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## Laparoscopic Hand-Assisted Living Donor Nephrectomy Program of a Tertiary Public Hospital in South-East Mexico



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### ABSTRACT

Laparoscopic living donor nephrectomy (LLDN) is a safe procedure in renal transplant programs. It offers excellent donor recovery and preserves adequate organ graft function. For small transplant centres with an advanced laparoscopic program, minimally invasive donor nephrectomy is a safe procedure with comparable outcomes to large transplant centers. The advantages of LLDN have been well documented, and it is the standard procedure in many high- and low-volume transplant centres. However, there is still concern that laparoscopic nephrectomy's learning curve and limited surgeon experience may be associated with increased morbidity for the recipient and/ or organ graft failure. This paper aims to present the initial experience with laparoscopic living donor nephrectomy with a young surgical medical team as their hospital's renal transplant program initiates. This is a descriptive and retrospective study including records of patients who underwent laparoscopic hand-assisted living donor nephrectomy at a public tertiary hospital from South-east Mexico from November 2012 to May 2019. The final sample included 30 clinical cases. To evaluate the renal function of the donors, an average glomerular filtration rate before nephrectomy of 116 ml/min/1.73 m<sup>2</sup> was calculated. The first follow-up visit was an average 6.3 months (minimum 1 month maximum 12 months) after nephrectomy. Their average glomerular filtration rate found was 83 ml/min/1.73 m<sup>2</sup>. There were no surgical complications based on the Clavien-Dindo classification. Nephrectomy is a safe procedure that has an expected deleterious effect on donor renal function.



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## INTRODUCTION

The evolution of renal transplantation over time illustrates a successful combination in the fields of surgery, immunology, and politics. Since the first transplant was performed in Mexico in 1963, the number of procedures has increased considerably. In the year 2021, 1,971 transplants were performed; of these, 1,496 (76%) were from living donors.(1) In developed countries, the number of transplants of cadaveric origin is 80% and the remainder are from living donors. In the case of Mexico, the proportion is inverted, out of every 10 transplants, seven are from living donors.(2,3)

Laparoscopic living donor nephrectomy (LLDN) can be performed safely and efficiently in transplant centres with initial experience. Even in a lower volume transplant centre, positive surgical outcomes and adequate long-term organ graft function can be achieved.(4) In order to obtain satisfactory results, the formation of an adequate surgical team improves the effectiveness of LLDN. A surgical team with an experienced surgeon was shown to have a significantly shorter operating time, less estimated blood loss, and a shorter length of stay. Likewise, ideal surgical assistance was also independently associated with shorter operative time. Thus, the successful implementation of a laparoscopic donor nephrectomy program is equally linked to the surgical expertise of the transplant surgical team.(5)

The adoption of a laparoscopic hand-assisted living donor nephrectomy (HALDN) makes it possible to combine the advantages of pure laparoscopy with those of open surgery. Manual assistance allows easy and safe exposure of the hilum elements, reducing the duration of the operation and allowing rapid removal of the organ graft after control of the hilum. Among the specific advantages of the HALDN versus pure laparoscopic donor nephrectomy are: a faster and simpler technique that allows starting laparoscopy in hospitals with low volume; controlled and safe access to the peritoneal space; less stress for the surgical team; improved control of complications; hand-assisted port can be used to extract the organ; may avoid reconverting an initial laparoscopy because of intraoperative complications by placing the hand-assisted port.(6)

In the High Specialty Regional Hospital of the Yucatan Peninsula (HRAEPY), a public tertiary hospital in South-east Mexico, the hand-assisted laparoscopic technique has been implemented since 2011, but there are no reports to date showing the results. However, published research

from another hospital in Mexico, Razón et al.(7,8) showed that HALDN is a safe procedure with less postoperative pain, shorter hospital stays, earlier rehabilitation, and has become the standard treatment, with a 0.23% rate of life-threatening or permanently debilitating complications and a 0.02% mortality rate.

