

## Bilateral Native Nephrectomy: Before or After Renal Transplantation?

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### ABSTRACT

**OBJECTIVES:** We hypothesized that patients undergoing bilateral native nephrectomy have a better perioperative course and earlier recovery when renal transplantation is performed before nephrectomy rather than afterwards, since the anuric state is avoided.

**METHODS:** Of 9 patients undergoing bilateral nephrectomy between November 2000 and December 2005, 5 had nephrectomy before renal transplant and 4 had nephrectomy after transplant. Hospital course and complications within 3 months of each operation were compared.

**RESULTS:** Patients who underwent bilateral nephrectomy prior to transplantation spent more days in the hospital overall (mean = 25 days) than did patients who received their transplant before nephrectomy (mean = 14 days). Serum creatinine levels over the course of both operations were greater for the group maintained on dialysis, but both groups had similar values at the time of discharge from the second procedure and at 1-year follow-up. Major and minor complications were more frequent in those who underwent nephrectomy before transplant.

**CONCLUSION:** The order of operations for patients undergoing both bilateral nephrectomy and renal transplantation impacts perioperative course, especially in the first 3 months after the operations are completed. Bilateral native nephrectomy before renal transplantation is associated with a greater risk of complications and longer overall duration of hospitalization.

**KEYWORDS:** Transplantation, Nephrectomy, Laparoscopy, Postoperative complications

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### INTRODUCTION

Bilateral native nephrectomy is sometimes indicated in association with end-stage renal disease managed with kidney transplantation. In such cases, a major decision is whether to perform the bilateral nephrectomy before or after renal transplantation. Experience suggests that pre-emptive renal transplantation for patients with severe renal insufficiency

provides better outcomes than transplantation after the onset of end-stage renal disease [1-3]. Indeed, time on dialysis has been correlated with poorer transplant outcomes [4,5]. Even if the native kidneys do not have adequate function to stave off end-stage renal disease and the need for dialysis, native urine production may simplify dialysis and improve quality of life compared to oliguric end-stage renal disease, which is characterized by significant fluid shifts during dialysis. However, for some patients bilateral nephrectomy is required before renal transplantation due to factors such as

large native kidneys that preclude renal allograft placement, high-grade malignancy, uncontrolled hypertension, severe infection, and others. After bilateral nephrectomy, patients become completely anuric and consequently may be more poorly prepared to handle the strain of subsequent renal transplantation. We hypothesized that delaying bilateral nephrectomy until after renal transplantation leads to a more favorable overall short-term recovery than pre-transplant bilateral nephrectomy. To assess this hypothesis, we analyzed the perioperative course of patients receiving both renal transplantation and bilateral nephrectomy.

## MATERIALS AND METHODS

We explored the impact on patients' perioperative course of bilateral laparoscopic nephrectomy following transplantation compared to bilateral laparoscopic nephrectomy prior to transplantation. The group of patients studied consisted of 9 patients who underwent bilateral laparoscopic nephrectomy in association with renal transplantation at our institution between November 2000 and December 2005. All patients undergoing bilateral laparoscopic nephrectomy by a single surgeon were identified retrospectively from surgical logs. From the 23 patients who also had a history of renal transplantation, we finally selected 9 patients for our study who met the 2 inclusion criteria: (1) bilateral nephrectomy was planned and conducted in preparation for renal transplantation or purposefully delayed until after transplantation, and (2) nephrectomy was part of the patient's transplant plan and not an unrelated treatment.

All nephrectomies were laparoscopic, either transperitoneal hand-assisted or retroperitoneoscopic. When possible, the same midline hand-assistance incision was used for both sides. Specimen extraction was through the hand-assistance incision (with partial morcellation or enlargement of the incision as necessary) or using morcellation via the primary port in cases of bilateral retroperitoneoscopic surgery. All but 1 renal transplants were performed at our institution.

Medical records were reviewed retrospectively and with Institutional Review Board approval. Variables that were analyzed included: serum creatinine at transplant, serum creatinine at nephrectomy, serum creatinine at the time of discharge from the second operation, serum creatinine at 1-year follow-up, kidney weights, length of hospital stay for each operation and for both operations combined with any associated admissions for complications, and postoperative complications. Postoperative complications for both bilateral

nephrectomy and transplantation were divided into major and minor. Major complications were any that occurred within 3 months of either operation that necessitated a return to the operating room, an invasive intervention, or readmission into the hospital. Minor complications were defined as changes in a patient's health status that could be treated medically without an invasive procedure, either during the course of the patient's hospital stay or in an outpatient setting. Each patient's perioperative clinical course was considered to begin with the first operation and to conclude 3 months after the second operation. The small cohort precluded the reasonable application of statistical analyses.

