

## A-28-Years-Old Man Received Kidney with Double Renal Arteries and Veins from Younger Sister: A Successful Laparoscopic Living Donor Nephrectomy

**Khin Phyu Pyar\*<sup>1</sup>, Saw Yan Naing<sup>2</sup>, Hlawn Moe<sup>3</sup>, Yan Naung<sup>3</sup>, Aung Kyaw Tun<sup>4</sup>, Aung Thaw Hein<sup>4</sup>, Aung Khant<sup>4</sup>, Myo Min Thant<sup>5</sup>, Yu Aye Latt<sup>6</sup>, San Lin<sup>7</sup>, Soe Min Aung<sup>8</sup>, Nyan Lin Maung<sup>8</sup>, Ohmar Hlaing<sup>9</sup>, Tin Tin San<sup>10</sup>**

<sup>1</sup>Professor and Head/Senior Consultant Physician and Nephrologist, Department of Medicine/Nephrology, Defence Services Medical Academy/ No. (1) Defence Services General Hospital (1000-Bedded), Yangon, Myanmar.

<sup>2</sup>Professor and Head/Senior Consultant Uro-surgeon, Department of Urology, Defence Services Medical Academy/ No. (2) Base Military Hospital (700-Bedded), Aung Ban, Myanmar.

<sup>3</sup>Senior Consultant Vascular surgeon, Department of Cardiovascular surgery, Defence Services Medical Academy, Yangon, Myanmar.

<sup>4</sup>Senior Consultant Uro-surgeon, Department of Urology, Defence Services Medical Academy, Yangon, Myanmar.

<sup>5</sup>Nephrology Fellow, Department of Nephrology, Defence Services Medical Academy, Yangon, Myanmar

<sup>6</sup>Professor and Head/ Senior Consultant Anesthetist, Department of Anesthesiology/Intensive care, Defence Services Medical Academy/ No. (1) Defence Services General Hospital (1000-Bedded), Yangon, Myanmar.

<sup>7</sup>Senior Consultant Nephrologist, Department of Nephrology, No. (2) Base Military Hospital (700-Bedded), Aung Ban, Myanmar.

<sup>8</sup>Senior Consultant Physician, Department of Medicine, No. (2) Base Military Hospital (700-Bedded), Aung Ban, Myanmar.

<sup>9</sup>Professor and Head/Senior Consultant Radiologist, Department of Radiology, Defence Services Medical Academy, Yangon, Myanmar.

### ABSTRACT

A-28-years-old man living donor kidney transplant recipient received kidney from younger sister. The transplant team decided to leave the right kidney which had better function though left kidney had double renal arteries and veins. Laparoscopic left donor nephrectomy was done successfully. This is our first case of laparoscopic donor nephrectomy with double renal arteries and veins done in Aung Ban Hospital.

**KEYWORDS:** living donor kidney transplant, double renal arteries and veins, laparoscopic donor nephrectomy

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### INTRODUCTION

The number of patients with end-stage renal disease is increasing substantially every year around the world. Among the various options for patients with end stage renal disease, kidney transplantation is the treatment of choice for a suitable patient; it is retrieved from either a cadaver or a live donor. In Myanmar, kidney transplantation has been done since 1995. Living kidney transplant has been done over 30 years in four military transplant centers. They are situated in Mingaladon (Yangon), Nay Pyi Taw, Pyin Oo Lwin and Aung Ban. In our country, nearly 500 living donor transplants have been done in military transplant centers. And, diseased/cadaveric kidney donor transplant program has not developed yet.

Laparoscopic living donor nephrectomy (LLDN) has many advantages over traditional open donor nephrectomy (TODN): less postoperative pain, shorter convalescence, and better cosmetic outcome of the donor nephrectomy. However, the technique of LLDN has undergone evolution at different transplant centers. Being low resource setting, the evolution has been growing slowly to get better skills on LLDN.