We report the results of the HALDN program at HRAEPY, describing donor kidney glomerular filtration rate after nephrectomy and the surgical complications using the Clavien-Dindo classification. This report aims to improve nephrectomy programs, providing evidence from our local health services, contributing to a better understanding on living donor nephrectomy.

## **MATERIALS AND METHODS**

This is a descriptive study of 30 clinical cases of patients with HALDN surgical procedures at the HRAEPY from November 2012 to May 2019. The study includes cases of patients who underwent HALDN with adequate follow-up of renal function and reported the presence or absence of surgical complications. The exclusion criteria were: records with incomplete follow-up data on renal function or complications, unreadable data of patients who underwent HALDN, and missing files.

For the statistical analysis of the study, measures of central tendency such as the arithmetic mean were used to describe the results obtained, as well as measures of dispersion to describe the variation of some variables.

## **RESULTS**

### **Characteristics of the sample**

From a total population of 34 patients who underwent donor nephrectomy in the period from November 2012 to May 2019, 4 were excluded due to lack of clinical records, so the final sample included 30 cases. All patients were registered in the database of the hospital's renal transplant service. The main clinical-demographic characteristics of interest are shown in Table 1.

### **Glomerular filtration rate**

To evaluate the renal function of the donors the glomerular filtration rate was calculated, before nephrectomy it was 116 ml/min/1.73 m<sup>2</sup>. It was found that at an average 6.3 months (minimum 1 month maximum 12 months) after nephrectomy (first follow-up visit) the average glomerular filtration rate was 83 ml/min/1.73 m<sup>2</sup>.

### **Post-surgical complications**

There were no surgical complications according to the Clavien-Dindo classification. Table 2 describes the mean creatinine and glomerular filtration rate of the patients before and after surgery.

### **DISCUSSION**

As a renal function replacement therapy, renal transplantation is increasing day by day. In Mexico 17,000 people are on the waiting list for a the kidney transplant by the year of 2021.(1) Currently, there has been an exponential growth in the population with end-stage renal disease, which has led to an increase in the number of individuals on dialysis, hemodialysis, and transplantation lists. It is well known that the latter continues to be the treatment of choice for the recovery and integration of the subject to a more normal life with a decrease in costs concerning the other options. However, in the Mexican population, the number of cadaveric donors has not increased as has the waiting list for organs. Therefore, live donation continues to increase. There are still questions about the evolution of living donors in terms of complications and renal function and whether this evolution is influenced by the type of surgery performed.(9)

The results obtained in these clinical cases report showed a decrease in the glomerular filtration rate after nephrectomy. Previous studies by Garg et al.(10) show a reduction in glomerular filtration rate, which is established at 86 ml/min/1.73m<sup>2</sup> at seven years of follow-up of the donation; however, in this study, it was observed that this approximate result of 83 ml/min/1.73m<sup>2</sup> was present in individuals with a follow-up of only 6.3 months on average. It is of interest to mention that the fact that the donor patient presents a decrease in renal function does not automatically translate into renal deterioration. Since this follow-up was short-term, we cannot state with certainty that renal function will not increase over time. The ideal step would

be to give these individuals a long-term follow-up and compare their function concerning this baseline. It can be considered that donor nephrectomy is not a harmless procedure, since it does lead to changes in the renal function of individuals. Furthermore, it is feasible that self-care, which should be greater for this type of individual, improves their quality of life and health with respect to their healthy controls.

It was found that no donor had surgical complications; this could be attributed to adequate pre- and trans-surgical management by the entire team in charge of the donor patient, from hospital admission and preparations for surgery to surgical management, technique, and preparation in the operating room. However, the observational and retrospective design of the study does not allow causal interpretations in this regard. The literature in Mexico in HALDN, such as the report by Razon et al.(7), showed 3.33% intraoperative complications.

