Vascular control during laparoscopic kidney donation

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SUMMARY

Laparoscopic donor nephrectomy (LDN) is the gold standard for kidney donation. Recent literature has led to considerable debate regarding the safest route to provide vascular control during this procedure. The most common devices used for vascular control during LDN are staplers and surgical clips. Opinions regarding the safety of these devices vary, as both are prone to dysfunction. Certain clips have already been contraindicated for use on the donor artery owing to reports of catastrophic complications of falling off. Donor safety is paramount to the continued success of renal transplantation in Canada. A review of existing practice at each institution may be called for to ensure the safest standards possible are in place. An appendix to this commentary is available at canjsurg.ca.

Since the initial publication by Ratner and colleagues[1] in 1995, the laparoscopic donor nephrectomy (LDN) has become the standard for living kidney donation. The minimally invasive technique is associated with improved cosmetics, decreased morbidity, a shorter length of stay and a quicker return to work, all of which have led to increased living donation rates around the globe.[2] The actual operation has evolved with notable improvements in optics, surgical instrumentation and energy sources.[3]

In recent years, the method of vascular control of the renal vessels has come under scrutiny owing to reported catastrophic outcomes of device failures.[3,4] The balance between donor safety and ensuring a sufficient vessel length for the transplantation anastomoses can be a fine line. The 2 most common modalities used to ligate and divide the artery and vein laparoscopically are surgical clips (locking and nonlocking) and staplers. Each technique comes with a risk of malfunction: clip slippage and stapler misfire, respectively.[5]

Surgical principles would imply that stapling is the safer of the 2 techniques, given that the staples actually transfix the vessel wall. Stapling devices allow for the division and ligation of the artery or vein in a single motion. The accepted sacrifice is the loss of a couple of millimeters of length on the graft vessel. Unlike staplers, surgical clips do not transfix the vessel wall. This leads to a risk of clip slippage, especially in a donor nephrectomy where there is a tendency to cut flush with the clip in order to facilitate longer vessel length. Several reports of donor deaths associated with locking clip slippage have led to the U.S. Food and Drug Administration placing a warning that plastic locking clips are contraindicated for use on the donor artery during nephrectomy.[5]

The use of staplers and clips is now commonplace throughout all surgical practices. But we must not forget that the rate of device malfunction is not trivial for either of these techniques. There is a strong suspicion that the actual incidence of stapler misfire and clip slippage is severely underreported. Resultant hemorrhage from a poorly secured renal artery can be brisk and difficult to control even with immediate action and conversion to an open laparotomy. For this reason, there has been a trend away from

nontransfixating means to secure the renal artery (e.g., clips) and a trend toward the use of transfixating devices, such as staplers. To minimize the risk of stapler misfire, many transplant centres have now transitioned to the use of noncutting staplers.

Despite the undesired outcome of device malfunction during hilar control in LDN, there is an important difference in how malfunctions can present. A stapler misfire is an immediate, observed complication that allows for the surgeon to react to the situation, potentially by compressing or grasping the vascular stump and/or immediately converting to open surgery. Clip slippage, on the other hand, is often delayed by hours or even days. This leaves the patient and medical team unaware of the hemorrhage while the patient is in the recovery room or on the ward, leaving little hope of timely reaction and salvage.

We recently surveyed 28 kidney donor surgeons from across Canada and found that a significant proportion have experienced either clip slippage or stapler misfire during donor procedures, some of which resulted in catastrophic outcomes (Appendix 1, available at canjsurg.ca). These findings are in keeping with those of similar surveys performed in the United States and Europe.[3,4] An important message that emerges from this relatively high rate of device failure, whether transfixing or not, is that all surgical devices are prone to malfunction and can lead to unwanted complications. In no other surgical population does this trepidation become more real than in live donors. This highlights the inherent risk of performing major surgery on healthy volunteers for the benefit of another patient.

Based on the findings of our survey along with information available from similar studies in the literature, we feel that it is vital that all transplant programs review their existing practices and make appropriate modifications to ensure that donor surgery is performed in accordance with the safest standards possible. The recommendations that we feel are reasonable to consider are outlined in Box 1. Furthermore, emergency simulations should be performed routinely by the transplant team of anesthesiologists, surgeons and nurses so as to minimize morbidity and mortality associated with intraoperative complications of LDN.

Box 1. Recommendations to ensure donor safety during laparoscopic kidney donation

- Mandatory attendance of 2 surgeons at all LDN cases (at minimum during the hilar dissection and transfixation and organ extraction)
- Use of large-bore intravenous catheters in all donors
- Use of arterial catheters for blood pressure monitoring
- Mandatory presence of cell savers in the operating room (or readily accessible)
- Emergency simulations for conversion to open surgery performed by the transplant team

LDN = laparoscopic donor nephrectomy.

Although rare, hemorrhagic complications can occur from device malfunction, resulting in poor outcomes for healthy volunteers undergoing LDN. With this in mind, surgeons need to remain vigilant when choosing their technique for vascular control.

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