3000 KIDNEY TRANSPLANTS: HOW WE DID IT

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INTRODUCTION

Kidney transplantation had a rocky start, spread over several decades of slow evolution.

In 1906 Mathieu Jaboulay performed the first transplant of a pig kidney into the elbow of a woman with progressive chronic renal failure. The graft worked for a few hours and was removed after 3 days[1].

In 1933, Ukrainian surgeon Yurii Vorony performed the first human kidney transplant. This organ, harvested 6 hours before from a deceased donor, was implanted in the recipient's thigh. The recipient died after 3 days of donor-recipient rejection[2].

It was not until 1954 that Joseph Murray successfully performed the first living donor kidney transplant. The donor was a monozygotic sibling of the recipient, which allowed the recipient to live another 8 years without immunological complications[3].

Alexandre Linhares Furtado performed the same feat in 1959 in Portugal, using a kidney that a sister donated to her brother. Unfortunately, it only worked for 1 month due to rejection. In 1980, already with the legislation allowing the donation of cadaver donors, the practice of kidney transplantation was initiated in Portugal, once again by the hand of Alexandre Linhares Furtado[4].

At Hospital de Santo António, the kidney transplantation program began in 1983 in a joint effort by Vascular Surgery, Urology and Nephrology.

This collaboration continues to this day, with the recipients in the care of Nephrology and the living donors in the care of Urology. In the middle of the two specialties is Angiology and Vascular Surgery, responsible for the harvesting of the organs, preparation of kidney grafts, the approach to the iliac vessels and vascular implantation. The ureteral implantation is always in charge of an Urologist.

SURGICAL TECHNIQUE

The preparation of the graft is carried out on the bench. The organ is removed from the freezer where it is encased in ice. On the bench, the graft is cleaned by dissecting the vessels and ureter from the surrounding tissues until only perihilar fat, renal vein, renal artery and ureter remain (Figure 1). In deceased donor kidneys we always preserve the aortic patch with the ostium of the renal artery.

This way we suture the aortic patch to the recipient iliac artery, moving the suture line away of the renal artery ostium. This technique, known as Carrel's patch, as proven to be of added value in the prevention of renal allograft artery stenosis[5]. The right kidney is usually harvested with the

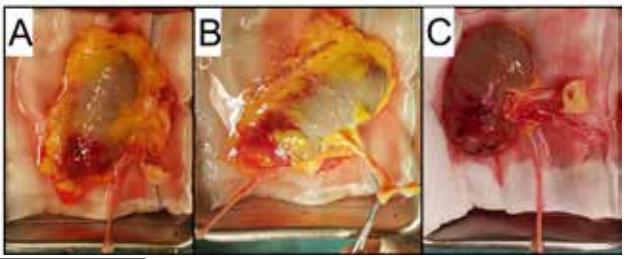

Figure 1 *A-Harvested kidney; B-Isolated renal artery; C-Cleaned graft with isolated renal artery with aortic patch, renal vein and ureter.*

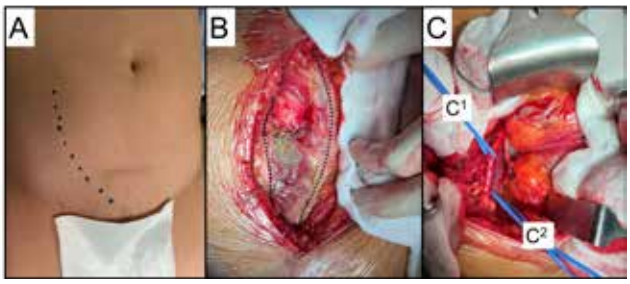

Figure 2 *A-Arcuate incision; B-External oblique muscle section, Scarpa's fascia (dotted); C-Iliac vessels exposure, C1-external iliac artery, C2-external iliac vein.*

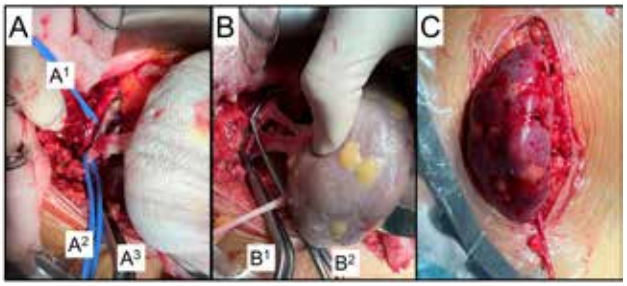

Figure 3 *A-venous anastomosis, A1-external iliac artery, A2-external iliac vein, A3-Swinney clamp in the external iliac vein; B-arterial anastomosis, B1-Swinney clamp in the external iliac artery, B2- Debakey peripheral clamp in the renal vein; C-Reperfused graft.*

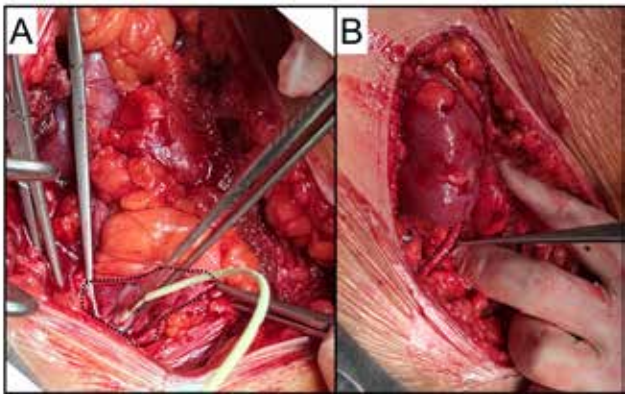

Figure 4 *A-ureteroneocystostomy, bladder lumen (dotted in black), ureter lumen (dotted in grey); B-ureter with stent inside (dotted in black).*

adjunct inferior vena cava (IVC). We regularly use part of the IVC to extend the short right renal vein. It obliges to a careful dissection of the lumbar veins so that the IVC does not bleeds once the graft is implanted.