It is worth mentioning some characteristics of the sample. It was observed that the male sex represented the highest percentage of donors, being the male siblings having the highest percentage of the donation. The average age of the donor was 33.1 years; this is relevant because patients at this age are labor and economically productive, so if there were the possibility of renal damage in this population, this would be reflected in the economy of society. Regarding the height, weight, and body mass index (BMI) of the patients, although the overall average body mass index is slightly increased, 11 patients presented obesity based on BMI. It has been observed that donors with a body mass index above 30, have a higher incidence rate of surgical complications (wound healing disorders, wound dehiscence, wound infection) and metabolic complications (arterial hypertension, impaired fasting glucose, diabetes mellitus). Other risk factors such as chronic degenerative diseases were absent. Laboratory studies (i.e. blood or urine tests) did not show any abnormality that could lead to any complication, such as the presence of urinary tract infection. It is important to mention that 26% of patients presented dyslipidemia, possibly related to the local diet (Yucatan peninsula), characterized by high consumption of pork and fat. Mexico is one of the countries with the worst ratings in terms of diet and obesity.(11) The importance of this parameter should be evaluated for future studies and emphasis should be placed on strict control of dyslipidemia in patients who are candidates for kidney donation.

Regarding the surgical approach, HALDN is the standard in our institution. When comparing our experience with other series of hand-assisted laparoscopic surgery we found a series of fewer

than 100 patients. In the study of Greco et al.(12) that was performed in highly concentrated centers and with surgeons who have overcome the learning curve, we identified that the results of warm ischemia, surgical time, and bleeding are better than in our series; however, the days in hospital stay are very similar.

Although 30 subjects are considered a small sample, it should be taken into account that this hospital is relatively recent. In the future, a homogeneous database could be completed with other local, national and international hospitals.

## CONCLUSIONS

Laparoscopic hand-assisted living donor nephrectomy is a very common procedure. Our results show that this procedure can be safely offered even in low volume centers as there were no surgical complications, Nephrectomy is a safe procedure that has an expected deleterious effect on donor renal function.

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<b>Table 1. Clinical-demographic characteristics of 30 kidney donor patients.</b>		
	<b>N or Mean</b>	<b>Percentage or Range</b>
<b>Demographic characteristics of donor patient</b>		
Sex:		
Female	12	40.0 %
Male	18	60.0 %
Relation with the receptor:		
Brother	10	33.3 %
Sister	4	13.3 %
Husband	3	10.0 %
Wife	3	10.0 %
Father	1	3.3 %
Mother	1	3.3 %
Other (cousin, friend, daughter, son)	8	26.6 %
Age (years)	33.1	18 - 55

<b>Clinical characteristics of donor patient</b>		
Height (centimeters)	155	138 - 170
Weight (kilograms)	67	45 – 89
BMI (Body mass index)	27.6	20 - 37
Patients with chronic degenerative diseases	0	0.0 %
Patients with previous surgeries	5	16.6 %
Patients with alterations in blood tests	0	0.0 %
Presence of dyslipidemia (hypercholesterolemia and hypertriglyceridemia)	8	26.0 %
Abnormal urine tests	0	0.0 %
Surgical approach:		
HALDN	29	96.6 %
Open surgery	1	3.3 %
Conversion from laparoscopic to open approach	0	0.0 %
Side of the surgery:		
Left	28	93.3 %
Right	2	6.6 %
Surgery time (minutes)	220	140 - 330
Intraoperative bleeding (milliliters)	165	30 - 400
Transfusions during surgery	0	0.0 %
Warm ischemia time (minutes)	2.3	.4 – 7
Clavien-Dindo Surgical Complications	0	0.0 %
Hospital stay (days)	3.6	3 – 6



**Table 2. Filtration rate of the patients before and after surgery (N=30)**

	<b>Mean</b>	<b>SD</b>	<b>Minimum</b>	<b>Maximum</b>
Pre-surgical creatinine mg/dl.	0.76	0.17	0.50	1.10
Pre-surgical glomerular filtration rate (ml/min/1.73 m <sup>2</sup> )	116.10	14.50	75.00	140.00
Post-surgical creatinine mg/dl	1.08	0.18	0.70	1.4
Post-surgical glomerular filtration rate (ml/min/1.73 m <sup>2</sup> )	83.66	16.46	56.00	124.00

