



ANATOMICAL VARIATION OF LEFT LUMBAR VEIN AND WORKING CLASSIFICATION IN LEFT LAPROSCOPIC DONOR NEPHRECTOMY-SINGLE CENTRE STUDY

Dr Laxmikant Sharma

Senior Resident, Institute of Urology Medanta- The Medicity, Gurugram

Dr Prafull B Mishra

Senior Resident, Institute of Urology Medanta-The Medicity, Gurugram

ABSTRACT

INTRODUCTION Laparoscopic donor Nephrectomy has now become standard for Donor Nephrectomy, however anatomical variation in the renal and lumbar vessels are the most common cause of conversion to open surgery. Better anatomical knowledge of the lumbar vein can significantly reduce the conversion to open, as well as reduce the intraoperative complications.

MATERIAL AND METHODS Single institutional, prospective, observational study conducted for 18 months (2017 -2019) where 174 healthy individuals who had underwent Left Laparoscopic Donor Nephrectomy. During the intraoperative period variations in the lumbar veins were noted and with special emphasis on the classification of left lumbar vein observed during 174 Laparoscopic donor nephrectomies

RESULTS

- In this study the types of lumbar veins which were observed were (As per our classification) -
- Type 1 – Single lumbar vein draining posteriorly in the Left renal vein.
- Type 2 – Single lumbar vein draining inferiorly in the Left renal vein
- Type 3 – Single lumbar vein draining superiorly in the Left renal vein
- Type 4 – Multiple lumbar veins
- Type 5 – No lumbar veins
- Type 6 – Lumbar vein draining into the gonadal vein

CONCLUSION LDN is the standard of care for harvesting of graft in the donors and gives them all the benefits of minimal invasive surgery and complex venous drainage is not absolute contraindication for LDN. Knowledge of the anatomy of lumbar veins drainage beforehand is required to prevent the complications such as hemorrhage, transfusion, open conversion and gas embolism.

KEYWORDS : LDN(Laparoscopic donor Nephrectomy), lumbar vein

INTRODUCTION

Renal transplantation is the treatment of choice for patients with End Stage Renal Disease (ESRD). Since the initial report by Ratner et al¹ in 1995, in last 2 decades laparoscopic donor nephrectomy (LDN) has become the standard of care worldwide. Main benefits of laparoscopic approach to the donor are reduced pain, shorter hospitalization, improved cosmesis and earlier return to work when compared to the traditional donor nephrectomy.

Due to donor organ shortage and increasing incidence of end-stage renal disease (ESRD), there is a trend toward accepting the extended criteria live kidney donors (obese donors, older donors, donors with hypertension)². Anatomical variations of the grafts are still one of the challenging problem in the renal transplantation.

Kidneys are drained by renal veins. Since the inferior vena cava is on the right side, the right renal vein is relatively short and it doesn't receive any tributary³. The left renal vein is longer than right renal vein and receives the left inferior phrenic vein, left suprarenal vein, left gonadal vein (left testicular vein in males, left ovarian vein in females) and left 2nd lumbar vein.

This is in contrast to the right side, where these veins drain directly into the inferior vena cava

A knowledge of embryologic development and anatomy of renal vessel variations would help the surgeons to anticipate and manage the potential risks successfully to prevent the vascular complications during laparoscopic live donor nephrectomy

The lumbar veins (the veins connecting left renal vein and left ascending lumbar vein) run along the posterior abdominal wall have to be dissected and divided carefully for the exposure of the proximal part of the renal artery for a better

length. Usually the lumbar vein is short in length and big in caliber. Because of the risk of accidental injury during laparoscopic donor nephrectomy which may lead to subsequent bleeding and conversion to open surgery⁴. Therefore, lumbar veins identification is important to avoid injury. The lumbar vein anomalies are mostly encountered during left side donor nephrectomy which include agenesis and collaterals⁵. In 65%–80% persons there are one or two lumbar veins. 3% people have three lumbar veins⁵. Net-like structure forms when there are multiple lumbar veins. Lumbar veins are usually posterior to the renal vein and inferior and posterior to the renal artery, at the L-1 vertebra level. During trans peritoneal approach, the chances of injury of lumbar vein is likely as they may not be adequately visualized⁶. Li et al. have classified the lumbar veins into five main types based on their clinical cases, which may help understanding of variations of the lumbar vein and reduce the risk of surgical injury and subsequent bleeding⁵.

MATERIAL AND METHODS

Study site: The study was conducted in the Kidney and Urology institute of Medanta -The Medicity Hospital, Gurgaon (Haryana)..

Study population: Consecutive healthy individuals, admitted in Kidney and Urology institute, Medanta-The Medicity for Left Laparoscopic Donor Nephrectomy.

