The risk of living kidney donation

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Living kidney donation has become an established part of the transplant programmes in most centres worldwide. It has indeed been an important part of our transplant programme for >30 years, comprising some 40% of all kidney transplantations in Norway [1]. However, the risk of unilateral nephrectomy should not be neglected. Here we review data on mortality, morbidity and psychosocial outcome after live kidney donation, both short- and long-term. In the survey we will particularly focus our own experience with almost 1800 living kidney donors including some data from our recently established living donor registry (Norwegian National Hospitals Donor Registry, established 1997).

Perioperative risks

Serious complications occur with major surgery such as nephrectomy, and perioperative mortality has been reported in about 1 out of 3000 living donor nephrectomies [2]. The results have probably improved over time as for surgery in general. We have performed almost 1800 nephrectomies at our centre without perioperative deaths. Perioperative complications have been prospectively registered in 387 consecutive donors during the last 5 years at our centre. Of these, 52 (13%) kidney donations were carried out with a laparoscopic technique. Minor complications were common [3]. Data are shown in Table 1. The rate of complications in this prospective series appears to be somewhat higher than in a retrospective report [4].

The risk of elective surgery obviously may be reduced with proper work-up of the donor. Guidelines for work-up have been published in recent years both in the US and in Europe [5,6]. The importance of proper work-up may be illustrated by the following histories. Fifteen years ago a male aged 55 years at donation experienced a perioperative myocardial infarction donating a kidney to his son. He told us later that he withheld symptoms of angina not to be excluded from donation! Eight years ago another potential male donor aged 45 years died suddenly with chest pain at home a few weeks before a scheduled kidney donation to his wife. At that time exercise ECG or other non-invasive assessment with isotope scans or echocardiography were not routinely performed even in older donors; but this is now performed routinely in potential donors over 40 years. Assessment of

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Several incidents were registered in many donors. 

Table 1. Perioperative incidents in 387 donors

<table>
<thead>
<tr>
<th>Incident</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any complication</td>
<td>34</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>21</td>
</tr>
<tr>
<td>Small peritoneal damage</td>
<td>17</td>
</tr>
<tr>
<td>Superficial wound infection</td>
<td>6</td>
</tr>
<tr>
<td>Deep wound infection</td>
<td>8</td>
</tr>
<tr>
<td>Re-operation</td>
<td>15</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>26</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>2</td>
</tr>
<tr>
<td>Blood (SAG) transfusion</td>
<td>1</td>
</tr>
<tr>
<td>Other (minor) events</td>
<td>57</td>
</tr>
<tr>
<td>Major complications:</td>
<td>8</td>
</tr>
<tr>
<td>Anaphylactic reaction</td>
<td>2</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>1</td>
</tr>
<tr>
<td>Bleeding over 300 ml</td>
<td>5</td>
</tr>
<tr>
<td>All major events</td>
<td>2</td>
</tr>
</tbody>
</table>

Data from the Norwegian National Hospitals Donor Registry [3].

Several incidents were registered in many donors.

Cardiovascular risk (CV) is probably the most important single issue of the work-up, at least in countries with high prevalence of CV disease. The quality of the work-up may be improved by the use of a donor form mandating the required tests for proper work-up. However, even with optimal selection and preparation of the donor, serious complications may occur. We experienced HIV infection in a young male donor caused by transfusion of plasma after surgery at the time before HIV testing of blood products was established. He died 2 years later from the disease.

Recovery after surgery is faster with laparoscopic nephrectomy, and reports so far also clearly show that post-operative pain related to nephrectomy is reduced [7–10]. However, the risk of serious acute complications and bleeding may be increased. In Scandinavia we are aware of two potentially fatal episodes due to bleeding, one in our own centre. For safety reasons we have established hand assist during the harvesting phase of laparoscopic nephrectomy.

