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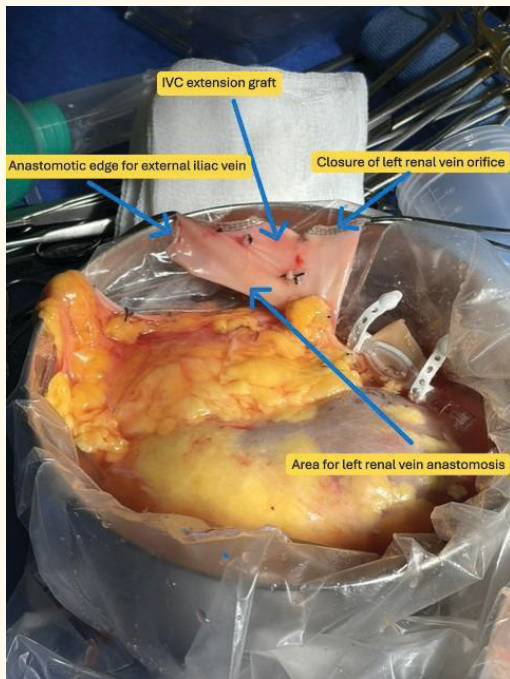


Figure 1: Bench preparation of the right renal allograft with IVC used as an extension graft.

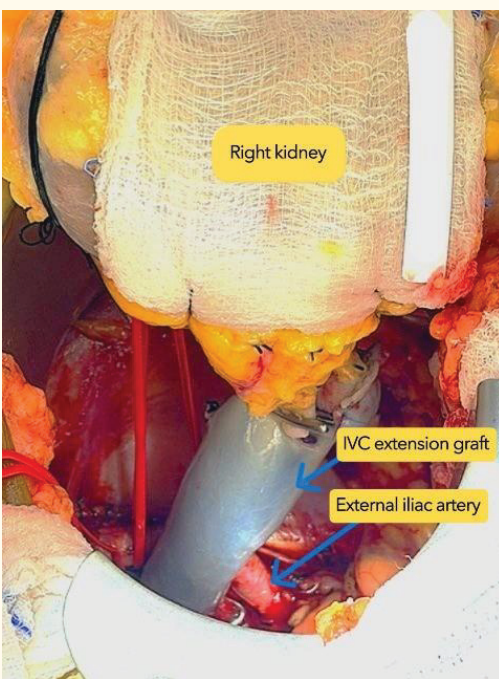


Figure 2: The damped IVC extension graft after release of EIV clamp.

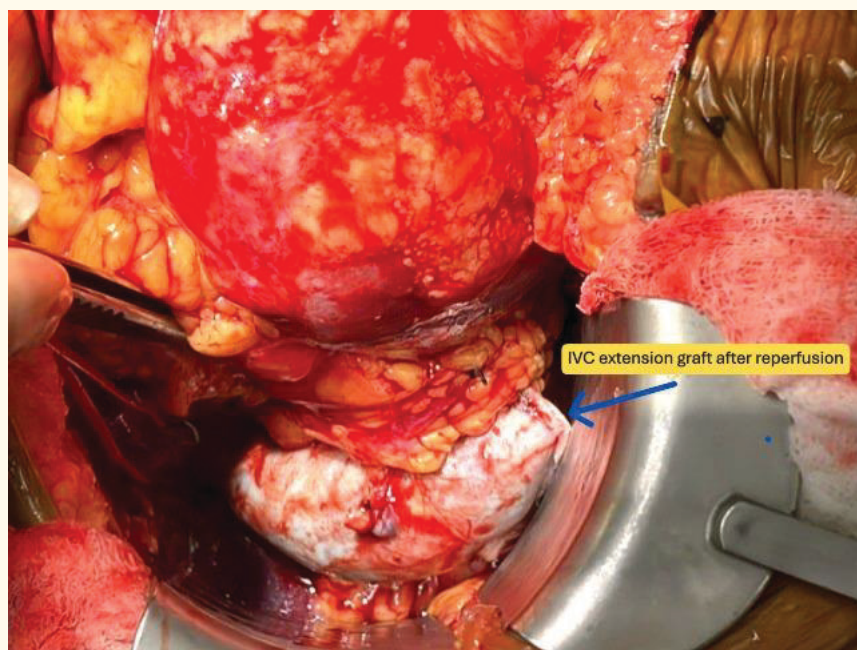


Figure 3: The IVC extension graft after reperfusion of the right kidney and placement in a right paracolic extraperitoneal pocket.



Figure 4: Anastomosis of the left renal vein end to side with the inferior vena cava graft.



Figure 5: Reperused dual kidneys prior to placement under the abdominal fascia.

