

Safety and quality of life of living kidney donors. Comparison between two techniques

Seguridad y calidad de vida de los donadores renales. Comparación entre dos técnicas

Estefanía Navarro-Del Río^{1*}, Alejandro Lugo-Baruqui¹, Rodrigo Prieto-Aldape²,
Concepción Oseguera-Vizcaíno¹, and Marco A. Covarrubias-Velasco¹

¹Unidad de Trasplantes, OPD Hospital Civil de Guadalajara Fray Antonio Alcalde; ²Centro Universitario de Ciencias de la Salud, Universidad de Guadalajara. Jalisco, Guadalajara, México

Resumen

Background: Currently there are no studies that determine the safety and quality of life of kidney donors in Mexico. **Objective:** To determine the safety of being a kidney donor and the quality of life, comparing the open approach with hand-assisted laparoscopic technique. **Method:** Observational, cross-sectional, analytical study of the kidney donors in our hospital from January 2015 to December 2018, in two groups: open technique and hand-assisted laparoscopic. To determine safety, the Clavien-Dindo scale and transoperative bleeding were used, and the SF-36 health-related quality of life questionnaire was applied. **Results:** There are no reports of peri-operative complications in any type of approach. All the patients obtained a grade I in the Clavien-Dindo scale. When the difference in the score of the SF-36 health-related quality of life questionnaire in kidney donor patients with hand-assisted laparoscopic surgical approach versus open approach was compared, a difference between both means of 14.05 was obtained, with $p < 0.0001$ in favor of the hand-assisted approach. **Conclusions:** Being a kidney donor is safe and the approach that we recommend is hand-assisted laparoscopic nephrectomy.

Keywords: Kidney transplant. Kidney donor. Quality of life. Safety. Nephrectomy.

Abstract

Antecedentes: Actualmente en México no hay estudios que determinen la seguridad y la calidad de vida de los donadores renales. **Objetivo:** Determinar la seguridad de ser donador renal y la calidad de vida, comparando el abordaje abierto frente al laparoscópico mano-asistido. **Método:** Estudio observacional, transversal, analítico, de todos los donadores renales de nuestro hospital de enero de 2015 a diciembre de 2018, con seguimiento mínimo de 2 años. Se dividieron en dos grupos: operados con técnica abierta o laparoscópica mano-asistida. Para determinar la seguridad se utilizaron la escala de Clavien-Dindo y el sangrado transquirúrgico, y se les aplicó el cuestionario SF-36 de calidad de vida relacionada con la salud. **Resultados:** No se reportan complicaciones transquirúrgicas en ningún tipo de abordaje. Todos los pacientes obtuvieron grado I en escala de Clavien-Dindo. En el puntaje del cuestionario SF-36 en pacientes donadores renales con abordaje quirúrgico laparoscópico mano-asistido versus abordaje abierto se obtuvo una diferencia entre ambas medias de 14.05, con $p < 0.0001$ a favor del abordaje mano-asistido. **Conclusiones:** Ser donador renal es seguro y el abordaje que recomendamos ofrecer es el laparoscópico mano-asistido.

Palabras clave: Trasplante renal. Donador renal. Calidad de vida. Seguridad. Nefrectomía.

*Correspondence:

Estefanía Navarro-Del Río
E-mail: ssteph.navarro@gmail.com

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Introduction

Chronic kidney disease (CKD) has become a public health issue in the Mexican population. Nearly 8% of Mexicans have CKD, and the incidence rate of end-stage kidney disease has increased dramatically along with risk factors such as type 2 diabetes mellitus, hypertension, obesity, and dyslipidemia¹. Back in 2019, CKD was the 10th leading cause of death in Mexico, with 14,630 deaths reported².

Renal transplantation (RT) is the preferred replacement therapy for patients with end-stage CKD to increase survival and quality of life³.

