

Laparoscopic versus open donor nephrectomy.

An appraisal on surgical outcome and post-operative course



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Maurizio Iaria, Enzo Capocasale, Raffaele Dalla Valle*,
Maria Patrizia Mazzoni, Mario Sianesi

Azienda Ospedaliero-Universitaria di Parma, Italy

Department of Surgery, Division of Surgery and Organ Transplantation

*Division of Emergency Surgery

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INTRODUCTION: *Laparoscopic living donor nephrectomy (LLDN) is supposed to be safe and effective and it ensures an excellent allograft function in the recipient. The use of laparoscopic technique is rapidly spreading in most transplant programs since it offers advantages over the open procedure. Aim of our study is to evaluate both surgical outcome and post-operative course in the LLDN group comparing with an historical series of open donor nephrectomies (ODN).*

MATERIALS AND METHODS: *From January 1992 to August 2008, 37 living donor nephrectomies were performed in our center. 23 nephrectomies were carried out, laparoscopically and 14 by open technique. Donors characteristics were comparable in both groups.*

RESULTS: *All laparoscopic nephrectomies were performed successfully without conversion. No significant differences were observed between the two groups for both surgical complication and graft and patient survival rates. Mean warm ischemia time ($p<0.04$), resumption of oral intake ($p<0.03$) and length of hospital stay ($p<0.0001$) were shorter in the LLDN group. Mean operative time ($p<0.036$) was longer in the LLDN group, whereas time to return to work and daily activities were similar ($p<0.52$).*

CONCLUSION: *Laparoscopic nephrectomy provides some post-operative advantages over the open technique without additional surgical risk ensuring comparable graft and patient outcomes. Therefore, LLDN has become the standard approach in our transplant center. However, the laparoscopic procedure should be performed only by experienced surgical staff in order to prevent serious complications in the donors.*

KEY WORDS: Laparoscopic nephrectomy, Living donor

Introduction

Over the past 10 years laparoscopic living donor nephrectomy (LLDN) has gained widespread acceptance as technique of choice over open donor nephrectomy (ODN) because it is associated with reduced post-operative pain, shorter length of hospital stay as well as faster return to daily activities ^{1,2}. Furthermore, it seems to provide sim-

ilar results in terms of patient and graft survival rates and to increase living kidney donation ¹. Surgeons major concern is to perform such technically-demanding procedure preserving donor safety.

Aim of this study is to analyze the surgical outcome along with the post-operative course of laparoscopic living donors comparing with the open donor nephrectomy.

Materials and methods

From January 1992 to December 2008, 37 living donor nephrectomies were performed at our Institution. 23 nephrectomies (65%) were carried out laparoscopically,

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Corrispondenza to: Dott. Enzo Capocasale, Via Gramsci 14, 43100 Parma, Italia (e-mail: ecapocasale@ao.pr.it).

TABLE I - Donors characteristics

Demographics	ODN	LLDN	P value
Sex (M:F)	4:9	8:14	—
Age	48±11	49±10	0.65
BMI	24,43±2,45	25,63±2,46	0.80
Cr. Clearance (ml/min)	83,5±22,08	98,5±19,32	0.06

whereas 14 (35%) using the open technique. The laparoscopic procedure was performed using 3 to 4 12 mm ports and the kidney graft was retrieved through a 7cm Pfannenstiel incision, whereas ODN was accomplished through a traditional lombotomic access. Both LLDN and ODN groups were comparable for age, sex, BMI and renal function (Table I). The LLDN group included an ABO-incompatible transplant. The left kidney was recovered in all but 1 case (95.7%) in the LLDN group, while in the ODN group the right kidney was preferred in 3 cases (21,4%). Each laparoscopic procedure was performed by the same surgeon.

7 vascular anomalies were encountered in the donors (6 in the LLDN group, 1 in the ODN group). LLDN and ODN groups were compared in terms of surgical complication rates and post-operative course. The Student's *t*-test was used to compare the two groups.

Results

DONORS

Neither deaths nor conversions were observed in the LLDN group. There was no significant difference in post-operative complication rates in both groups ($p=0.6$). The LLDN group displayed 1 intra-operative complication (2.7%) such as an ileal perforation occurred as a consequence of Veress needle's insertion. No mortality was registered in the ODN group. We had 1 case (7.1%) of post-operative bleeding which required blood transfusion, whereas in the LLDN group there were 3 complications (13%) such as 1 pulmonary atelectasis treated with bronchoscopy and 2 bleedings whose surgical treatment was mandatory.

Vascular anomalies were more frequently encountered in the LLDN group (3 double arteries, 3 lower pole arteries) comparing with the ODN group (1 lower pole artery). We did not find any increasing post-operative complication rate. Mean operative time was significantly shorter in the ODN group ($p<0.036$). In the last 11 patients of the LLDN group we had a significant decrease in mean operative time from 300 min \pm 46.56 to 224.5 min \pm 48.65 which was comparable to the mean operative time of the ODN group (224,61 min \pm 41.35) ($p=0.996$). Warm ischemia time was significantly shorter in the LLDN group (2.52 min vs. 3.31 min) ($p<0.04$).

Donors of the LLDN group tolerated well earlier oral intake (2-5 days vs. 4-6 days) ($p<0.0001$) and they had a significantly shorter mean length of hospital stay (7 days vs. 9 days) ($p<0.0001$).

Time to return to work and daily activities were similar in the two groups. At a median follow-up of 166.7 months in the ODN group (Cr.= 1.15 \pm 0.13 mg/dl) and 37.4 months in the LLDN group (Cr.= 1.18 \pm 0.16 mg/dl) ($p=0.69$) no differences in renal function were found.