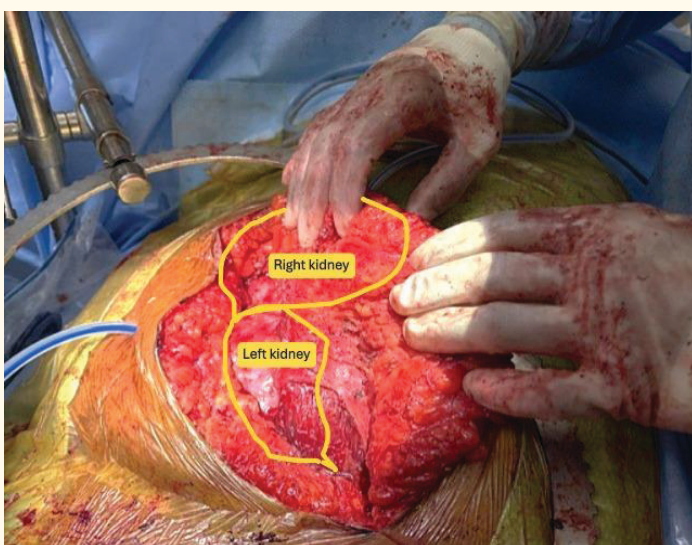


Figure 6: A completed "desert-duplex" prior to fascial closure with or without a peritoneal opening to accommodate a tension free closure.

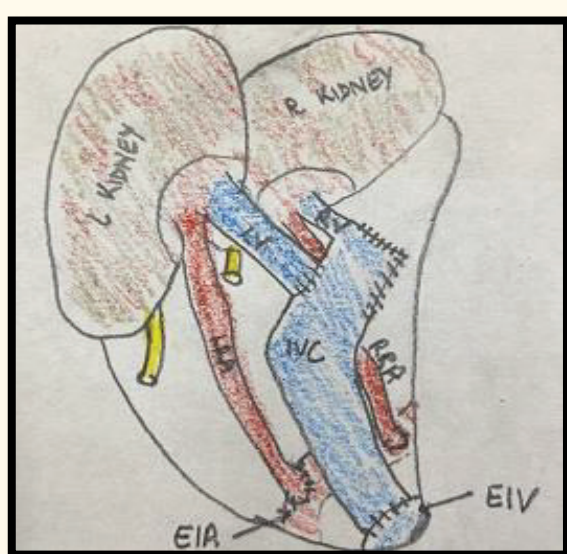


Figure 7: Diagrammatic representation of "desert-duplex" dual kidney transplantation using an extension IVC graft.

Discussion

Dual kidney transplantation (DKT) is an uncommon and underutilized procedure yielding an average 110 kidney transplants annually. Recent data analyzed in 2025 from the Organ Procurement and Transplantation Network (OPTN) demonstrated 1,015 dual kidney transplants performed between 2014 -2024 out of a total of 134,933 (0.74%). (1) The organ discard rate remains a stubborn at around 20% since the year 2021 with kidneys being the most commonly non -utilized organ.(2) DKT is a known technique of increasing nephron mass, having been performed since 1996 in the United States. The under utilization of dual kidneys is likely related to multiple potential reasons. These include uncertain allocation and recipient guidelines, concern over organ quality, technical difficulty, operative time, complications, cold ischemic times at offer, patient perception of marginal organs and easier access to higher quality single kidney transplants for centers with voluminous waiting lists and long waiting times. Organ Procurement Organizations (OPO) tend to refrain from dual allocation due to a disincentive in measured metrics of efficiency and revenue when compared to single allocation. In Las Vegas, NV our transplant program has partly overcome declining access to non marginal kidneys after changes in organ allocation policy in March 2021 . DKT has helped sustain access to viable organs. While nationally DKT comprised less than 1% of all kidney transplants, at Las Vegas it comprises 15% (Table 1) of all kidney transplants.

A technical modification has allowed for overcoming surgical difficulty and shortening of operating time without comprising outcomes. The procedure dubbed locally as the "desert-duplex" allows for transplantation despite organ scarcity. We describe the use of an IVC extension graft to facilitate unilateral DKT in older obese recipients .

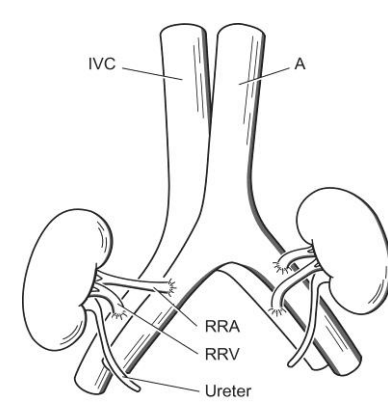


Figure 8: Bilateral DKT (3)

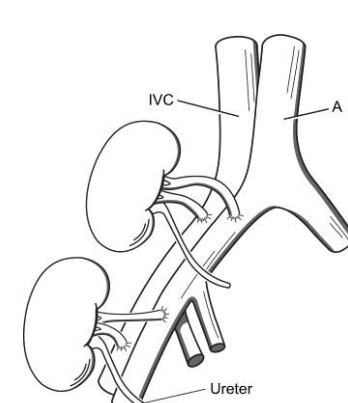


Figure 9: standard unilateral DKT(3)