Although, historically, RT has grown significantly in Mexico³, the waiting list for organ recipients is 5 times larger than the number of patients who actually end up receiving a transplant⁴. Unlike other countries like the United States or Spain, most kidneys in Mexico come from living donors⁵. It has been documented that recipients of a kidney graft from a living donor have better survival rates than those who receive a graft from a deceased one. This different survival is similar for grafts from related and unrelated living donors, which is one of the main reasons why the number of transplants from unrelated living donors has been increasing non-stop worldwide⁶.

Living kidney donation for transplantation purposes is unique among surgical procedures in that a perfectly healthy person undergoes surgery not for his/her own benefit but for the benefit of someone else. The risks associated with unilateral nephrectomy for the donor include perioperative or short-term morbidity and mortality along with the long-term risk of living with only one kidney⁶.

Very few studies have been conducted on the quality of life of kidney donors. Currently, in our setting, there are no studies determining the safety and quality of life of renal donors, and although it is a common practice, it is essential to determine these factors to make sure that performing live donor RT results in two healthy patients with a good quality of life, which is the primary goal of transplant surgery⁷. The study was conducted to determine the safety profile of being a kidney donor and how it affects quality of life, comparing the open and hand-assisted laparoscopic approaches, which happen to be the only two types of surgeries performed in our center since it is a public hospital with limited resources available.

Method

This was an observational, cross-sectional, and analytical study that examined all patients from the transplant unit of our hospital treated with nephrectomy for kidney donation from January 2015 through December 2018.

The patients were divided into 2 groups based on the approach used: open surgery or hand-assisted laparoscopic surgery. The main variables analyzed were the type of donor (related or unrelated), the surgical approach (open or hand-assisted laparoscopic), procedural time, anatomical variants, blood loss, transfusion requirements, intraoperative and postoperative complications according to the Clavien-Dindo classification, pre- and post-nephrectomy working activity, glomerular filtration rate before and after nephrectomy, and quality of life assessed using the 36-item short form health-related quality of life questionnaire via telephone calls.

The inclusion criteria were all adult living kidney donors during the aforementioned period, with a minimum follow-up of 2 years. The exclusion criteria included patients with incomplete health records, those who did not respond to the telephone call, those who did not give their prior written informed consent to be included in the study or those who died due to causes unrelated to kidney donation.

For normality testing, the Kolmogorov-Smirnov test was used. Based on their distribution, quantitative variables were expressed as measures of central tendency and dispersion, and the qualitative ones as absolute frequencies and percentages. Hypothesis testing was performed to assess quality of life using the SF-36 questionnaire as the main variable. The chi-square test or the Fisher's exact test was used to study qualitative or categorical variables, and the Student t test or the Mann-Whitney U test to analyze the quantitative ones, as appropriate. Statistical analysis was performed using GraphPad® version 6.01 and the Excel® spreadsheet program. P values < 0.05 were considered statistically significant.

Results

A total of 109 renal donor patients who met the previously mentioned inclusion criteria were included in the study. Among them, 91 (83.4%) underwent hand-assisted laparoscopic nephrectomy, none of them requiring conversion to open surgery. The remaining 18 patients (16.6%) underwent open nephrectomy.

Table 1. Demographic characteristics of both groups

Variables	Hand-assisted laparoscopic approach: 91 (83.4%)	Open surgery: 18 (16.6%)	p
Sex (feminine)	56 (62%)	9 (50%)	-
Age (years)	36.4 (SD, $\pm$ 10.3)	38.1 (SD, $\pm$ 11.7)	0.69
Relationship (related)	72 (79.1%)	16 (88.9%)	0.51
Weight (kg)	63.1 (SD, $\pm$ 10.6)	66.3 (SD, $\pm$ 11.8)	0.27
Height (m)	1.66 (SD, $\pm$ 0.07)	1.68 (SD, $\pm$ 0.07)	0.30
Working life pre-donation (yes)	73 (80%)	12 (66.6%)	0.22
Glomerular filtration rate pre-donation (mL/min)	115.7 (SD, $\pm$ 9.8)	117.2 (SD, $\pm$ 10.7)	0.50

SD, standard deviation.

