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# LAPAROSCOPIC HAND-ASSISTED DONOR HEMINEPHRECTOMY IN LIVING DONOR WITH HORSESHOE KIDNEY. CASE STUDY

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***Abstract***

*Report of our clinical case of laparoscopic hand-assisted donor heminephrectomy in living donor with horseshoe kidney (Horseshoe kidney) has a good innovation in donor kidney retrieval technique and particularly in case of congenital anomalies.*

*Kidney transplantation is a "gold standard" of treatment of chronic kidney disease in terminal stage. Nowadays there is a strong deficit of donor organs. Due to undeveloped cadaveric kidney transplantation we always try to accept donors with different anatomic particularities. In our practice we perform traditionally laparoscopic hand-assisted donor nephrectomy either in case of single artery and vein or multiple vessels.*

*This case is a report of kidney transplantation from 65-years-old woman for her 39-years old son with end-stage renal disease. Technical challenge was due to that donor had a Horseshoe kidney with parenchymal isthmus, with 4 arteries on right half and 2 arteries on the left with retrocaval position of the latters.*

*We performed literature review for similar cases and found out that usually open laparotomy was performed in this patients. So we decided not to change the familiar for us technique in this case also. Donor underwent laparoscopic hand-assisted donor heminephrectomy with subsequent successful implantation of graft and immediate function.*

***Keywords:*** *laparoscopic hand-assisted, nephrectomy, horseshoe kidney*

## *Introduction*

Horseshoe kidney is a congenital anomaly that is characterized by the fusion of lower poles of both kidneys, with lower than usual location, just below the inferior mesenteric artery. The incidence is approximately 1 in 400-500 adults and are more frequently encountered in males (M\F ratio is 2:1) [*Kumar P et al., 2008; Barakat A et al., 2016*]. The vast majority of cases are sporadic, except for those associated with genetic syndromes [T*ischkowitz MD et al. 2003*]

Horseshoe kidney are, in themselves, asymptomatic and thus they are usually identified incidentally. Thus there are some conditions that encountered frequently in people with Horseshoe kidney than in general population. These are: hydronephrosis, renal calculi, renal tumors, infection and others [*Yavuz S et al. 2015*].

Usually in Horseshoe kidney ureter passes anteriorly to isthmus. In 70 % cases there are multiple arteries and\or veins with separate perfusion of

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isthmus. The latter makes a great challenge for surgeon during organ procurement.

Kidney transplantation is the best treatment option in patients with end-stage renal disease. Technical aspects and immunosuppression protocols are greatly improved for the last decades but the real problem that is still relevant nowadays is the shortage of donor kidneys in spite of annual increase in organ demand. In US the 63,000 newly diagnosed people who would benefit from a transplant minus the 20,000 who will get one leaves us with the 43,000: the group of new people, each year, who will die prematurely on dialysis because they couldn't get a new kidney [*McCormick F et al. 2018*]. Thus there is a tendency to extend the criterion for selection of donors, and of them, living donors with Horseshoe kidney with separate blood supply and pelvicalyceal system do no more constitute a contraindication for organ donation.

### *CASE PRESENTATION*

A 39-years old male with end-stage renal disease, for the last 2 years of haemodialysis, admitted to our center for kidney transplantation. Recipient had concurrent arterial hypertension and otherwise there were no contraindications for transplantation during preoperative evaluation. Donor was his mother (66-year-old woman), with arterial hypertension 1 stage (AP max 142/90 mmhg), during preoperative evaluation otherwise healthy. Due to lack of others younger related donors, we inform patients about potential risks of donation and after informed consent taken we prepared patients for surgery.


*To overcome it is possible, due to the uniting the knowledge and will of all doctors in the world*

On CT scan donor had Horseshoe kidney, revealed first in her life, with parenchymal isthmus, 4 arteries on right half and 2 arteries on the left and the latter had retrocaval position, with aortocaval transposition that is sometimes

***FIGURE** 1. CT angiography scan of donor. Horseshoe kidney with parenchymal isthmus (black arrow) with multiple arteries in both moieties (white arrows). 2 arteries traverse the right half posteriorly.*

seen in patients with horseshoe kidneys (Fig. 1).