Long-term mortality

Although increased long-term mortality has not been reported in healthy persons after nephrectomy [11], convincing data on long-term survival of kidney donors were first presented by Fehrman-Ekholm et al. in 1997 [12]. Twenty years after kidney donation the observed to expected mortality of these 430 donors was 0.76 compared with the background population adjusted for age and gender. In a larger series of 1332 Norwegian kidney donors followed up for an average of 32 years, we confirmed a survival benefit among the donors. The relative risk of mortality was 0.7 for female and 0.5 for male donors compared with the background population [13]. An increased survival may not be surprising as the donors are positively selected and screened for disease. Therefore, it is of further interest that the Norwegian male donors had the same relative risk for mortality as in another screened population accepted for health insurance.

Thus, there are no indications that kidney donation has any negative impact on long-term survival.

Long-term morbidity

Hypertension and kidney impairment are potential risks associated with kidney donation. Earlier studies found little or no effect on blood pressure [2,14]. In a meta-analysis of all studies comprising more than 3100 nephrectomized patients and 1700 appropriate controls, no increment in incidence of hypertension was found. However, there was an average increase in blood pressure of 2–3 mmHg and a further increase in systolic pressure of 1 mmHg for each decade following kidney ablation [15].

Glomerular filtration rate (GFR) is obviously reduced following nephrectomy, the loss of function is on average 17 ml/min with a compensating contra-lateral kidney [15]. The same meta-analysis actually demonstrated a tendency for improved filtration of ~ 1.5 ml/min/decade. It is conceivable, however, that GFR will eventually show a natural decline long-term. Proteinuria was negligible after donation and increased by 75 mg/day for each decade. Kidney functional reserve persists after kidney donation but is probably somewhat reduced [16].

Although most centres find the risk of kidney donation acceptable, the risk should not be neglected. Donors with low GFRs may be at particular risk and graft survival of the recipients is decreased with GFRs under 80 ml/min [17]. Relatives of recipients with end-stage kidney disease may also be genetically susceptible for kidney disease, for example diabetes or SLE or for progression of such disease. We have experienced seven cases of end-stage renal disease among our 1800 donors suggesting that this may be true. Most cases had primary kidney disease and not sclerosis due to hypertension or hyperperfusion [18]. Although more long-term data are needed [19], the overall risk of progressive renal failure due to kidney donation appears to be acceptable.

Quality of life and disability

Systematic reports on the effects of kidney donation on quality of life and psychosocial function long-term were first published in the 1990s. In our own centre 494 donors were examined on average 6.7 years after kidney donation. The results were compared with those of a control population in mid-Norway. The donors had a significantly higher score in more than two-thirds of the questions related to quality of life. Overall, the quality of life was significantly better than for the background population. Less than 3% felt that they would probably or definitely not have donated today, but 5% regretted donation in the case that the recipient had died or lost their graft (Table 2) [20]. Data from Sweden comprising 370 donors 12.5 years after transplantation showed similar results, <1% regretted donation [21]. In a
slightly more selected series of about 590 donors in Minneapolis the quality of life was also found to be higher than in the background population. However, 4% regretted that they had accepted donation [22]. Similar positive results have recently been reported from Japan, albeit in a smaller series [23]. All centres concluded in their reports that the results were overwhelmingly positive and that the donors had a better quality of life than the background population. This is not surprising considering the selection process of donors with excellent physical and mental health status.

In Norway persons with chronic disabling disease may receive a disability pension. We examined the incidence of disability pension among all previous donors being alive in 1998. In men over 50 years the incidence was 20.1 vs 24.9% in the background population. The difference was even greater for females 12.6 vs 29.2% [13]. The data further substantiate that kidney donors maintain a good physical and mental health with a high quality of life long-term.

Conclusions

The good results and the extra supply of kidneys through living donation are beneficial to any renal replacement therapy programme. The problem is the risk for the donor. With the present knowledge this risk is small and in general the donation outcome is excellent. We believe, however, that it is important to have registries for follow-up of donors. Registries have also been established by others [24] and Scandiatransplant is preparing a donor database to be launched in 2003. With proper work-up and proper information of the potential risks involved, we strongly support an active use of living kidney donation.

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