No statistically significant differences were found in the demographic variables between the two groups.

The decision to perform either one was determined by the resources available and the patient's decision at the time of RT.

The mean ages of patients undergoing hand-assisted laparoscopic nephrectomy and open surgery was 36.4 and 38.1 years, respectively. Regarding the donors' demographic variables (sex, relationship with the recipient, weight, height, preoperative working activity, and glomerular filtration rate), no statistically significant differences were seen between the two groups (Table 1).

None of the donors had chronic-degenerative diseases (diabetes, hypertension, chronic kidney disease [CKD] or heart diseases) prior to nephrectomy, and at the time of the study, none of them had developed any of these either.

Regarding the intra- and postoperative outcomes of the different groups studied, no statistically significant differences were seen in the kidney provided, the anatomical variants reported, procedural time or the length of stay. However, a statistically significant difference was found regarding bleeding, higher in the open approach group, although no patient required blood transfusions during or after nephrectomy (Table 2). All patients experienced grade I complications according to the Clavien-Dindo scale. At the time of the study, no donor deaths have been reported.

The mean glomerular filtration rate reported before nephrectomy was 115.7 mL/min in patients treated with hand-assisted laparoscopic approach and 117.2 mL/min in those treated with open surgery, with no statistically significant differences between the two being reported. The mean glomerular filtration rate of donors before and after hand-assisted laparoscopic nephrectomy was -7.5 (standard deviation [SD], $\pm$ 1.4; 95% confidence interval [CI], -10.3 to -4.6 ; $p < 0.0001$)

post-nephrectomy (latest value ever reported in the health records at the time of the study). The difference in the mean glomerular filtration rate of donors before and after open nephrectomy was -9 mL/min ($p = 0.01$) after surgery.

A total of 78% of the patients said they had a job prior to nephrectomy. However, at the time the study, only 65.1% were employed. Among them, a difference was seen in the number of donors with working activity before and after the hand-assisted laparoscopic surgery (relative risk [RR], 1.2; 95%CI, 1.01 to 1.45; $p = 0.04$). However, none of them reported it was directly related to their condition as renal donors. The different working activity before and after surgery in donors with open nephrectomy was of only 1 patient, which was not statistically significant.

When the differences in the scores obtained in the SF-36 health-related quality of life questionnaire of renal donor patients were compared between hand-assisted laparoscopic surgery and open surgery, the mean scores were 95.83 (SD, $\pm$ 0.53) and 81.79 (SD, $\pm$ 3.15), respectively. The difference between the two means was 14.05 (SD, $\pm$ 1.8; 95%CI, 17.68 to 10.41; $p < 0.0001$), which was statistically significant.

When we analyzed the groups and split the scale by functions, we found that all of them, except for social functioning decreased significantly in patients who underwent open surgery, especially regarding bodily pain, with a mean score of 73.88, and the emotional role, with a mean score of 38.88 (Fig. 1).

Discussion

RT is a procedure that has become widely popular in our region. Several studies have been published on the benefits patients with end-stage renal

Table 2. Intra- and postoperative outcomes of both groups

Variable	Hand-assisted laparoscopic approach	Open surgery	p
Kidney (n)	Left: 84 (92.3%) Right: 7 (7.7%)	Left: 17 (94.5%) Right: 1 (5.5%)	1.00
Anatomical variants (yes)	15 (16.4%)	3 (16.6%)	1.00
Procedural time (min)	99.4 (SD, $\pm$ 8.7)	100.3 (SD, $\pm$ 8.1)	0.58
Bleeding (mL)	20 (IQR, 20-30)	40 (IQR, 20-55)	0.002
Length of stay (days)	2.4 (SD, $\pm$ 0.5)	2.6 (SD, $\pm$ 0.5)	0.11

IQR: interquartile range; SD: standard deviation.