### *Surgical technique*

In our center for the last 10 years we performed more than 500 laparoscopic hand-assisted donor nephrectomies. The difference between classical nephrectomy and the latter is the precise dissection of renal vessels in order to have maximal length for engraftment. Mostly access to the renal hilum lies from dissection and lifting the lower pole, that was impossible in this case. We decided to take left

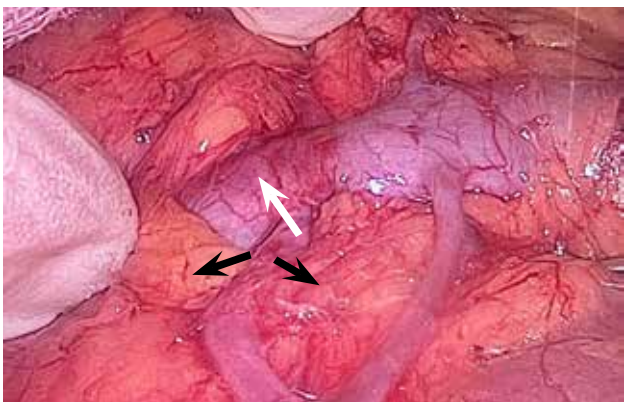

***FIGURE** 2. Gonadal vein is splitted up into 2 branches (black arrows) that carry blood to left renal vein (white arrow).*

half as it had fewer arteries and easier to engraft.

Traditionally we make a mini-laparotomy incision in the upper midline and insert hand-port

After the transsection of Toldt's fascia we gain an access to the retroperitoneum. With precise dissection of peritoneum from paranephron, ureter and gonadal vein are exposed. The latter is the surgical landmark for renal vein (Fig. 2). Gonadal vein is splitted up into 2 branches (black arrows) that carry blood to left renal vein (white arrow). There were also two adrenal veins that entered into renal vein. All veins were clipped and transected. Adrenal gland was separated from paranephron also. Isthmus was also dissected from surrounding tissue.

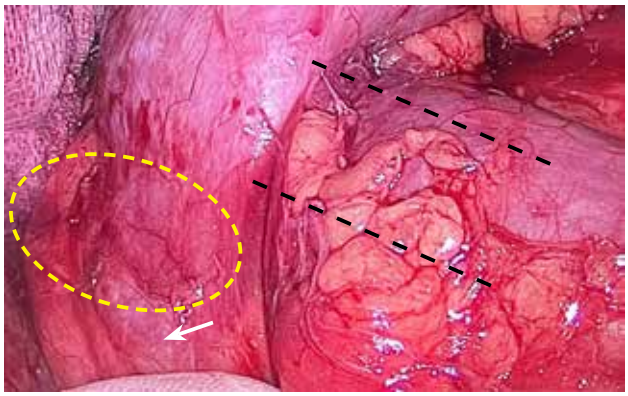

***Figure** 3. Inferior vena cava (IVC) was beneath the isthmus*

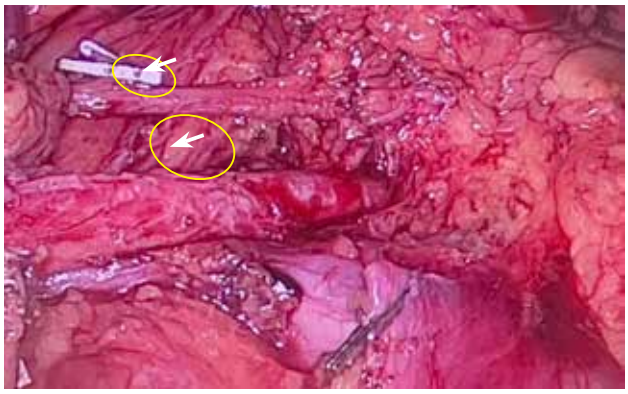

***Figure** 4. Lower pole of the left half was fully dissected including isthmus (yellow dotted line) and IVC just beneath it (black dotted line). Small part of lower pole of right half is also seen (white arrow).*

***Figure** 5. Resected isthmus was sutured on back-table by interrupted suture and utilizing haemostatic sponge. Kidney graft was successfully engrafted with immediate function.*

Lower pole of the left half was fully dissected including isthmus (yellow dotted line) and IVC just beneath it (black dotted line). Small part of lower pole of right half is also seen (white arrow). (Fig.3)

Due immobile lower pole it was impossible to lift up the kidney, so we approached to arteries posteriorly (Fig. 4).