Decision to choose kidney depends on several factors such as anatomy of artery/vein, split renal function in scan. As a rule of thumb, it is better to leave better kidney to the donor (*Musquera Felip et al., 2010*). However, Khalil found that the choice and laterality should be based on center and surgeon preference and experience as there were no statistical

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differences between left and right kidney donor nephrectomies on recipient outcomes (Khalil et al., 2016). Intraoperative sequelae as well as post-operative complications between single vessel LLDN and multiple vessel LLDN were found to have no significant difference from statistical point of view (Kasap et al., 2021) (Karayagiz et al., 2022). Several reviews confirmed that there was no difference in long term graft function in patients transplanted with single vessel live donor allograft kidney and patients transplanted with multiple vessels live donor allograft kidney are not obviously different (Alomar, 2021).

### CASE PRESENTATION

The transplant recipient was a 28-year-old male, the elder brother of the donor, presented with end-stage kidney disease. The likely cause was due to chronic glomerulonephritis (CGN) as the native kidney disease. His body weight was 60 kg, and his body mass index was 23. The blood groups of both donor and recipient were compatible. CDC cross-match was negative, and no donor-specific antibodies were detected on the single antigen bead assay. He had been undergoing hemodialysis for two years prior to the kidney transplantation.

The donor was 26-year-old woman; she voluntarily decided to become a living kidney donor. A comprehensive medical work-up revealed no contraindications for kidney donation. The glomerular filtration rate (GFR) was measured at 105.9 mL/min/1.73 m<sup>2</sup> using a 99mTc DTPA nuclear scan, with differential kidney function showing 49.7 mL/min (47%) on the left side and 56.2 mL/min (53%) on the right side. Computed tomographic angiography provided detailed visualization of the renal artery anatomy (figure 1,2).

On the left side, two renal arteries were identified: the superior renal artery, measuring 5 mm, originating from the aorta at 13 mm below the superior mesenteric artery (SMA), and the inferior renal artery, measuring 4 mm, originating from the left common iliac artery. There were two renal veins on the left side: the main renal vein, measuring 6 mm in diameter, drained into the inferior vena cava, while the accessory left lower pole renal vein drained into the left common iliac vein. A duplex pelvicalyceal system was observed in the left kidney: the upper collecting system drained the upper pole, and the lower collecting system drained the mid and lower poles, uniting at the pelvi-ureteric junction, with a single ureter draining into the bladder.

On the right side, a single renal artery, renal vein, and ureter were present.

Following a thorough discussion in our routine multidisciplinary meeting, it was decided to proceed with the donation of the left kidney. The transplant team would like to leave the right kidney which had better function; 56.2 mL/min (53%) on the right side.

The donor nephrectomy was performed using standard laparoscopic techniques. Both renal arteries were

preserved, dissected up to the aorta and common iliac artery, and then divided. The renal veins were divided close to the vena cava and common iliac vein. The accessory renal artery was clamped and cut first, followed by the main renal artery. The ureter was dissected as a bundle and divided at the level of the iliac vessel. The kidney graft was extracted through a small incision in the left iliac fossa. Immediate perfusion of the kidney graft was achieved using HTK solution through the renal arteries.

The kidney graft was placed in the right iliac fossa. Two renal arteries were anastomosed with the right external iliac arteries separately (end-to-side anastomosis). Two renal veins were anastomosed to the side of the external iliac vein. Then, the kidney graft was rapidly and uniformly reperfused. Brisk diuresis was observed on the operating table. Ureteroneocystostomy was performed using 5/0 polydioxanone suture with a ureteric stent placed in situ, following the Lich-Gregoir technique.

Six hours post-transplantation, the creatinine (Cr) level decreased from 11 mg/dL pre-transplantation to 7 mg/dL. Doppler ultrasound confirmed that the kidney graft was well perfused Figure (3,4). The kidney graft function continued to improve, with the Cr level decreasing to 0.9 mg/dL by day 5 post-transplantation. The patient's hospital stay lasted ten days. The ureteric stent was removed four weeks after transplantation, and there were no surgical complications.

### DISCUSSION

The number of patients with end-stage renal disease is increasing substantially every year around the world. Renal transplantation is the best treatment option to improve survival and quality of life. Living donor kidney transplantation is considered an established treatment for end-stage renal failure.