Greater bleeding was seen with the open approach compared to the hand-assisted laparoscopic approach, with a statistically significant difference without impacting procedural time or the length of stay.

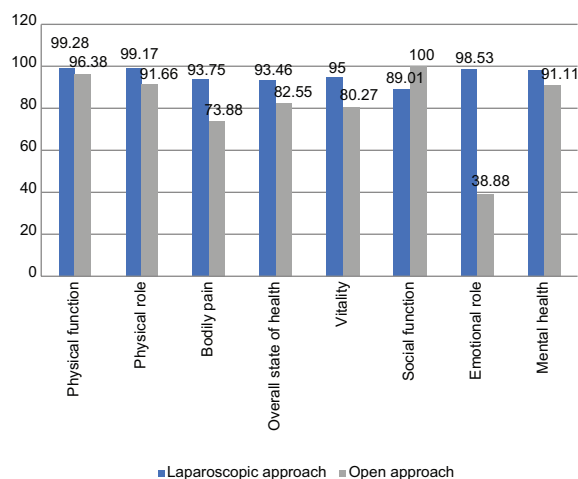


Figure 1. SF-36 questionnaire scores according to its dimensions. The SF-36 health questionnaire evaluates 8 areas on a scale from 0 (worst health status) to 100 (best health status) using algorithms and indications provided in the questionnaire's interpretation manual. Higher scores indicate better quality of life. The results obtained with the hand-assisted laparoscopic approach were the best ones in all areas except for social functioning. The area most affected by open surgery was the emotional role.

disease (ESRD) obtain from RT. In many countries across the world, deceased donor transplantation is preferred to avoid risking the life of a living donor. In our country, the demand of kidneys for this kind of patients exceeds the supply of deceased donors, making the living donor the best option to this date. Jalisco, Mexico is the state with the highest number of patients with chronic kidney disease^{8,9}, and our center is the largest public hospital in Western Mexico providing specialized care to patients without any kind of medical or social coverage, and during the study period, the second largest public hospital in Western Mexico in the number of RTs performed⁵.

Due to the need and benefit for renal recipients to have a living donor, we must ensure that the lives of these donors are not put at risk.

In terms of surgical safety, we followed the recommendations from the Vancouver and Amsterdam forums regarding the care of renal donors^{10,11}. We measured intraoperative bleeding, intra- and postoperative complications using the Clavien-Dindo scale¹², and mortality as the main variables to determine safety.

It is well-known that obesity increases the risk of complications in renal donors¹³. However, overall, our donors, are not obese, and based on our observations of our population, the body mass index is not a factor to determine the type of surgical approach that should be used.

Most studies comparing open and laparoscopic nephrectomy agree that laparoscopic nephrectomy takes longer (150 min compared to the 145 min of open nephrectomy)¹⁴. Studies comparing the hand-assisted and the pure laparoscopic techniques agree that the former is faster. However, there is no statistically significant difference between the two. The Mayo Clinic group (Rochester, MN, United States) reports a mean time of 121 ± 29 min for the hand-assisted laparoscopic nephrectomy¹⁵. Our procedural time is shorter than that reported in the medical literature. Procedural time may be an indirect determinant of difficulty in surgery, reflecting intraoperative complications and bleeding. In our study, no intraoperative complications were reported in either approach during this period. The reported bleeding was minimal, below what is found in the literature, although it was higher in the open approach, as expected. Our procedural time is shorter than what has been reported in the literature. Procedural time can be an indirect determinant providing insight on how

difficult surgery will be regarding complications and intraoperative bleeding. Nonetheless, no intraoperative complications were reported for either one of the two approaches during this period. The bleeding reported was minimal, and below what is commonly found in the medical literature. However, as expected, it was higher in the open approach.

The rate of postoperative complications in the medical literature ranges from 2% to 14%, while mortality ranges from 0.03% to 0.4%¹⁶. In our study, no postoperative complications were reported according to the Clavien-Dindo scale, since all our patients were categorized as grade I. At this point, no mortality has ever been reported. We should mention that one of the study limitations is that this is a retrospective, short-term study, and the appropriate time to measure long-term outcomes has not been established yet.