RECIPIENTS

There were no differences regarding the incidence of delayed graft function (DGF) and urological complications (1 ureteral leak in the LLDN group vs. 1 late middle ureter stenosis in the ODN group). 2 vascular complications developed in the LLDN group: 1 renal artery thrombosis which led to graft loss and 1 late renal artery stenosis treated successfully with both PTA and endovascular stenting.

Allograft survival rate was slightly better in the LLDN group (95% vs. 85%), whereas creatinine values were not statistically significant (ODN Cr.= 1.43 \pm 0.34 mg/dl, LLDN Cr.= 1.33 \pm 0.30 mg/dl) ($p=0.35$).

Discussion

The spectrum of surgical complications and the quality of post-operative course in the living donor kidney population has been analyzed extensively in the literature. There is a good level of evidence that both LLDN and ODN provide overlapping results in terms of donor post-operative complication rates (5-26% vs. 3-38%).¹ Regarding post-operative recovery, the laparoscopic approach seems to offer few advantages such as less post-operative pain, early restart of oral intake, shorter length of hospital stay and faster return to work².

Furthermore, recipients still have low incidence of surgical complications (LLDN 0-31% vs. ODN 2-19%), graft (LLDN 93-100% vs. ODN 91-100%) and patient survival rates (LLDN 97% vs. ODN 100%) are preserved¹.

LLDN is a technically-demanding surgical procedure requiring specific training and consistent learning curve in order to avoid additional risks for the donor and to reach favorable graft outcome. Our learning curve was relatively short for two reasons: 1) the local surgical team already owned a long-standing experience in laparoscopic surgery, 2) we were trained by a laparoscopic surgeon with recognized expertise in the field (3). We believe those two factors led us to a zero conversion rate along with comparable post-operative complication rates between the two groups. Besides, our data were consistent with current literature⁴⁻⁶. As previously reported by

different Authors ^{2,6}, we also observed a shorter hospital stay and an earlier oral intake in the LLDN group. Laparoscopic kidney graft retrieval has been associated in previous reports with higher rate of DGF ⁴. Those data were not confirmed in our early experience (2.7%). We hypothesize that plentiful perioperative fluid administration, suitable anesthesiological management, low-pressure CO₂ pneumoperitoneum, short warm and cold ischemia times have led to a negligible rate of DGF. The mean operative time became shorter as we gained experience in the laparoscopic approach and now is comparable in both groups.

The presence of multiple arteries did not prevent laparoscopic kidney retrieval and was not associated with a higher rate of vascular complications ^{7,8}. No differences in urological complications were noted between the two groups. We suggest that this finding could be related to the routinary harvesting of the gonadal vessels along with the ureter, limiting the risk of ischemic injury. Favorable allograft survival rates in the LLDN group comparing with ODN group are most likely biased by the considerable difference in follow-up length (166.7 vs. 37.4 months).

As previously reported in the literature, our preliminary experience confirms that LLDN is at least as safe and effective than open approach providing post-operative benefits for the donors. In light of these results, LLDN is now considered the procedure of choice in our transplant program. Nevertheless, the laparoscopic procedure should be performed only by experienced surgical staff in order to prevent serious complications in the donors.

Riassunto

La nefrectomia nel donatore vivente deve essere una procedura sicura ed efficace e deve garantire un'ottima funzionalità renale nel ricevente. Mentre in passato l'intervento era eseguito con la tecnica open, attualmente il prelievo di rene viene effettuato, sempre più frequentemente, per via laparoscopica in quanto tale tecnica è associata ad una riduzione del dolore post-operatorio e dei tempi di degenza, consentendo inoltre una precoce ripresa dell'attività lavorativa. Nonostante la maggiore complessità della tecnica laparoscopica la sopravvivenza dell'organo e del paziente è sovrapponibile a quella ottenuta con la tecnica open. Scopo di questo studio è quello di confrontare l'approccio laparoscopico e la tecnica open analizzando le complicanze chirurgiche e la qualità del decorso post-operatorio. Dal Gennaio 1992 all'Agosto 2008 sono state eseguite 37 nefrectomie da donatore vivente, di cui 23 per via laparoscopica (LDN) e 14 con tecnica open (ODN). Le caratteristiche dei donatori era-

no sovrapponibili per età, sesso, indice di peso corporeo e funzionalità renale.

Le 23 nefrectomie laparoscopiche sono state portate a termine senza necessità di conversione. Si sono verificate 3 complicanze (13%) nel gruppo LDN ed 1 nel gruppo ODN (7.1%) (p=0.6). La ripresa dell'alimentazione (2-5 vs. 4-6 gg.) e la degenza postoperatoria (7 vs. 9 gg.) sono state significativamente più rapide nel gruppo LDN (p<0.0001), mentre il ritorno all'attività lavorativa è risultato sovrapponibile nei 2 gruppi (p<0.52). Nei riceventi non abbiamo osservato differenze significative nell'incidenza di complicanze chirurgiche e nella sopravvivenza dell'organo e del paziente.

In base ai nostri dati riteniamo che entrambe le tecniche possano essere considerate sicure ed efficaci, garantendo inoltre una buona funzionalità del graft. La laparoscopia, pur essendo tecnicamente più difficile e complessa, presenta alcuni vantaggi nel post-operatorio. E' comunque auspicabile che tale tecnica venga utilizzata solo presso centri di provata e specifica esperienza per evitare possibili gravi complicanze nel donatore.

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