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# Retroperitoneoscopic Donor Nephrectomy: A Retrospective, Non-Randomized Comparison of Early Complications, Donor and Recipient Outcome with the Standard Open Approach

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## Abstract

***Objectives:*** We retrospectively performed a comparative analysis of retroperitoneoscopic and open donor nephrectomy in terms of donor complications, as well as recipient complications and functional graft outcome.
***Methods:*** A total of 134 donor nephrectomies including 69 open (ODN) and 65 retroperitoneoscopic (RDN) nephrectomies was analyzed retrospectively. Both groups were comparable in terms of age, body mass index (BMI), operating time (OPT), warm ischemia time (WIT) and blood loss.
***Results:*** There were no statistically significant differences with respect to recipient outcome, mean values for age, BMI, OPT and cold ischemia time (CIT). The overall donor complication rate did not differ. Early functional graft follow-up showed significant differences in 24 h-urine output between the two groups ($p < 0.001$), but serum creatinine was comparable after 7, 30, 180 and 365 days. The early rejection rate in the recipients was similar in the two groups.
***Conclusion:*** Retroperitoneoscopic donor nephrectomy (RDN) provides comparable perioperative features, such as operating time, warm ischemia time (WIT) and overall complication rate to the open donor nephrectomy (ODN). Additionally, it has no negative impact on recipients' operating time, graft ischemia and early graft function.


**Keywords:** Retroperitoneoscopy; Donor nephrectomy; Comparison of techniques; Recipient outcome; Laparoscopy

## 1. Introduction

Living donor nephrectomy is unique in that it affects a healthy individual rather than a sick person. This makes it a very demanding and sophisticated surgical procedure. The safety and efficiency of the surgical technique are of utmost concern for the donor and the recipient. Therefore, the surgical technique recommended must entail the lowest possible morbidity

*Abbreviations:* ODN, open living donor nephrectomy; HLDN, hand-assisted laparoscopic living donor nephrectomy; RDN, retroperitoneoscopic living donor nephrectomy; OPT, operating time; WIT, warm ischemia time; BMI, body mass index; CIT, cold ischemia time; CsA, Cyclosporine microemulsion; MMF, Mycophenolate Mofetil; SRL, Sirolimus; AZA, Azathioprine; FK, Tacrolimus; Pred, Prednisolone.

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without compromising the functional outcome of the graft.

Since the early 1990s, transperitoneal laparoscopic techniques have been successfully adapted for various open urologic procedures, including laparoscopic living donor nephrectomy which was first described in 1995 [1].

Only few centers have reported a large number of kidney donations performed with the retroperitoneoscopic approach [2–5]. The most frequent arguments against the retroperitoneoscopic approach are the difficulty in establishing the topography, the smaller working space and a probably steeper learning curve compared to the transperitoneal approach.

In this retrospective study, we analyzed the perioperative outcome and early complication rate of donors and recipients after retroperitoneoscopic donor nephrectomy (RDN) as compared to standard open donor nephrectomy (ODN).

## 2. Materials and methods

From November 1997 to March 2004, 69 ODN and 65 RDN were performed at the Basel University Hospital. Since November 2001, retroperitoneoscopy has become our favored approach for living donor nephrectomy after we had used a standard open approach for donor nephrectomy for more than ten years. Right-sided donor nephrectomy was performed in 45 donors (34%). Indications for right-sided nephrectomy are listed in Table 1. All potential donors were routinely evaluated according to a donation protocol. Their suitability was discussed in detail by the transplantation team comprising nephrologists, urologists, visceral and vascular surgeons, transplantation coordinators, immunological laboratories and psychosomatics experts. Preoperatively, a conventional or a contrast enhanced magnet resonance angiography was performed to evaluate the vascular anatomy in all donors.

All perioperative data including operating time (OPT), warm ischemia time (WIT) and complication rate of donors and recipients were prospectively collected in the RDN group and compared retrospectively with the ODN group.

