

# Native Nephrectomy in Kidney Transplantation, When, Why, and How?

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## Abstract

Native nephrectomy (NN) is not routinely performed in the context of kidney transplantation. Certain clinical circumstances necessitate performing NN such as large polycystic kidneys impairing patient's quality of life and hindering graft implantation. NN may be done either before, simultaneously with, or after kidney transplantation. Although several studies have reported the potential benefits of the pretransplantation approach, others defended the simultaneous approach postulating that it is feasible and satisfactory. Nevertheless, still the ideal timing of NN is not settled, and several factors determine the choice of nephrectomy timing, including the presence of pressure symptoms, residual diuresis, and adequate space for the graft and living (not deceased) kidney donation. Answering these questions will help in decision making to attain an individualized approach that would help in achieving optimum timing of NN in relation to kidney transplantation.

Keywords: kidney transplantation, native nephrectomy

## Introduction

Pretransplant recipient native nephrectomy (NN) is not the standard practice in kidney transplantation and usually both native kidneys are left in place. In some circumstances, NN may be beneficial and indicated in certain circumstances (Table 1); however, data to support or discourage are limited. The loss of residual excretory function and erythropoietin production are the main concerns should the graft fail, especially in pre-emptive transplantation.

Why? (Several indications exist for NN either unilateral or bilateral [1–3])

For patients with recurrent infection associated with nephrolithiasis, pre-transplant nephrectomy of native kidneys seems a reasonable therapeutic option. Stones requiring nephrectomy are usually complicated (staghorn stone) or infected (struvite stone) [4]. For

vesicoureteral reflux, the presence of recurrent pyelonephritis – especially when accompanied by a nonfunctioning kidney – is considered an indication for pretransplant nephrectomy despite paucity of evidence [5]. Regarding blood pressure control, benefits of NN have been reported from retrospective observations. Hypertension is very common after kidney transplantation and is one of the non-immunological causes of graft failure. Theoretically, NN is thought to ameliorate hypertension by removing the renin-secreting native kidneys. However, old reports from Norway did not find any significant improvement of blood pressure after NN as compared with a nonnephrectomized control group in a retrospective evaluation of 158 patients [6]. Nevertheless, another research group explored the outcomes of NN for a prolonged period after transplant and concluded that NN is effective to help blood pressure control, in resistant hypertension in renal transplant patients, but it starts to show up 3 months after surgery, and continues to work for a year and more [7]. Moreover, kidney transplant recipients with pre-transplant bilateral NN were found to have lower blood pressure and lower ventricular mass index compared with controls without nephrectomy [8]. Patients with autosomal dominant polycystic kidney disease (ADPKD) who had ipsilateral nephrectomy concomitantly with transplantation required less hypertensive medications after transplantation than controls [9]. A delayed contralateral nephrectomy for the same group improved blood pressure control to a greater extent [9]. Bilateral NN also helped in controlling resistant hypertension in five patients after kidney transplantation [10]. Thus, it seems that NN works for resistant hypertension, and the old reports about its poor results may ensue from multiple perioperative complications at that time. Patients with massive proteinuria may benefit from pretransplant nephrectomy. Nephrectomy decreases mortality, allows for growth (in children), and protects against renal graft thrombosis [11,12]. Moreover, there may be other special indications for NN in pediatric population with genetic disorders including Denys–Drash syndrome and patients

with primary hyperoxaluria. Denys–Drash syndrome is a rare genetic disorder consisting of pseudohermaphroditism, Wilms' tumor, and progressive glomerulopathy. Native bilateral nephrectomy is advised in patients with this syndrome, because the risk of developing Wilms' tumor is very high if native kidneys are left in place even if it was absent at the time of diagnosis [13]. In patients with primary hyperoxaluria, combined liver and kidney transplantation (CLKT) is the treatment of choice when the patient reaches end-stage kidney disease. However, plasma oxalate levels remain high several months after transplantation owing to slow excretion of the residual body oxalate. Those patients often require dialysis after transplantation to protect the graft. Recently, bilateral NN was performed at the time of CLKT in a child with primary hyperoxaluria [14]. This led to drastic decrease of oxalate levels eight-fold within hours after the operation then continued to decrease thereafter till reaching normal levels in less than 20 days (reported in the literature to occur within several months up to 3 years with some patients still having high oxalate levels even after 3 years of CLKT [15]). This can decrease the need for hemodialysis after transplantation and help protect the kidney against graft dysfunction from persistent hyperoxaluria. Timing of nephrectomy relative to graft placement is controversial and yet there is no consensus regarding the optimal timing in relation to transplantation. Although some studies reported similar outcomes when nephrectomy was performed before, during, or after kidney transplantation [21], a considerable number of other studies favor simultaneous NN [24,25].