Once it is certain that the organ is fit to be transplanted, the transplant surgery begins.

An arcuate incision is made in the iliac fossa where the graft will be implanted (lazy L incision on the right or lazy J on the left) (Figure 2A). After adequate haemostasis of the subcutaneous fat, Scarpa's fascia is opened using an electric scalpel. Then, the muscle fibres of the external oblique muscle are penetrated using the Kelly forceps. The manoeuvre is repeated in the internal oblique and transversus abdominis muscles (Figure 2B). When the retroperitoneal space is reached, electrocauterization of the muscle layers begins, replicating the incision that was made previously in the skin. With blunt dissection the retroperitoneal iliac vessels are approached and then sharply dissected from the surrounding tissues (Figure 2C). Normally 5-8cm of each vessel are isolated to allow for a safe clamping. A Swinney clamp is used to control the iliac vein. After a proper longitudinal venotomy (+/-15mm), the renal vein (or the donor IVC) is anastomosed with two 5-0 polypropylene hemisutures (Figure 3A). A Debakey peripheral clamp is placed 2cm away from the anastomosis in the renal vein (or donor IVC). Then the Swinney clamp is removed from the iliac vein and passed to the iliac artery. If the graft comes from a diseased donor a 15mm longitudinal arteriotomy is made, if the graft is from a living donor an arterial puncher is usually used. When the anastomosis is between the iliac artery and the aortic patch the suture technique is the same of the vein (Figure 3B). If the graft is from living donor two 6-0 polypropylene hemisutures are used to anastomose the iliac artery to the renal artery. A bulldog artery clamp is put 3cm away from the arterial anastomosis and the Swinney clamp is removed. If both the anastomoses are tight and sealed the bulldog artery clamp is removed and after the renal vein starts to fill, the Debakey peripheral clamp is removed from the renal vein (or donor IVC). The kidney graft capsule is inspected searching for haemorrhage points that are cauterized (Figure 3C).

Our centre opts for an anti-refluxing ureter implantation technique. The urological surgeon starts to isolate the bladder antero-lateral wall. After a 5cm vesicotomy is performed the ureter is pulled from the outside to the inside of the bladder under direct view with a cyst duct forceps. The ureter is anastomosed to the inside of the bladder with 3 to 6 simple sutures of 4-0 short-term absorbable multifilament. The double J ureteral stent is retrogradely passed from the bladder to the renal graft pelvis (Figure 4A). The bladder is closed with two rows of 3-0 absorbable multifilament suture.

A 12fr silicone drain is placed along the surgical

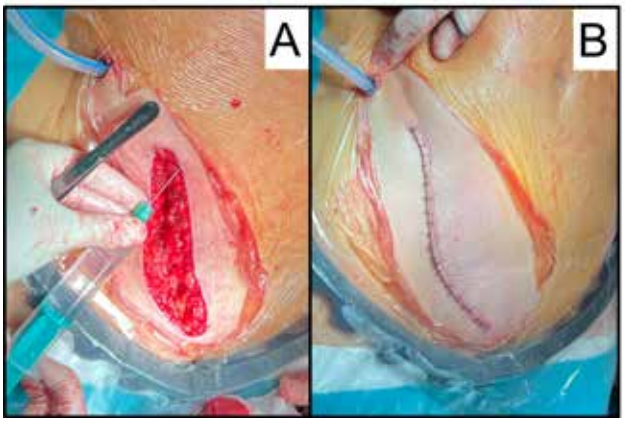

Figure 5 *A- 12fr drain in place and wound infiltration with ropivacaine. B-Surgical wound closed with staples.*

wound, exiting thru an independent incision. The muscle layer is approached with 3 to 4 simple sutures of 3-0 absorbable multifilament and the Scarpa's fascia is closed with continuous suture of 1 absorbable multifilament. After wound infiltration with ropivacaine, skin staples are applied (Figure 5).

In the first post-operative day a doppler ultrasound is performed to access normal kidney perfusion and absence of macrovascular complications.

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REFERENCES

1. Jaboulay M. Greffe de reins au pli du coude par soudures artérielles et veineuses. Lyon Med. 1906;107:575–577.
2. Matevossian E, Kern H, Hüser N, Doll D, Snopok Y, Nährig J, Altomonte J, Sinicina I, Friess H, Thorban S. "Surgeon Yurii Voronoy (1895–1961) – a pioneer in the history of clinical transplantation: in Memoriam at the 75th Anniversary of the First Human Kidney Transplantation". Transplant International 2009;22(12):1132–1139.
3. Murray JE, Merill JP, Harrison JH. Renal homotransplantation in identical twins. Surg Forum. 1995;88:379–411.
4. Mota A. Vinte anos de transplantação renal nos Hospitais da Universidade de Coimbra. Acta Urológica Portuguesa. 2000;17(4):15-30.
5. Munda R, Alexander J, Miller S, Roy M, Fidler J. Renal allograft artery stenosis. 1977;134(3), 0–403.