Study design: Single institutional, prospective, observational study

Study Duration: 18 Months

Sample size: 174

Inclusion Criteria:

Healthy individuals who had underwent Left Laparoscopic Donor Nephrectomy.

Exclusion Criteria:

1. Right sided Donor Nephrectomies
2. Any absolute contraindication to Laparoscopic surgery (uncorrectable coagulopathy, intestinal obstruction unless there is an intention to treat, significant abdominal wall infection, massive hemoperitoneum or hemoretroperitoneum, generalized peritonitis and suspected malignant ascites.)

OBSERVATIONS AND RESULTS

Table 1: Demographics of the Donors (N= 174)

Sex = n (%)	Male	50 (28.7%)
	Female	124 (71.3%)
Donor Status	Healthy	153 (87.9%)
	Marginal	21 (12.1%)
Age, Mean ± SD (Range)	45.5±11.5 (18 - 72)	
BMI, Mean ± SD (Range)	25.2±4 (15.2 - 35.1)	
GFR LK, Mean ± SD (Range)	45.7±5.8 (31 - 61.2)	
Operative Time Duration , Mean ± SD (Range)	123.9±32.1 (60 - 240)	
EBL, Mean ± SD (Range)	84.6±35.2 (30 - 200)	

Distribution of the donors by Age group

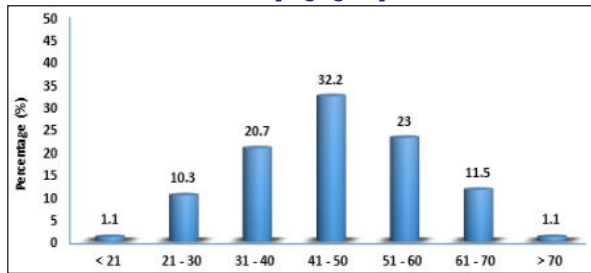


Figure 1. Distribution of donors by Age group (Total donors = 174)

Table 2: Types of lumbar veins observed during Left laparoscopic Donor Nephrectomy

Intraoperative lumbar vein Type (n = 174)		
1 (Posterior)	42	24.1%
2 (Inferior)	28	16.1%
3 (Superior)	9	5.2%
4 (Multiple)	33	19.0%
5 (No Lumbar vein)	57	32.8%
6 (Draining into Gonadal vein)	5	2.9%

Figure 2: Types of lumbar veins observed during Left laparoscopic Donor Nephrectomy

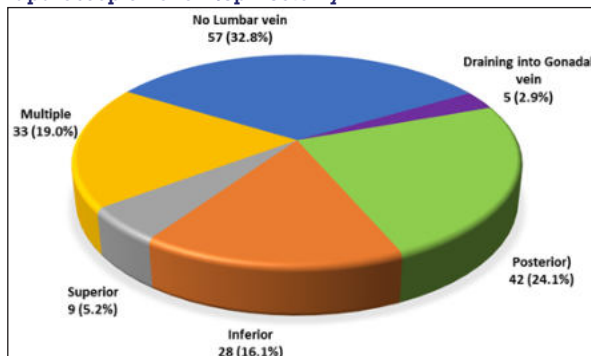


Table 3: Comparison of Intraoperative parameters of the donors with and without left lumbar vein variations

Intraoperative lumbar vein	Number (n=174)	Operative time	EBL
Lumbar Vein Present	117	119.6±34.5	132.8±24.2
Lumbar Vein Absent	57	82.8±36.8	64.5±37.7
Overall	174 (100.0%)	123.9±32.1	84.6±35.2
p-value	-	0.010*	0.220

*p-value < 0.05, statistically significant

Above table shows that the operative time was least when no lumbar vein was present which was 83 minutes and was 120 minutes when lumbar vein was present, while the mean operative time was 124 minutes. The estimated blood loss was 64.5 ml when there was no lumbar vein while it was 132 ml when lumbar vein was present and the mean estimated blood loss was 84.6 ml

DISCUSSION

In 2011 Li et al⁵ had prospectively studied the Anatomical variation of the posterior lumbar tributaries of the left renal vein in retroperitoneoscopic left living donor nephrectomy and found that there were seven types in total, including five main types (accounts for 95.1%, 58/61 cases) and the type of reno-hemi-azygo-lumbar trunk (AZV; accounts for 16.4%, 10/61 cases). According to the number of posterior lumbar tributaries, no lumbar vein was present in 16.4% (10/61 cases), one lumbar vein accounted for 47.5% (29/61 cases), two lumbar veins accounted for 32.8% (20/61 cases) and three lumbar veins accounted 3.3% (2/61 cases). They also classified the variations of lumbar veins into 7 types:-

Type 1: The lumbar vein runs parallel to the route of the renal artery, perpendicular to the psoas major and drains into the left renal vein dorsally (29.5%, 18/61 cases)

Type 2: The lumbar azygos vein passes the renal artery dorsally, and imports the left renal vein dorsally (16.4%, 10/61 cases)

Type 3: One lumbar vein runs parallel to the route of the renal artery, perpendicular to the psoas major; another lumbar azygos vein passes the renal artery dorsally and imports the left renal vein dorsally; these two veins import the left renal vein dorsally and separately (16.4%, 10/61 cases).