After kidney totally freed from surrounding fatty tissue and arteries and vein were maximally dissected it was dilemma what to do first. There were 2 ways: first - to suture the isthmus of both halves and transect the isthmus, afterwards clipping and transecting the ureter and vessels, or, the second way – to suture isthmus first just closer to right half and after clipping and transecting ureter and vessels quickly transect the devascularized left half above suture line. The first was technically difficult and risky coupled with bloodloss but second way was easier and with less risk. We firstly devascularized the left half and then quickly transect the isthmus just above the suture line, preventing bleeding from the right half. Warm ischemic time 1 was 92 seconds. Resected isthmus was sutured on back-table by interrupted suture and utilizing haemostatic sponge (Fig. 5).

### *Discussion*

When there is a deceased donor with Horseshoe kidney, that we had one in our experience, technical aspect of organ procurement does not constitute any difficulties, but in case of living donor one of the main issues is the surgical approach as we must utilize convenient and minimal invasive approach we less trauma and short period of recover. In this way we made a short literature review before surgery.

There have been 9 cases of horseshoe kidney transplantation from live donors publishedwith maximal follow-up of 54 months. A laparotomy

was performed by means of a medial upper incision. The isthmus of the kidney was divided using a harmonic scalpel and the left segment was used; it had 2 arteries too distant to create a common one, thus anastomosed separately. The renal vein was side-to-side anastomosed to the right external iliac vein and a Lich-Gregoir ureteral implant was made. There were no intraoperative or postoperative complications in the donor who currently remains asymptomatic. Recipient developed a delayed graft function (DGF), and was discharged on the 12th day after surgery. After 24 months of surgery, renal function has remained stable with a serum creatinine of 128μmol/L [*Justo-Janeiro JM et al. 2015*]. In this report there are also multiple arteries and open approached eased the surgical intervention but with more invasiveness.

The similar report was made by Michael M. Kaabak M.M.and co-authors. Left subcostal open incision was made in 38-year-old man, that was donor for her 13-year-old daughter. Seven years since heminephrectomy, the donor's serum creatinine was 1.6 mg/dL, his blood pressure was 130/80 mm Hg, and he had 221 mg/day of proteinuria. Because of suggestion that horseshoe kidneys are associated with an increased occurrence of renal pelvic tumors [*Bauer S.B. et. al., 1988*],we performed computed tomography in July 2015 and found no pathology [*Michael M. Kaabak Met al. 2015*].

The same surgical approach was used by Sozener U and eco-authors (2019) in 59-year-old woman with Horseshoe kidney, with thin fibrous isthmus. There were two ureters for the left kidney. The vessels, ureters were prepared and the kidney was mobilized up to the isthmus.The artery and vein were divided and the isthmus separation was performed with a 60-mm Endo GIA Black stapler (Medtronic, USA). After separation, no bleeding and no urine leakage were detected from transacted surface of the remaining kidney. No postoperative complications were observed in donor. Drain was taken out on the 3rd day after creatinine sampling and she was discharged on the 4th day. Her creatinine levels were stable during postoperative 1st, 3rd and 6th months follow-up 0.82, 0.86 and 0.85mg/dl respectively. Her blood pressure levels, urine output, creatinine levels and glomerular filtration rate values showed a stable and sufficient renal capacity with remaining right kidney.

There some complications in some of them but overall the survival and the long-term function of the grafts were all favourable[*Hüser N et al., 2005; Dinckanet A al., 2007; Sezer T et al., 2013*]

One of the main standpoints during preoperative preparation of donor is to assess the renal function. The second most common is the visualization of the pelvicalyceal system because the most common complication in long-term follow is urine leak [*Inoue S et al. 2000*]. Another common issue is a complex vasculature system that must be assessed preoperatively. It is of primum interest to preserve the total vasculature of kidney graft as it affects the survival rates.

Splitting of isthmus also is made by many different ways in different reports, Of them, the most simple and safe, is proper manual suturing as you can control the tension of ligature on tissues.

In our case, we want to mention the whole technique of organ procurement. It has many apparent advantages against open approaches, such as;

- Minimal invasiveness
- Good manual control
- Good visualization
- Quick recovery time
- Good cosmetic effect
- Low risk of postoperative hernia

### *Conclusion*

In case of Horseshoe kidney it is common problem the anomaly of kidney vasculature, pelvicalyceal system, isthmus. These pitfalls are not a contraindication for organ donation anymore. There different techniques of organ procurement but in developing surgical era we must utilize minimal invasive approaches in these patients also as t affect their recovery period and return to their daily activity.

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