Removal of Foley Catheters in Live Donor Kidney Transplant Recipients on Postoperative Day 1 Does Not Increase the Incidence of Urine Leaks

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Abstract

Keywords
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Catheterization of the urinary bladder during kidney transplantation is essential. The optimal time to remove the Foley catheter postoperatively is not universally defined. It is our practice to remove the Foley catheter on postoperative day 1 in live donor kidney transplant recipients who meet our standardized protocol criteria. We believe that early removal of Foley catheters increases patient comfort and mobility, decreases the risk of catheter associated urinary tract infections, and allows for decreased hospital length of stay. The hypothetical risk of early removal of Foley catheters would be the increased risk of urine leak. We reviewed 120 consecutive live donor kidney transplant recipients and found that there was not an increased incidence of urine leaks in patients whose Foley catheters were removed on postoperative day 1.

All aspects of perioperative and postoperative care of kidney transplant recipients need to be heavily scrutinized to ensure optimal patient safety and clinical outcomes. Innovations in care protocols must be tested in an evidence-based manner to demonstrate efficacy. Although postoperative urine output measurement with Foley catheterization is essential for kidney transplant recipients, the optimal duration of catheterization is not inexorable. The trend in most institutions is to err on the side of leaving the catheter in for a longer period of time, to ensure consistent urine output. Some[1] recommend catheter removal on postoperative day 5. The risks of prolonged Foley catheterization are manifold. The first is increased risk of catheter-associated urinary tract infection. This must be given special consideration in the newly transplanted patient undergoing obligate immunosuppression. The second is decreased patient mobility, which increases the risk of venous thrombo-embolism and pneumonia, and hospital length of stay. For these reasons, it is the practice in our institution to remove Foley catheters on postoperative day 1 in live donor kidney transplant recipients, provided they have met standardized protocol criteria. The hypothetical risk of early catheter removal is an increased risk of urine leak. It is believed that bladder drainage with Foley catheterization relieves the tension on the newly created ureteroneocystostomy anastomosis. If a leak is present, catheterization may allow the leak to heal before becoming clinically manifest.

Aim

The purpose of our study was to analyze the practice of Foley catheter removal on postoperative day 1 in live donor kidney transplant recipients and its correlation with urine leaks.

Patients and Methods

We evaluated the clinical outcomes of 120 consecutive live donor kidney transplant recipients. All patients underwent color flow-grayscale duplex Doppler ultrasonography in the post anesthesia care unit immediately after transplantation to ensure adequate vascular flow and screen for the presence of hydronephrosis or any fluid collections. Urine output was replaced with an equivalent volume of intravenous fluid until the morning after the transplant. Subsequently, patients were kept on maintenance intravenous fluids (routinely 100 mL/h) until able to tolerate adequate oral intake. In instances of adequate urine output and no barriers to early ambulation, Foley catheters were removed on postoperative day 1.

Patients who did not demonstrate consistent urine output on postoperative day 1 had their catheters maintained for longer. The reasons for extended catheterization included delayed graft function, early rejection, and the need for prolonged fluid or electrolyte replacement due to hypovolemia or electrolyte imbalances.

Urine leaks were most often suspected in instances of fluid collections seen on imaging studies, such as color flow-grayscale duplex Doppler ultrasonography, the presence of urinoma, inadequate urine output, and or electrolyte or creatinine abnormalities.

Results

Eighty-one (68%) of the 120 live donor kidney transplant recipients had their Foley catheters removed on postoperative day 1. Of the 81 patients, 6 (7.4%) developed urine leaks. Of the six, three were managed with percutaneous nephrostomy tube drainage and ureteral stenting. Two underwent interventional radiological drainage of perinephric urinoma with subsequent resolution. The last had resolution of the urinoma without any intervention based on subsequent follow-up Doppler imaging. The remaining 39 patients had their Foley catheters maintained due to delayed graft function, inadequate urine output, or any other critical issue necessitating prolonged monitoring. Of those 39 patients, 3 (7.7%) developed urine leaks. Two of these were treated with percutaneous nephrostomy tube drainage and ureteral stenting. One underwent interventional radiological drainage of perinephric urinoma with subsequent resolution.