## RESULTS

Of the 9 patients, 4 were placed into the Transplant-Nephrectomy group because they first underwent renal transplantation and then bilateral nephrectomy (transplant then nephrectomy, TN). The remaining 5 patients were placed into the Nephrectomy-Dialysis-Transplant group because they underwent bilateral nephrectomy prior to renal transplantation and were maintained on hemodialysis in the interim between operations (nephrectomy, maintenance on hemodialysis, then transplant, NDT). Out of the 9 patients, only 1 (in the NDT group) was in end-stage renal disease at the time of the first procedure.

Patient characteristics are listed in Table 1. Both age (49 vs. 40 years) and body mass index (28 vs. 22 BMI) tended to be greater in the TN group. Autosomal dominant polycystic kidney disease was the most common indication for nephrectomy (5 patients). There were 6 male patients evenly split between the 2 groups. The mean American Society of Anesthesiologists Score was similar in both groups.

Table 1 summarizes the perioperative patient characteristics. Of the laparoscopic nephrectomies, 1 in each group was retroperitoneoscopic and the others were bilateral hand-assisted transperitoneal. The mean total weight of the 2 kidneys among the TN group was 2,454 grams, compared to 1,800 grams in the NDT group. Average estimated operative blood loss during laparoscopic nephrectomies and the mean interval between operations was similar for both groups. NDT patients spent a mean of 9 days in the hospital following transplantation, while TN patients spent a mean of 5 days. After nephrectomy, NDT patients spent a mean of 6 days in the hospital compared to the TN group's 4 days. The durations of hospitalization after the first procedure were similar in the 2 groups (5 days in the TN group, 6 days in the NDT group),

but hospitalization was longer after the second procedures in the NDT group (9 days, compared to 4 days in the TN group). Complications resulted in a mean of 11 additional days in the hospital for NDT patients and 6 days for TN patients. The NDT group's total mean length of stay for both operations and complications was 25 days, and the TN group's was 14 days.

**Table 1. Perioperative Patient Characteristics and Outcomes**

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Parameter	TN	NDT	All
Number of Patients	4	5	9
Mean Years Age at Start of Treatment	49	40	44
Mean Body Mass Index	28	22	25
Mean American Soc. Anesthesiologist Score	2.3	2.4	2.3
Gender (Male/Female)	3/1	3/2	6/3
<i>Indication for Nephrectomy (No.)</i>			
ADPKD*	2	3	5
Renal Mass	1	0	1
Chronic Infection	1	1	2
Reno-vascular Hypertension	0	1	1
Route for Nephrectomy (HALS <sup>†</sup> /RP <sup>‡</sup> )	3/1	4/1	7/2
Renal Transplant Donor (Living/Deceased)	4/0	4/1	8/1
Mean Weight of Kidneys (grams)	2,454	1,800	2,045
Mean Estimated blood loss for Nephrectomy (ml)	250	244	247
Mean Days between Operations	145	130	137
Mean Days Hospitalization for Nephrectomy	4	6	5
Mean Days Hospitalization for Transplant	5	9	7
Mean Days Hospitalization for Complications	6	11	9
Mean Days Hospitalization Overall <sup>§</sup>	14	25	21

\*Autosomal Dominant Polycystic Kidney Disease; †Hand-assisted laparoscopic; ‡Retroperitoneoscopic; §Includes both procedures and any hospitalization for complications. Overall total appears different than sum because of rounding.

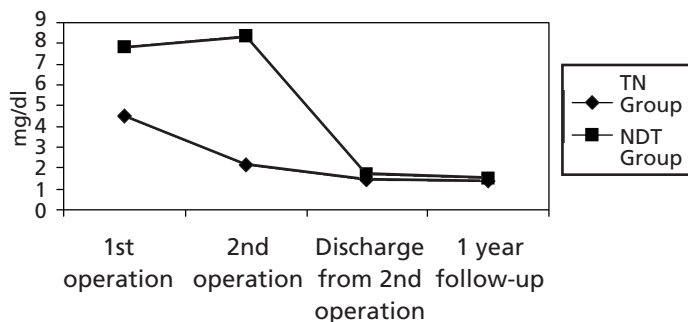
Serum creatinine levels over the course of both operations are plotted in Figure 1, revealing greater values in the NDT group over the course of the 2 procedures, but then similar values at the time of discharge from the second procedure and at 1-year follow-up.