According to Xiao et al, warm ischemic time was longer in laparoscopic living donor nephrectomy than open donor nephrectomy (Xiao et al., 2020). However, laparoscopic living donor nephrectomy (LLDN) has shown less morbidity than the open approach, with less pain and analgesia requirements and allowing a quicker recovery and an earlier return to normal activity. In Myanmar, we have been trying to improve our skills in doing LLDN; we have done 70 pairs of transplants with LLDN. Ninety percent of them had single artery. This is our first case of LLDN with double arteries and veins done in Aung Ban hospital. We have reported a case with successful RLDN without intraoperative complications done in Aung Ban hospital too (Khin Phyu Pyar et al., 2024). The choice and laterality of donor nephrectomies should be based on center and surgeon preference and experience because the outcomes of recipient was not different statistically (Khalil et al., 2016). According to Musquera Felip, it is mandatory to maintain the best kidney in the donor (*Musquera Felip et al., 2010*). In this patient, the academic

## **A-28-Years-Old Man Received Kidney with Double Renal Arteries and Veins from Younger Sister: A Successful Laparoscopic Living Donor Nephrectomy**

board for transplant team decided to leave the right kidney which had better function though left kidney had double renal arteries and veins. LLDN was done on left successfully. Both donor and recipient had no complication. Generally, warm ischemia time, blood loss, and surgeon expertise defined surgical approach in LLDN (Dagnæs-Hansen et al., 2022). They found that laparoscopic procurement of a kidney with multiple renal arteries was reliable and it did not cause significant impact on the graft outcome.

Moreover, Kasap et al investigated the early outcome of LLDN with a single artery and multiple arteries; they were compared regarding donor and recipient hospital stay, operative time, warm ischemia time, and postoperative complications with Clavien-Dindo classification. Warm ischemia time and operation time were higher in LLDN with multiple arteries group than LLDN with a single artery group. Regarding graft function, the prevalence of acute tubular necrosis did not differ between groups; and, there was also no significant difference in the acute rejection or mortality rates after transplantation. Serum creatinine levels were lower in multiple renal artery recipients initially; however, there was no statistical difference during the 6 months of follow-up. Recipient morbidity and mortality were not different between the 2 groups. Therefore, they concluded that renal allograft transplantation with multiple renal arteries can be performed with reasonable complications and acceptable results (Kasap et al., 2021). Furthermore, Karayagiz et al compare the long-term graft outcomes of left-versus-right donor nephrectomy with multiple renal arteries. They found that doing LLDN with multiple renal arteries were safe procedures with no significant negatively impacted rates for neither survival nor complications of the recipients in the long-term, compared to LLDN with single renal artery (Karayagiz et al., 2022). Therefore, this case report was in accordance with their findings.

We are going to compare warm ischemic time and total warm ischemic time in this case report (multiple vessel LLDN) with single vessel LLDN done by the same team ( same uro-surgeons & vascular surgeons ) in Aung Ban hospital. Some differences were noted in two cases. In single vessel LLDN where 28 years old donor (Allograft kidney weighing 165 gm) to 60 years old female recipient, total warm ischemic time was 33 min 25 sec; 1st warm ischemic time was 5 min 25 sec; cold ischemic time was 14 min; and, 2nd warm ischemic time was 28 min. The main reason was having too much peri-nephric fat in donor's kidney took longer time. In multiple vessel LLDN where 26 years old donor (Allograft kidney weighing 161 gm) to 28 years old male recipient, total warm ischemic time was 66 min; 1st warm ischemic time was 4 min 50 sec ( calculated since accessory renal artery clumped); cold ischemic time was 39 min 30 sec; and, 2nd warm ischemic time 61 min 10 sec. Therefore, warm ischemic time was nearly double in multiple vessel LLDN. Genc et al found that mean operative time was significantly

higher in LLDN with 2 renal arteries (Genc et al., 2011). Troppmann et al pointed out that clinical outcome was the same in multiple vessel LLDN and single vessel LLDN (*Clinical Outcomes Following Single vs. Multiple Vessel Living-Donor Kidney Transplantation: A Retrospective Comparison of 210 Patients*, n.d.) (Troppmann et al., 2001). Therefore, this case report supported their finding.