When comparing nephrectomy timing either before, during, or after kidney transplantation, blood loss, operative time, and hospitalization length were nonsignificantly greater for the concomitant nephrectomy group; however, kidney allograft function and patient survival did not differ between the three groups [21]. Patient satisfaction was better with concomitant nephrectomy and kidney transplantation [22,25]. Another study reported excellent graft and patient survival with low morbidity with simultaneous ipsilateral nephrectomy and graft transplantation [26]. One more advantage of the simultaneous approach is that it allows for preemptive transplantation especially in the presence of well-planned living donor [27]. Despite all these advantages, a recent study reported an increased incidence of renal vascular thrombosis with the simultaneous bilateral nephrectomy approach in patients with ADPKD [24]. Regarding pretransplant NN, one study reported safer results with sequential laparoscopic bilateral NN followed by kidney transplantation than simultaneous nephrectomy and transplantation [28]. However, many drawbacks of this approach should be considered, notably the increased number of procedures to which the patient is exposed before kidney transplantation with risk of sensitization to human leukocyte antigen (HLA) antigens [25]. A recent retrospective report noted that the mean panel-reactive antibodies significantly increased after pretransplant NN was performed [24]. Moreover, rapid loss of residual kidney function with pretransplant NN leaves predialysis patients anuric, thus losing the

advantage of pre-emptive transplantation [25] (see Table 3). A third group of studies compared pre-kidney and postkidney transplant NN. In their cohort, post-transplant nephrectomy, especially when laparoscopically done, was very safe procedure with excellent comparable patient and graft outcomes plus a lower complication rate than pretransplant nephrectomy [29].

#### **How? (laparoscopic or open – unilateral or bilateral)**

The choice of surgical technique is still a controversial issue. Laparoscopic removal of cystic kidneys is increasingly used and is gaining more popularity rather than open nephrectomy. Many studies had shown the safety of performing laparoscopic nephrectomy with comparable results and better patient satisfaction than open nephrectomy [30–32]. Ipsilateral nephrectomy was chosen as the standard procedure for kidney transplantation in one hundred consecutive patients with ADPKD, with excellent graft and patient survival. In this study, simultaneous ipsilateral nephrectomy with kidney transplantation had lower surgical complications and less added time to the standard transplantation compared with bilateral nephrectomy.

#### **An individualized approach for autosomal dominant polycystic kidney disease**

Finally, as discussed before, no consensus is there regarding the optimal timing for NN relative to kidney transplantation especially in patients with ADPKD. An algorithm was recently proposed which can assist in choosing the best time and technique for NN in kidney transplantation [20]. This algorithm can be modified for optimum decision making (see Fig. 1) considering the following points: the presence of residual kidney function, the presence of adequate site for graft placement, the higher complication rate of the simultaneous approach, the potential hazards of the remaining kidney in cases when the unilateral approach is chosen, the presence of experienced surgeons for laparoscopic approaches, and the degree of patient satisfaction.

#### **Alternative options to native nephrectomy**

Indeed, when NN is indicated, surgery remains the gold standard but transcatheter renal arterial embolization may be a safer alternative option owing to its low morbidity [34]. However, it may not be a suitable option in the context of pre-emptive living donor kidney transplantation, as it takes as long as 6 months to achieve sufficient kidney volume reduction before grafting can be performed [35].

#### **Conclusion**

NN has several indications with kidney transplantation. Timing of NN is still a matter of debate. Each approach for NN has its benefits and drawbacks. Therefore, decision making should be individualized for each patient to reach the best clinical outcome.

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