Discussion

Urine leaks are the most common urological complication following kidney transplantation occurring in 5 to 10% of cases.[2,3] Most leaks are small and resolve without intervention. When leaks persist, percutaneous nephrostomy tube placement and ureteral stenting are the standard treatment. Surgical re-exploration is rarely necessary.[4] Some studies recommend maintenance of the Foley catheter for 1 week after a urine leak has been demonstrated[5]; however, there is no suggestion or evidence that preemptive catheterization will prevent urine leak.

In our study, 7.5% of total patients developed urinary leaks. Of the patients who had catheters removed on postoperative day 1, 7.4% developed urine leaks. Of the patients who had catheters removed on greater than postoperative day 1, 7.7% developed urine leaks. The overall numbers are similar in incidence to those commonly reported in the literature. The percentages of urine leak in postoperative day 1 removal group and the greater than postoperative day 1 group were similar. This indicates that the incidence of leak was not increased by the early removal of Foley catheters.

Urine leaks are therefore not attributed to early Foley catheter removal. Urine leaks can often be attributed to microvascular damage to the ureteral blood supply. Such injury can be present in the donor subclinically prior to transplant, or can be incurred during allograft excision or backbench preparation. Factors associated with increased urine leaks after renal transplantation included male gender, African American race, and surgical technique for ureteroneocystostomy anastomosis.[6] Of note, in the studies linking African American patients to greater risk of urine leaks, African American patients were more often induced with thymoglobulin. It is not definitive that induction with thymoglobulin has any correlation with urine leak, but a causal relation has been observed.[6] In our series, two patients developed urine leaks after being treated with thymoglobulin. One patient was an African American woman who received thymoglobulin upon induction due to a positive crossmatch for B and T cells. She also underwent preoperative treatment with plasmapheresis and intravenous immunoglobulin treatment. The second patient was treated with thymoglobulin for an episode of acute rejection. Both patients had Foley catheters in place for longer than 1 day postoperatively, and both were managed successfully with percutaneous nephrostomy tube placement and ureteral stenting.

There are studies that recommend routine ureteral stenting at the time of transplantation to prevent urinary complications postoperatively.[7] However, the study showed that ureteral stenting bears an increased incidence of urinary tract infection. Furthermore, the benefit was only seen in cadaveric donor kidney transplantation, and that was primarily in the reduction in postoperative urinary strictures. There was no benefit in living donor kidney transplantation. We do not routinely employ ureteral stents in living donor kidney recipients at our institution.

Surgical technique for performance of the ureteroneocystostomy anastomosis has also been implicated in the risk for developing urine leaks after kidney transplantation and has been studied.[8] The intravesical Leadbetter–Politano technique was found to have a higher leak rate than the extravesical Lich–Gregoir technique. This was attributed to the second intravesical cystostomy utilized in the intravesical Leadbetter–Politano technique. When comparing extravesical techniques, the U-Stitch technique had a higher leak rate than the Lich–Gregoir technique. This was attributed to the lack of mucosa to mucosa anastomosis in the U-Stitch technique. The study did not find a difference between antireflux and non-antireflux techniques. It is the practice in our institution to use a full thickness ureter to bladder anastomosis.

Regarding the incidence rate of catheter-associated urinary tract infections, studies indicated that 80% of nosocomial UTIs are due to catheters. The risk of UTI increases by 3 to 7% each day that it remains in the body.[9] Twenty-five percent of patients with catheters in for more than 1 week will contract a UTI.[10]

Conclusion

In this study, we have shown that removal of Foley catheters in live donor kidney transplant recipients on postoperative day 1 does not increase the incidence of postoperative urine leaks. We believe that early catheter removal has the potential to decrease the risk of catheter-associated urinary tract infections and hospital length of stay. We also believe that it improves patient comfort, and promotes early postoperative ambulation.[11] We hope that these innovations in living donor kidney transplantation will have continued success and that we can extend these benefits to all categories of kidney transplantation.

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