Donor operating time for single vessel LLDN was slightly longer than multiple vessel donor LLDN, 2 hours 56 minutes and 2 hours 30 minutes respectively. Moreover, blood loss was 150 cc in single vessel LLDN and 50 cc in multivessel LLDN. The reason was having too much peri-nephric fat in donor's kidney and high BMI of donor took longer time. Regarding operating time for recipient, multivessel LLDN took longer time than single vessel LLDN, 3 hours and 2 hours respectively. It was in accordance with other reports. Genc et al found that mean operative time was significantly higher in LLDN with 2 renal arteries (Genc et al., 2011). Blood loss was more in multivessel LLDN too, 200 cc in multivessel LLDN and 150 cc in single vessel LLDN.

Both recipients achieved their best creatinine level on 4th POD ( single vessel Recipient Creatinine 0.6 mg/dl, multiple vessel recipient 0.9 mg/dl). Therefore, having normal serum creatinine on 4th POD supported the previous evidence. Both donors did not have complication and they returned to their normal activity 2 weeks after surgery. Graft function and outcome till one month were the same in recipient with multivessel LLDN and single vessel LLDN. (Dagnæs-Hansen et al., 2022) (Karayagiz et al., 2022) (Kasap et al., 2021).

We should compare the long-term outcomes of patients transplanted with single vessel LLDN and patients transplanted with multiple vessels LLDN. And it was not obviously different in study done by Alomar (Alomar, 2021).

### **CONCLUSION**

The use of multivessel LLDN had excellent clinical outcomes. It did not increase the risk of developing postoperative complications or other adverse outcomes in both donor and recipient.

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### **Declaration of conflict of interest**

The authors declared no potential conflicts of interests with respect to authorship and publication of this article.

### **Ethical approval**

Our institution does not require ethical approval for reporting cases.

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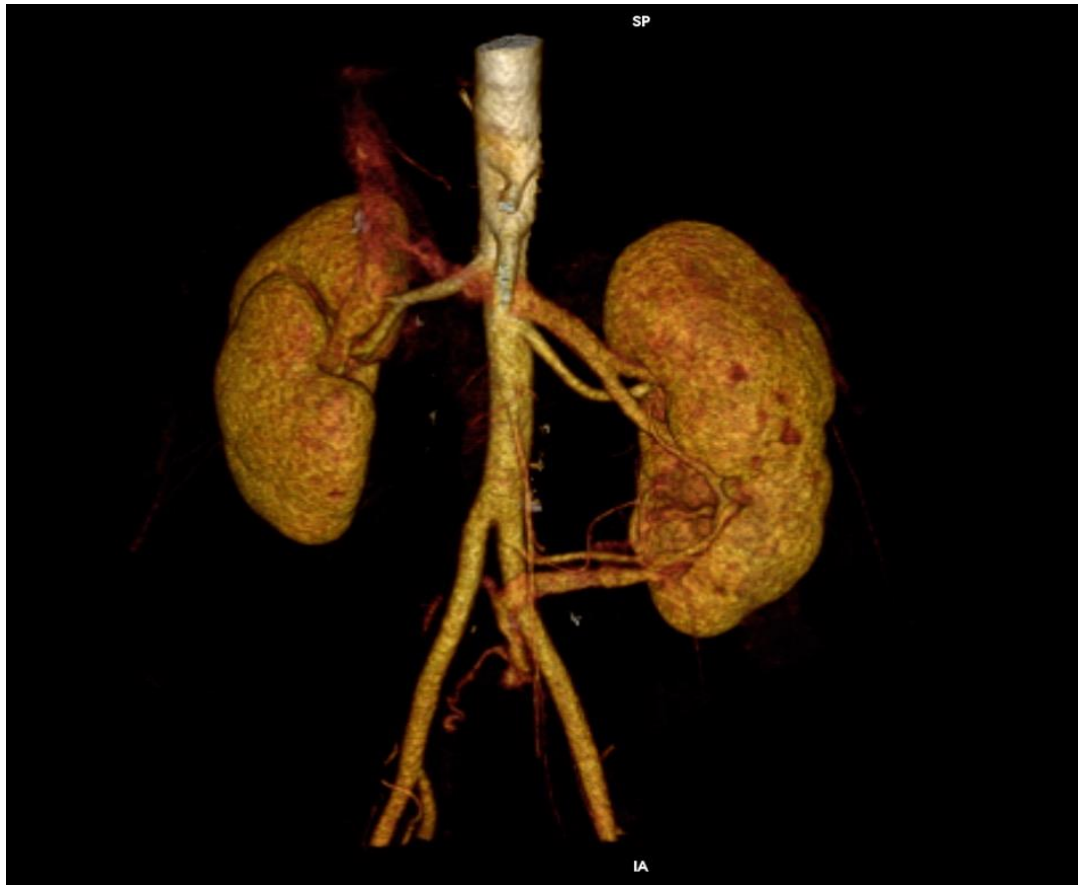
## Informed consent