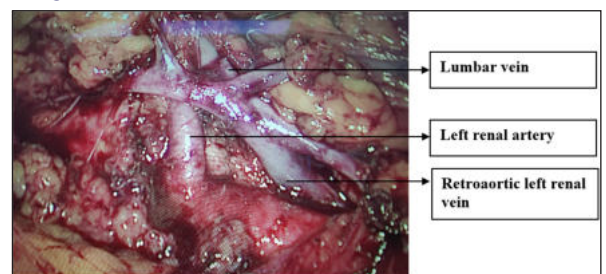
Type 4: One lumbar vein runs parallel to the route of the renal artery, perpendicular to the psoas major; another lumbar azygos vein passes the renal artery dorsally; these two veins confluence to form the reno-hemi-azygo-lumbar trunk (AZV) and drain into the left renal vein dorsally (16.4%, 10/61 cases).

Type 5: There is no lumbar vein or lumbar azygos vein connecting the left renal vein and the ascending lumbar vein/hemiazygos vein (16.4%, 10/61 cases).

Type 6: The lumbar azygos vein passes the renal artery dorsally, and imports the gonadal vein (1.6%, 1/61 cases).

Type 7: There are two lumbar veins and one lumbar azygos vein, draining into the left renal vein dorsally and separately (3.3%, 2/61 cases)

Image 1 :



Laparoscopic view of left donor nephrectomy with retroaortic left renal vein with lumbar vein draining posteriorly

In this study we had observed the variations of lumbar vein during left laparoscopic donor nephrectomy and classified the lumbar veins into 6 types –

Type 1 – Single lumbar vein draining posteriorly in the Left renal vein (24.1 %, 42/174)

Type 2 – Single lumbar vein draining inferiorly in the Left renal vein (16.1 %, 28/174)

Type 3 – Single lumbar vein draining superiorly in the Left renal vein (5.2 %, 9/174)

Type 4 – Multiple lumbar veins (19.0 %, 33/174)

Type 5 – No lumbar veins (32.8%, 57/174)

Type 6 – Lumbar vein draining into the gonadal vein (2.9%, 5/174)

We found that there were no lumbar veins in 32.8% of cases which was double of the above mentioned study. In this study it was found that the operative time was least when no lumbar vein was present which was 83 minutes and was 120 minutes when lumbar vein was present, while the mean operative time was 124 minutes. The estimated blood loss was 132 ml and 64.5 ml when lumbar vein was present and absent respectively, and the mean estimated blood loss was 84.6 ml.

CONCLUSION

Knowledge of the anatomy of lumbar veins drainage beforehand is required to prevent the complications such as hemorrhage, transfusion, open conversion and gas embolism. Surgeons should also have the understanding of reading the CT angiography films and do not depend on the radiology report as they can be misinterpreted. LDN is the standard of care for harvesting of graft in the donors and gives them all the benefits of minimal invasive surgery and complex venous drainage is not absolute contraindication for LDN.

REFERENCES

1. Ratner LE, Ciseck LJ, Moore RG, Cigarroa FG, Kaufman HS, Kavoussi LR. Laparoscopic live donor nephrectomy. *Transplantation*. 1995; 60:1047-9.
2. Genc V, Karaca AS, Orozakunov E, Cakmak A, Sevim Y, Ustuner E, et al. Multiple renal arteries challenge in laparoscopic donor nephrectomy: how far can we go? *Journal of the Korean Surgical Society*. 2011; 80: 272-7.
3. Cooley DA, Wukasch DC, eds. *Techniques in vascular surgery*. Philadelphia: Saunders, 1978:282.
4. Sundaram CP, Martin GL, Guise A, Bernie J, Bargman V, Milgrom M, et al. Complications after a 5-year experience with laparoscopic donor nephrectomy: the Indiana University experience. *Surg Endosc*. 2007; 21: 724-8.
5. Li G, Dong J, Lu JS, Zu Q, Yang SX, Li HZ, et al. Anatomical variation of the posterior lumbar tributaries of the left renal vein in retroperitoneoscopic left living donor nephrectomy. *Int J Urol*. 2011; 18:503-9.
6. Nicholson ML, Veitch PS. Laparoscopic live-donor nephrectomy. *Nephrol Dial Transplant*. 2000;15:1124-6.