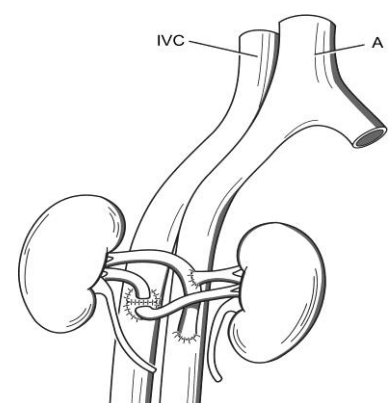


Figure 10: Unilateral DKT after back table vascular anastomosis (3)

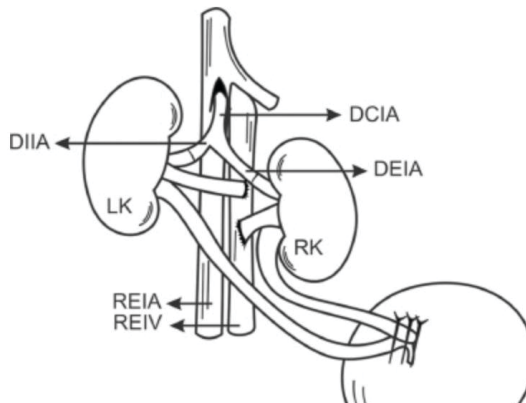


Figure 11: Unilateral DKT using an iliac artery graft(4)

Introduction

Dual kidney transplantation (DKT) is a known technique of increasing nephron mass , used to increase access to kidney transplantation and reduce organ non-utilization. Recipients selected are often at the higher end of the Estimated Post Transplant Survival (EPTS) spectrum, after being deemed suitable for a marginal organ. They often have anatomical challenges i.e.. body mass index (BMI) as well as limited physiological reserve due to age and other comorbidities. We devised a surgical technique that allows improved access to the external iliac vein (EIV) for unilateral DKT reducing the length of the operation while improving opportunities for transplantation in more marginal recipients.

Methods and Materials

This study is a case series of 13 unilateral DKT using an inferior vena cava (IVC) extension graft to facilitate placement despite difficult access and limited visible length of the EIV. Recipients were selected intraoperatively for this technique if access to the EIV was limited due to a narrow pelvis or depth due to body habitus. During bench preparation, the right renal vein (RRV) remained attached to the IVC. The upper end of the IVC as well as the left renal vein (LRV) orifice was stapled using a 35 mm Echelon Flex™ Powered Vascular Stapler . The lower end of the IVC was anastomosed to the visible EIV after clamping it with a side biting Lambert-Kay vascular clamp, while the right renal artery(RRA) was anastomosed to the distal common iliac artery (CIA) or the proximal external iliac artery (EIA). The left renal artery (LRA) was anastomosed to the distal EIA and a Lambert -Kay side-biting clamp placed on the IVC graft was used to facilitate the LRV being anastomosed to the IVC graft just below the RRV. The right kidney remained reperused while the left kidney was transplanted. The ureters were then anastomosed to the bladder in standard fashion using indwelling double-J stents. (Fig 1-7)

Results

We performed 13 unilateral DKT in the last 9 months. These were marginal kidneys that failed allocation as single organs. Dual placement was deemed necessary due to biopsy findings, donor age, KDPI scores, initial serum creatinine, DCD kidneys with long cold time or warm time, non use of normothermic regional perfusion, extensive atherosclerotic disease , long duration of anuria or continuous renal replacement (CRRT) .The transplants were performed in patients with an average age of 67+/- 5.5 years, with an average BMI of 31+/-7.2 kg/m² . 6 month creatinine clearance averaged 50.2+/- 7.2 mls/min. There were no episodes of rejection, graft loss and patient survival remained at 100%. Delayed graft function was 53% defined as the need for dialysis within a week after transplantation. Post operative length of stay averaged 5 days. Surgical complications included 2 ureteric strictures managed by percutaneous intervention and one perioperative bleed requiring re-exploration.

We noted no ipsilateral deep venous thrombosis, urine leaks, arterial dissection , peripheral vascular disease, wound complications subsequent to the ipsilateral placement. We preemptively open the peritoneum to allow positioning of two kidneys, if they are larger kidneys form a high BMI donor.

	2020	2021	2022	2023	2024	2025	2026
Single KTX	90	120	119	149	148	140	54
Dual KTX	1	18	22	23	32	39	11
Total	91	138	141	172	180	179	65
Percentage%	1	13	15	13	17	22	16

Table 1: Annual dual kidney transplants performed and percentage of total kidney transplants performed at UMC Las Vegas NV

Conclusions

Surgical access to a deep external iliac vein can be improved by use of an IVC graft. Unilateral dual kidney transplantation is feasible in marginal recipients , through a single incision with excellent outcomes. This particular technique allows for increased utilization of marginal kidneys, increased access to transplantation in marginal recipients, shorter surgical time without compromising long-term outcome.

References

- 1)D. M., Kaufman, Perkins, J. D., R., Bakthavatsalam, N., Leca, L., Sibulesky, Single Versus Dual Kidney Transplants From Marginal Donors: Balancing Survival and Resource Utilization, *Journal of Transplantation*, 2025, 7744010, 9 pages, 2025. <https://doi.org/10.1155/jpt.7744010>
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