The informed consent for publication in this article was obtained from patient.

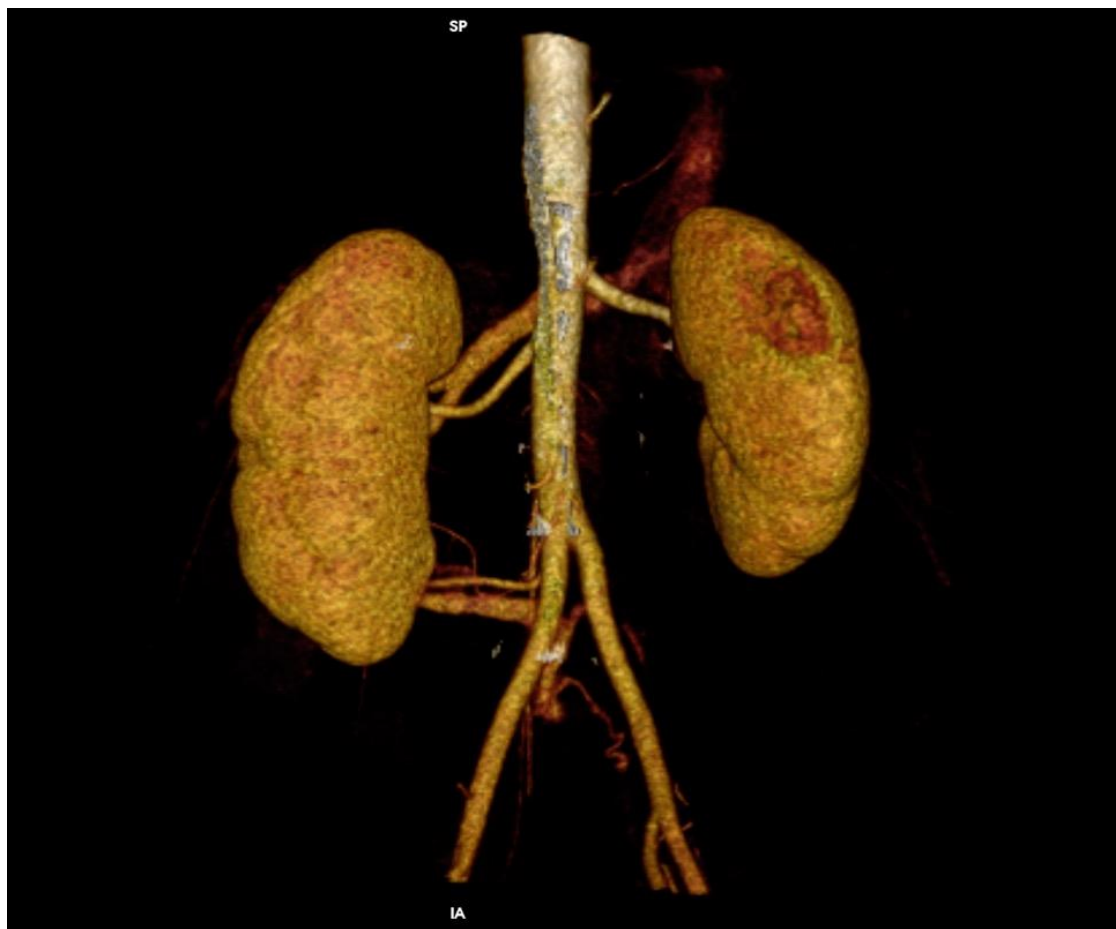