One of the greatest fears associated with living kidney donors is the risk of developing CKD. Although the glomerular filtration rate may drop by up to 50% immediately after nephrectomy, the risk of developing CKD has not been found to increase compared to the overall population¹⁷. Our patients' outcomes are consistent with those reported in the medical literature available.

Nowadays, it is necessary to address quality of life after a medical procedure. Although a consensus has not been reached on the best way to measure health-related quality of life, the SF-36 scale is one of the most widely used ones worldwide¹⁸.

In living donor RT, favorable results must be guaranteed for both donor and recipient. Most studies conclude that renal donors have an excellent quality of life after donation¹⁹.

In our study, although we expected patients treated with open nephrectomy to have a lower quality of life compared to those treated with hand-assisted laparoscopic nephrectomy, the difference was significant. The quality of life of patients treated with hand-assisted laparoscopic nephrectomy was better. Bodily pain and emotional role were impacted significantly in patients with open nephrectomy, whereas donors treated with hand-assisted laparoscopic nephrectomy did not experience this decline.

Several studies have been conducted on the renal donors' emotional role. Back in 2006, Clemens et al.¹⁹ reported depression rates from 5% to 23% in kidney donors. In a retrospective study conducted on U.S. donors, Lentine et al.²⁰ found cumulative depression rates of 4.2% and 11.5% 1 year and 5 years after donation, respectively. The donor's risk factors

associated with depression include being an unrelated donor, the death of the recipient, and renal graft failure. While donors undergo psychological and psychiatric evaluations as part of the pre-transplant protocol, post-donation follow-up is necessary to prevent adverse outcomes²⁰. We believe that esthetics always comes second when it comes to surgical approaches. However, cosmetics is important for the patients on the psychological level, especially if surgery is unnecessary for their health, as is the case with kidney donation.

Conclusions

Based on the aforementioned results, we determined that there is no difference regarding safety when comparing donor nephrectomy with open surgery and hand-assisted laparoscopy. However, there is a significant difference regarding quality of life, with hand-assisted laparoscopic nephrectomy showing better results. Therefore, we believe that the latter should be the first-line therapy here.

In Mexico, no studies have ever been conducted to determine the quality of life of the overall population using this scale, so we could not compare our results with the quality of life of the overall population. Despite this limitation, we firmly believe that based on these results, living donor RT can still be offered as a safe method for both donor and recipient. We consider the hand-assisted laparoscopic approach to be the best option, given our results. However, if the necessary resources are not available, open nephrectomy with donation purposes is a viable alternative.

As far as we know, this is the first study of its kind ever conducted in Mexico, making it worthwhile to continue with a long-term, prospective study to determine the quality of life of renal donors.

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None whatsoever.

Conflicts of interest

none reported.

Ethical disclosures

Protection of human subjects and animals in research. The authors declare that no experiments were performed on humans or animals for this study.