Complications are shown in Table 2. Compared to the TN group, NDT patients had more complications, except for minor complications after bilateral nephrectomy. In both groups, more complications were experienced following the second operation. Some patients experienced more than 1 complication in each category. In the TN group, there were no major or minor complications following the first operation (renal transplant), compared to an average of 0.4 major complications and 0.4 minor complications per patient following the first operation (nephrectomy) in the NDT group. For the second operation, the average number of major and minor complications per patient was 1.0 and 0.75 in the TN group, compared to 2.0 and 1.4 in the NDT group.

## COMMENTS

This study analyzed short-term complications experienced by 9 patients who underwent both renal transplantation and bilateral laparoscopic nephrectomy. Our data showed that longer hospital stays and higher rates of major complications within the first 3 months after completion of both surgeries were associated with the NDT group's order of operations.

Despite similar blood loss associated with nephrectomy (250 mL in the TN group, 244 mL in the NDT group), NDT patients had a longer length of stay in the hospital and poorer renal function (indicated by their creatinine levels) at all times during the course of their operations. Both groups had similar serum creatinine levels after 1 year. Additionally, the TN group had fewer major and minor complications than the NDT group.



**Figure 1. Mean serum creatinine over time**

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We think it likely that the poorer renal function in the NDT group, after nephrectomy, contributed significantly to these differences. It is interesting to note that in both groups the second surgery was associated with more complications. This might be related to immunosuppression in group TN and time on dialysis in the NDT group. Of course, any person who has recently had major surgery might be expected to fare more poorly during a subsequent operation on this basis alone. As discussed by Papalois *et al.* [1], preemptive transplantation avoids the anephric state experienced by the NDT group. However, they found no difference in quality of life between patients who undergo preemptive transplant versus patients who are maintained on dialysis until transplantation. Similarly, Fuller *et al.* [6] saw no significant difference in perioperative morbidity between pre-transplant, concomitant, and post-transplant nephrectomy. As such, they recommended the concomitant approach for convenience. In our analysis, we did not consider concomitant native nephrectomy and renal transplantation, which is rarely performed at our institution. Interestingly, the series by Ismail *et al.* [7] suggested that bilateral nephrectomy concomitant with renal transplantation is associated with a very high rate of additional surgical procedures. They instead recommended staged laparoscopic bilateral nephrectomy followed by renal transplantation. Our results suggest that there are considerable short-term benefits if nephrectomy can be delayed until after transplantation (rather than performed before transplantation), including decreased time in the hospital and fewer major postoperative complications.

It is important to note the higher average serum creatinine at the outset of surgery in the NDT group. Patients who continue to make urine or have more renal function likely benefit more from leaving the native kidneys in place before transplantation compared to patients who are already oliguric. As such this difference in preoperative creatinine between the 2 groups does indicate a selection bias. That the NDT group had less kidney reserve at the beginning of the series of procedures likely contributed to their poorer perioperative experience and represents a selection bias in favor of the TN group—although we still feel that the order of the procedures is a major factor.

## CONCLUSIONS

When bilateral nephrectomy is required in association with renal transplantation, our data suggests that transplantation before nephrectomy is associated with a milder perioperative course than that associated with nephrectomy before transplantation. The former is the recommended order of

Table 2. Complications

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Statistic	TN	NDT
<b>Bilateral Lap. Nephrectomy</b>		
% Patients in Group w/ Major*	25%	40%
% Patients in Group w/ Minor <sup>†</sup>	50%	20%
<b>Renal Transplantation</b>		
% Patients in Group w/ Major	0%	60%
% Patients in Group w/ Minor	0%	80%
<b>1st Operation<sup>‡</sup></b>		
% Patients in Group w/ Major	0%	40%
% Patients in Group w/ Minor	0%	20%
<b>2nd Operation</b>		
% Patients in Group w/ Major	25%	60%
% Patients in Group w/ Minor	50%	80%
<b>All Operations</b>		
% Patients in Group w/ Major	25%	80%
% Patients in Group w/ Minor	50%	80%

\*Major complications included deep venous thrombosis, ileus, atrial fibrillation, acute tubular necrosis, pneumonia requiring intubation, respiratory failure, lymphocele requiring drainage, intractable abdominal pain requiring readmission, acute pancreatitis, necrotic bowel and obstruction, AV fistula thrombosis with loss of fistula, and gastrointestinal hemorrhage requiring blood transfusion.

†Minor complications included transfusion of blood products, diarrhea, clotted hemodialysis catheter, focal segmental glomerulosclerosis recurrence, urinary tract infection, steroid psychosis, difficulty weaning from respirator, cyclosporine toxicity, and paresthesias.

‡The first operation was transplant for the TN group and bilateral nephrectomy for the NDT group.

procedures unless nephrectomy must be performed first owing to a specific indication.

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