



Renal transplant surgery: important things a nephrologist should know

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Renal transplantation is the most effective form of renal replacement therapy (RRT) for increasing life expectancy in younger recipients and for improving quality of life in older recipients. For society as a whole, it is also the most cost-effective form of RRT [1]. However, the prevalence of transplantation in the RRT population varies significantly across Europe (9–70.3%) [2].

The optimal pathway for most CKD 5 patients is pre-emptive transplantation from a living or deceased donor. While the benefits of pre-emptive living donor transplantation are well recognized in terms of graft survival and avoidance of dialysis, not all recipients will have a potential living donor, and timely listing for deceased donor transplantation also provides potential benefits for graft survival [3].

A first renal transplant will usually involve an extra peritoneal approach to the iliac artery and vein. An anatomically standard kidney transplant will require three anastomoses. First, the donor renal vein to the external iliac vein using an end-to-side anastomosis, followed by the donor renal artery to the external iliac artery (end to side) or internal iliac artery (end to end). Once reperfusion of the renal allograft is established, the donor ureter is shortened and implanted into the recipient bladder using an extra vesical (Lich–Gregoir) uretero-neo-cystostomy over a flexible ureteric stent. Ureteric stents reduce the risk of major urinary complications and if removed by 3 weeks do not increase the risk of post-transplant urinary tract infection [4].

Planning for a living or a deceased donor kidney transplant requires an understanding of the technical preconditions for successful transplant surgery. These aspects of renal transplant surgery can be subdivided into five main categories (Figure 1).

(i) Arterial factors: Implantation of the renal allograft requires adequate arterial vasculature for donor artery anastomosis. Significant proximal stenotic disease should be excluded and assessment of adequate distal perfusion and ‘clampability’ of vessels is required. The prevalence of peripheral vascular disease in the transplant population has increased. Evaluation of the vasculature requires careful clinical assessment and for those with clinically significant peripheral vascular disease, imaging of the aorta–iliac segments may be required to

identify the optimal implantation site: computed tomography angiography enables arterial assessment or ferumoxytol-enhanced magnetic resonance angiography allows assessment of both venous and arterial systems [5].

(ii) Venous outflow factors: Adequate venous drainage can be adversely affected by venous stenosis secondary to tunnelled central venous catheter use, deep vein thromboses, previous radiotherapy or pelvic surgery. Venous outflow issues affecting the iliac system are often asymptomatic due to collateralization. The frequency of venous abnormalities affecting transplant planning is often underestimated [5].

(iii) Urinary drainage factors: Urinary drainage of the allograft can range from a normal bladder in patient still passing urine to a shrunken bladder in an anuric patient. Allograft longevity will be improved by an effective, low pressure, compliant system that can protect the upper renal tract and transplanted kidney. In some patients, this will necessitate active management and may vary from the need for regular medication or intermittent catheterization only, to a conduit, bladder augmentation or plan for cutaneous ureterostomy. A careful urological history is essential and is generally more informative in the pre-dialysis setting. Urological investigations include ultrasound, urodynamics, cystoscopy and a proportion that will require surgery prior to listing. This has the potential to significantly delay transplantation [6].

(iv) Organ factors: These significantly influence the variation in graft and patient survival. Kidneys retrieved from deceased donors have variable anatomy with multiple arteries, veins and duplex ureteric systems. Kidneys retrieved from living donors, while less subject to variation in perfusion and donor disease, have significantly shorter vessels. Back bench assessment of kidneys establishes the number, quality and integrity of the vasculature (including an assessment of donor atheromatous disease, quality of organ perfusion and identification of parenchymal abnormalities). The lymphatics are ligated and reconstruction of multiple vessels is undertaken. The peri-pelvic and peri-ureteral tissues are preserved as the distal