Patients' data protection. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

References

- García-García G, Gutiérrez-Padilla AJ, Chávez-Iñiguez J, Pérez-Gómez HR, Mendoza-García M, González-De la Peña MM, et al. Identifying undetected cases of chronic kidney disease in Mexico. Targeting high-risk populations. *Arch Med Res*. 2013;44:623-7.
- Instituto Nacional de Estadística y Geografía. Mortalidad general 2019. (Cited 21-07-2021.) Available from: <https://www.inegi.org.mx/sistemas/olap/registros/vitales/mortalidad/tabulados/ConsultaMortalidad.asp>.
- Gabilondo F, Gabilondo B, Arroyo C. El estudio del donador vivo para trasplante renal. *Rev Invest Clin*. 2005;57:195-205.
- Tamayo y Orozco JA, Lastiri Quirós HS. La enfermedad renal crónica en México. Hacia una política nacional para enfrentarla. Academia Nacional de Medicina de México. México: Intersistemas;2016. Disponible en: https://www.anmm.org.mx/publicaciones/ultimas_publicaciones/ENF-RENAL.pdf.
- Centro Nacional de Trasplantes. CENATRA. Estadísticas 2021. (Cited 11-08-2021.) Available from: http://cenatra.salud.gob.mx/transparencia/trasplante_estadisticas.html.
- Ghods AJ. Living kidney donation: the outcomes for donors. *Int J Organ Transplant Med*. 2010;1:63-71.
- Klop K, Timman R, Busschbach J, Dols L, Dooper I, Weimar W, et al. Multivariate analysis of health-related quality of life in donors after live kidney donation. *Transplant Proc*. 2018;50:42-7.
- United States Renal Data System. USRDS Home Page. (Consultado el 11-08-2021.) Disponible en: <https://adr.usrds.org/2020/end-stage-renal-disease/11-international-comparisons>.
- Méndez-Durán A, Ignorosa-Luna MH, Pérez-Aguilar G, Rivera-Rodríguez FJ, González-Izquierdo JJ, Dávila-Torres J. Estado actual de las terapias sustitutivas de la función renal en el Instituto Mexicano del Seguro Social. *Rev Med Inst Mex Seg Soc*. 2016;54:588-93.
- The Ethics Committee of the Transplantation Society. The consensus statement of the Amsterdam Forum on the care of the live kidney donor. *Transplantation*. 2004;78:491-2.
- Lentine KL, Kasiske BL, Levey AS, Adams PL, AlberúJ, Bakr MA, et al. KDIGO clinical practice guideline on the evaluation and care of living kidney donors. *Transplantation*. 2017;101:7-105.
- Clavien PA, Camargo CA Jr, Croxford R, Langer B, Levy GA, Greig PD. Definition and classification of negative outcomes in solid organ transplantation. Application in liver transplantation. *Ann Surg*. 1994;220:109-20.
- Chow G, Prieto M, Bohorquez H, Stegall M. Hand-assisted laparoscopic donor nephrectomy for morbidly obese patients. *Transplant Proc*. 2002;34:728.
- Sundqvist P, Feuk U, Häggman M, Persson AEG, Stridsberg M, Wadström J. Hand-assisted retroperitoneoscopic live donor nephrectomy in comparison to open and laparoscopic procedures: a prospective study on donor morbidity and kidney function. *Transplantation*. 2004;78:147-53.
- Li H, Stegall M, Chow G, Dean P, Heimbach J, Taner T, et al. Hand-assisted laparoscopic donor nephrectomy: experience with over 2400 cases at a single center. *Am J Transplant*. 2016;16 (Suppl 3):653.
- Segev DL, Muzaale AD, Caffo BS, Mehta SH, Singer AL, Taranto SE, et al. Perioperative mortality and long-term survival following live kidney donation. *JAMA*. 2010;303:959-66.
- Garg AX, Muirhead N, Knoll G, Yang RC, Prasad GV, Thiessen-Philbrook H, et al. Donor Nephrectomy Outcomes Research (DONOR) Network. Proteinuria and reduced kidney function in living kidney donors: a systematic review, meta-analysis, and meta-regression. *Kidney Int*. 2006;70:1801-10.
- Lins L, Carvalho FM. SF-36 total score as a single measure of health-related quality of life: Scoping review. *SAGE Open Med*. 2016;4:2050312116671725.
- Clemens KK, Thiessen-Philbrook H, Parikh CR, Yang RC, Karley ML, Boudville N, et al. Psychosocial health of living kidney donors: a systematic review. *Am J Transplant*. 2006;6:2965-77.
- Lentine KL, Schnitzler MA, Xiao H, Axelrod D, Davis CL, McCabe M, et al. Depression diagnoses after living kidney donation: linking U.S. Registry data and administrative claims. *Transplantation*. 2012;94:77-83.