depends on blood types of donor and recipient

<table>
<thead>
<tr>
<th>Donor</th>
<th>Recipient</th>
<th>Chance of match</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>A</td>
<td>91 %</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>76 %</td>
</tr>
<tr>
<td>A</td>
<td>O</td>
<td>20 %</td>
</tr>
<tr>
<td>B</td>
<td>O</td>
<td>17 %</td>
</tr>
<tr>
<td>AB</td>
<td>O / A / B</td>
<td>0 %</td>
</tr>
</tbody>
</table>

→ enrichment of the pool for A – O couples
Altruistic (unspecified) donation in the Netherlands
The Big Donor Show
Altruistic (unspecified) donation in the Netherlands
Domino (paired) donation

Altruistic donor → Recipient A

Donor A → Recipient B

Donor B → Recipient X (waiting list)
Allocation of an altruistic donor kidney

- Is the donor willing to participate in a domino procedure?
- Matching to local recipients that participate unsuccessfully in the living donor kidney exchange program
  - ABO compatible
  - Highly sensitized, without anti-donor HLA antibodies
  - Longest waiting time

- When participation in a domino procedure is declined or a suitable match cannot be found: donation to local waiting list patient, according to ETKAS priority
Altruistic donation in the Netherlands 2000-2011

<table>
<thead>
<tr>
<th>Type of donation</th>
<th>Donors (n)</th>
<th>Chain length</th>
<th>Transplantations (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donation to waiting list</td>
<td>51</td>
<td>-</td>
<td>51</td>
</tr>
<tr>
<td>Domino-paired donation</td>
<td>55</td>
<td>2</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>120 (69)</td>
<td></td>
<td>205 (154)</td>
</tr>
</tbody>
</table>
Living donor transplantations – Nijmegen 2006-2011

- Direct donation
- Paired exchange
- Domino paired exchange
- Altruistic donors

Altruistic donors in Nijmegen, 2008-2012

• 41 potential altruistic donors
• 19 transplantations performed, 2 are planned
• 20 donors removed from the program
  ▪ medical reasons, n=12
  ▪ doubts about motivation, n=5
  ▪ lack of support by family members, n=2
  ▪ psychological lability, n=1

• all altruistic donors are satisfied about their donation
How to handle an altruistic kidney offer

• Give general information, as to every living donor
• Emphasize that consent can be withdrawn at any moment
• Refer the potential donor to a psychologist/psychiatrist
• Explain that a domino-paired donation is preferred, and that it can take some time to find a match
• Inquire about preference regarding the moment of donation
• Reassure that the donor will comply with the anonymity rule
Future options

• Use of bridge donors

• Allocation of altruistic donor kidneys to a national pool of recipients from incompatible couples → multicenter domino-paired donation

• Voluntary participation of all living donors with blood type O in the living kidney exchange program, despite having a compatible recipient
  Potential advantages for the recipient: younger donor, larger kidney, better HLA-match

• Inclusion of participants of ET Acceptable Mismatch program as potential recipients of altruistic donor kidneys
Nonsimultaneous extended altruistic donor (NEAD) chain
Never ending altruistic donor (NEAD) chain

Altruistic donor → Recipient A

Donor A → Recipient B

Donor B* → Recipient ?

* Bridge donor
Nonsimultaneous extended altruistic donor (NEAD) chain
Never ending altruistic donor (NEAD) chain

Bridge donor B → Recipient C

Donor C → Recipient D

Donor D → Recipient X or ?
Future options

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Conclusions

• The living donor kidney exchange program is a successful option for incompatible donor-recipient pairs
• Living donor kidney exchange is preferable above ABO-incompatible transplantation or desensitization
• Altruistic donors allow domino-paired donation, which increases the chances for couples that are unsuccessful in the kidney exchange program
• Merging the pool of altruistic donors and incompatible couples can increase the number of transplantations
• Kidney-paired donation empowers people to become living donors, circumventing hurdles preventing their donation
Acknowledgements

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