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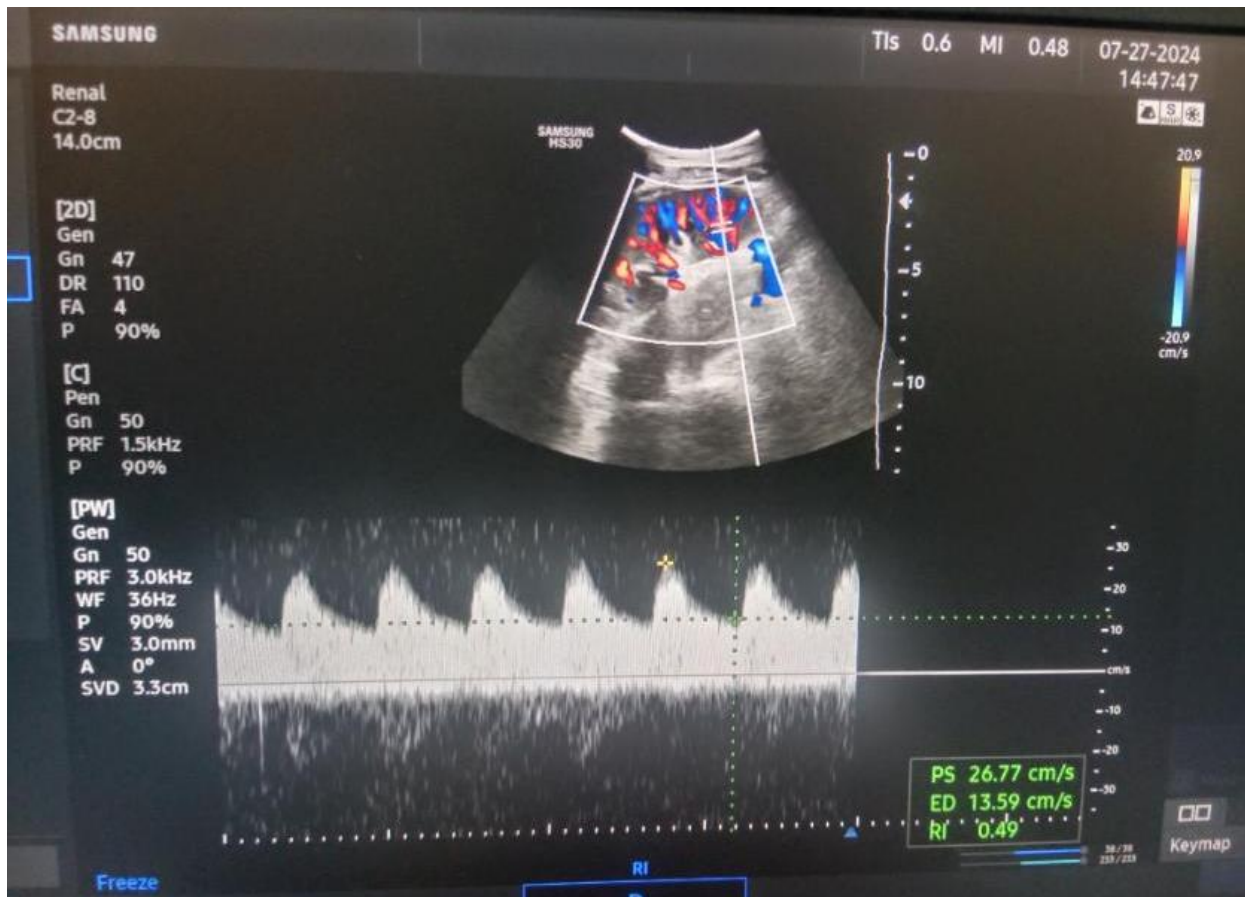