**Table 1**
Indications for right-sided living donor nephrectomy

| | OLDN ($n = 69$) | RLDN ($n = 65$) |
|---|---|---|
| Left side | | |
| Multiple arteries | 13 | 9 |
| Upper/lower pole artery | 5 | |
| Early division of artery branch | 2 | 6 |
| Doubled pyelon | | 1 |
| Venous anomalies | 1 | |
| Right side | | |
| Arterial stenosis | 3 | 3 |
| Vascular dysplasia | 2 | |
| Total | $n = 26$ (37.7%) | $n = 19$ (29.2%) |

All intraoperative and postoperative complications within a period of 30 days were analyzed for this study. Intraoperative complications were immediately documented in the patient's chart by the surgeon. Postoperative complications were documented by the ward nurse or the ward resident. Complications after discharge were documented by an outpatient resident. Major complications were defined as complications that significantly detract from donor well-being, graft function or recipient well-being, including conversion, transfusion, re-operation or surgical graft damage.

A standard open extraperitoneal approach through a subcostal flank incision without rib resection was used in ODN. Our technique for RDN has recently been published in detail [6]. With the donor in a slightly overextended flank position, a 1–2 cm skin incision just below the tip of the twelfth rib is made and a small initial retroperitoneal space is created by index finger dissection. After insertion of a balloon dissector, the retroperitoneal space is bluntly dissected with infusion of approximately 800–1200 ml sterile 0.9% saline solution into the dissection balloon. We prefer to use water instaed of air, because the volume of infused water correlates exactly with extraperitoneal volume created by the following blunt balloon dissection. After removal of the balloon-dissector, a pneumoperitoneum is established with an intraabdominal pressure of 12–15 mmHg and the peritoneal reflection is bluntly mobilized antero-medially from the undersurface of the anterior abdominal wall with the tip of the camera in order to get a larger working working space and to be able to insert the additional trocars safely under vision. Intraabdominal pressures during nephrectomy above 15 mmHg are avoided. Finally, three more trocars ($2 \times 12$ mm, $1 \times 5$ mm) are inserted in a typically diamond position. Gerota's fascia is incised laterally and the hilum is exposed. Dissection of the renal vessels is performed first after the kidney has been freed from the covering fatty tissue. The ureter is carefully dissected and clipped with two absorbable 12 mm clips. Only harvesting of the kidney is performed with hand-assistance. For this purpose, the lower trocar access is enlarged up to 7–9 cm by a muscle split incision and the surgeon's hand is inserted directly into the retroperitoneum. The incision diameter is large enough to ensure a safe, quick and careful removal of the kidney. Pre- (and postoperative) administration of diuretics was abandoned after February 2003. However for intra vessel volume expansion saline infusion is increased immediately prior to transsection in order to improve early onset of renal graft function. The kidney is raised and the renal vessels are optimally exposed for transection that is performed using a TA*-30-2.5 (AutoSuture®) disposable stapler on both artery and vein. Subsequently, the kidney is stored on cold storage solution (Viaspan®) until a clear venous effluvium is visible. The kidney is put in a sterile plastic bag and taken forthwith to the next operation room, where the implantation is performed immediately.

Operating time (OPT) was defined as the period between skin incision and skin closure. We defined warm ischemia time (WIT) as the time from closure of the renal artery to the time when clear outflow of the cold irrigation solution (Viaspan®) in the renal vein was detected.

As part of a study protocol, recipients transplanted from February 1998 to December 2000 were randomized 1:1 to either triple therapy with CsA/MMF/Pred or FK/AZA/Pred. As part of a second study protocol, patients transplanted from January 2001 to October 2003 were randomized 1:1 to either SRL/MMF/Pred or CsA/MMF/Pred. From October 2002 all patients additionally received two doses of anti-interleukin-2 receptor antibody basiliximab (day 0 and day 4). All patients with clinical suspected acute rejection (creatinine increase more than 25% from baseline, weight gain, and