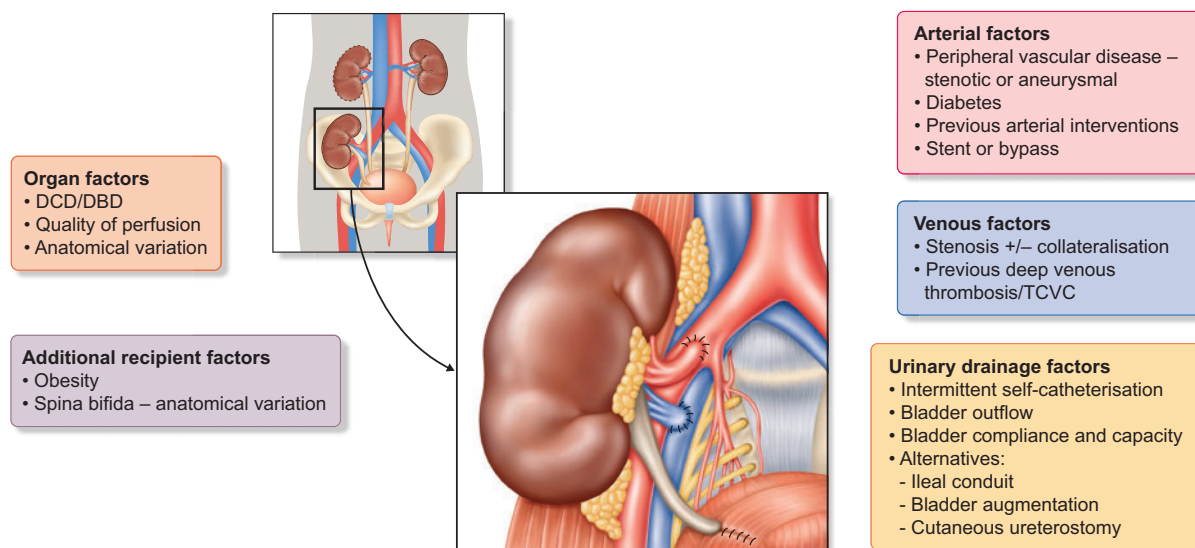


FIGURE 1: Factors to consider in surgical assessment of potential renal transplant recipients. DCD, donation after circulatory death; DBD, donation after brain-stem death; TCVC, tunnelled cuffed central venous catheter.

ureteric perfusion is dependent on this. Transplant allograft longevity is significantly influenced by multiple donor factors but the most important of those available preoperatively is donor age. *Ex vivo* machine perfusion viability assessment and risk assessment based on pre-implantation renal transplant histology are the subject of ongoing clinical trials. These may assist in effective utilization decisions in the future [7, 8].

- (v) Recipient factors: Abnormalities in spinal and pelvic bony anatomy such as in the context of spina bifida are also relevant to technical implantation due to reduce space and the potential need for intraperitoneal implantation. Modifiable factors that influence graft survival and potential complications should be discussed and optimized where possible. Recipient body mass index (BMI) is a significant modifiable risk factor for graft survival and complications post-transplant. Wound complications are the most common surgical complication after transplant and a BMI >30 confers a 2- to 4-fold increased risk of significant wound infection, dehiscence and hernia [9].

Reported rates of complications from renal transplant surgery are relatively low at 5–10%. However, vascular complications such as renal artery or vein thrombosis often result in graft loss. Transplant renal artery stenosis or pseudoaneurysm will also result in the need for further intervention. Transplant ureteric complications usually relate to ischaemia of the distal ureter resulting in urinary leak or stenosis.

Living donor transplantation offers better graft and patient survival for any recipient irrespective of age or comorbidity [10]. However, the overall benefits of transplantation have led to expansion in both donor and recipient pools and increased

the complexity of assessment, decision-making regarding organ utilization and the surgical procedure. Age and time on the waiting list are the most important recipient factors that influence survival benefit from transplantation.

Transplant surgery can offer significant benefit to patients requiring RRT. Key factors that the multidisciplinary team should address prior to transplantation include education and facilitating access to living donor transplantation, timely waitlisting and optimization of BMI.

CONFLICT OF INTEREST STATEMENT

I declare that the results presented in this paper have not been published previously in whole or part.

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