**Figure (1) Donor Renal Angiogram (Anterior view)**

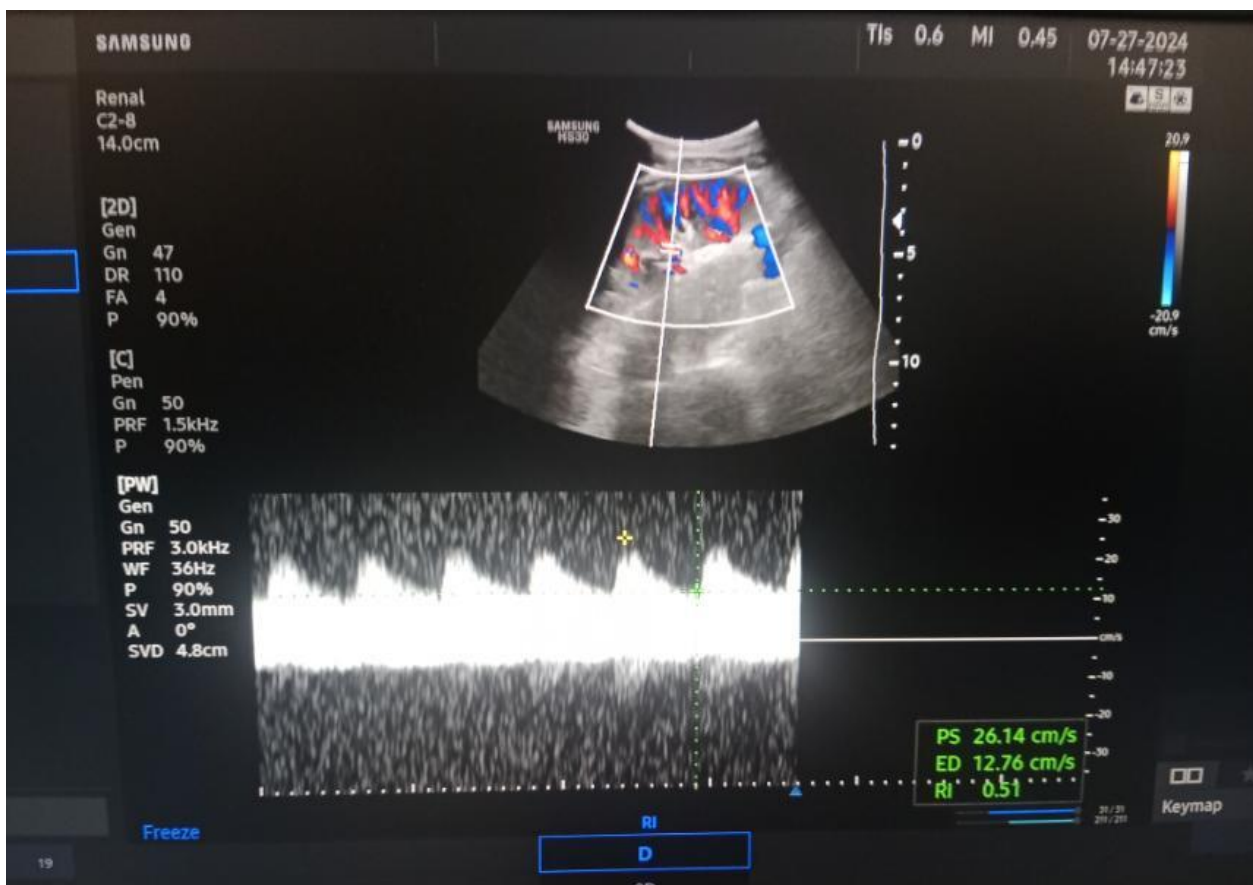


**Figure (2) Donor renal angiogram (posterior view)**

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**Figure (3) Allograft Doppler ultrasound showed normal wave form of the superior renal artery**



**Figure (4) Allograft Doppler ultrasound showed normal wave form of the inferior renal artery**