MANUAL SPECIMEN RETRIEVAL WITHOUT A PNEUMOPERITONEUM PRESERVING DEVICE FOR LAPAROSCOPIC LIVE DONOR NEPHRECTOMY

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ABSTRACT

Purpose: We present a novel method of kidney retrieval based on a modified Pfannenstiel incision and insertion of the assistant hand into the abdominal cavity without a device for pneumoperitoneum preservation. This maneuver is performed as the last step in pure laparoscopic live donor nephrectomy. Also, we assessed the effect of this technique on warm ischemia time compared with the standard laparoscopic bag retrieval technique.

Materials and Methods: A total of 70 laparoscopic live donor nephrectomies were performed at our institutions between October 1998 and March 2001. The first 43 cases were completed using an EndoCatch bag device (Auto Suture, Norwalk, Connecticut) for specimen retrieval, while the last 27 were done using a novel manual retrieval technique through a modified Pfannenstiel incision. We retrospectively analyzed the results in regard to warm ischemia time and intraoperative complications related to the procedure.

Results: A statistically significant difference was noted in the EndoCatch and manual retrieval groups in regard to warm ischemia time (p < 0.001). There were 2 complications related to the EndoCatch device and none related to the manual technique. No differences were detected regarding recipient outcomes.

Conclusions: Manual specimen retrieval after live donor nephrectomy allows shorter warm ischemia time, while saving the cost of an EndoCatch bag or pneumoperitoneum preserving device that would be used during hand assisted live donor nephrectomy. It was shown to be a safe method without increased donor morbidity.

Key Words: kidney, nephrectomy, laparoscopy, living donors, specimen handling

Since the first description of laparoscopic nephrectomy by Clayman et al., the surgical treatment of many urological diseases has changed dramatically. In 1995 Ratner et al. described the first live donor nephrectomy. Since then, at many centers this technique has been adopted due to decreased associated morbidity, early return to daily activity and better cosmesis, while achieving recipient outcomes similar to those of open donor nephrectomy. Recent data show an increase in the waiting time for cadaveric kidney donors. The superior donor results obtained with live donor nephrectomy may improve the incentive for living kidney donation. Even with the large experience achieved at some centers technical difficulties associated with the procedure still remain, including problems related to kidney retrieval. Complications related to EndoCatch bag, kidney removal have been reported. Sasaki et al. described 1 case in which the retrieved kidney fell out of the EndoCatch bag, leading to 10 minutes of warm ischemia. Nakache et al. performed a case in which warm ischemia time was prolonged due to failed kidney entrapment secondary to large specimen size. In addition, Rosin et al. reported a tear in the collecting bag, leading to difficult specimen retrieval. Similarly Jacobs et al. described 5 cases of failed kidney entrapment with the EndoCatch bags with resultant manual extraction needed to remove the specimen.

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Some kidney transplantation groups have used hand assisted laparoscopic live donor nephrectomy with good results in regard to warm ischemia time. Pneumoperitoneum preserving devices, such as the Intromit (Medtech, Dublin, Ireland) and Pneumosleeve (Dexterity, Inc., Blue Bell, Pennsylvania), have been successfully used. However, problems related to wound complications, significant incisional pain and the high cost of these devices remain.

MATERIALS AND METHODS

In the original Pfannenstiel incision the skin, anterior fascia, belly of the rectus muscles and posterior fascia are incised transverse along the same plane. In our modification the skin is incised transverse but the fascia is incised sagittal, cutting through the midline decussations of the rectus fascia and then spreading between the rectus muscles to enter the peritoneum (fig. 1). This maneuver creates crossing incisions in 2 planes to minimize potential leakage around the surgeon hand.

Before positioning the patient in the beginning of the case the pubic hair is shaved and a 7.5 cm. transverse line is marked 2 finger breadths above the symphysis pubis (fig. 2). Later after the kidney is completely mobilized and only attached by the renal pedicle the ureter is transected at the level of the iliac artery and the patient, who was in the 45-degree lateral decubitus position, is rotated lateral, so that the lower abdomen is in a more horizontal plane. A Pfannenstiel skin incision is made at the previously marked line, followed by a 7.5 cm. vertical incision in the linea alba.
After the skin and fascia are incised the rectus muscles are bluntly spread until the peritoneum pushed by pneumoperitoneal pressure is visualized bulging between the rectus muscles. The assistant right hand is wrapped glove to elbow with an adhesive drape to avoid fluid contamination through the assistant sleeve. The laparoscope is then reinserted. Under direct vision the assistant surgeon using the fingers bluntly inserts the hand through the peritoneum and into the abdominal cavity, avoiding the bladder and bowel (fig. 3). During hand insertion pneumoperitoneum is temporarily lost. However, after the palm is through the incision the arm fits tightly into the crossed incisions, thus preventing any further significant CO₂ leakage and loss of pneumoperitoneum. Two CO₂ insufflators are simultaneously used at this point to restore pneumoperitoneum rapidly. After the hand is in the abdominal cavity pneumoperitoneum is reestablished and the patient is rotated medial to allow the bowel and spleen to reflect off of the kidney by gravity. The assistant hand can be used for retraction of the bowel medial during stapler division of the renal hilum or for holding the kidney up lateral if the bowels are well retracted by gravity alone. The best exposure is achieved by having the renal hilum between digits 2 and 3, while retracting the bowel medial with the thumb and the ureter lateral with digit 5 (fig. 4).

The stapler is then inserted and fired across the vessels. The kidney is manually extracted. A laparotomy pad is used to occlude temporarily the incision, pneumoperitoneum is restored and hemostasis is verified. The fascia is closed using a running 1-zero polydioxanone suture, followed by skin closure with running 4-zero subcuticular poliglecaprone. Perioperative data and patient demographics were recorded retrospectively. Statistical comparisons were performed using the Student t test.

RESULTS

A total of 43 cases were performed using the EndoCatch bag, as described by Kim et al, 17 and 27 were performed using manual specimen retrieval. Average warm ischemia time was significantly shorter using manual retrieval compared with the EndoCatch bag retrieval technique (101 seconds, range 55 to 245 versus 173, range 120 to 360, p <0.001). The groups were similar in regard to donor demographics.

There were 2 complications related to the EndoCatch device. In 1 case a 2 cm. superficial splenic laceration was cauterized using bipolar cautery and hemostasis was verified. The patient became hemodynamically unstable on postoperative day 1. During emergency laparotomy splenic bleeding was confirmed and splenectomy was performed. In another case the kidney slipped out of the EndoCatch bag during removal from the abdominal cavity. To retrieve the kidney the surgeon hand was rapidly inserted into the abdominal cavity and the kidney was identified and retrieved with resultant warm ischemia time of 6 minutes. This kidney functioned well with no sequelae. No complications were related to manual retrieval.

DISCUSSION

Laparoscopic live donor nephrectomy is gradually becoming the standard of care for renal procurement with equal
mid-term recipient outcomes and decreased donor morbidity. The majority of live donor nephrectomies are done using pure laparoscopy and an EndoCatch bag for kidney retrieval. The cost of the EndoCatch bag is about $110 per case. Complications have been reported when using the EndoCatch bag for spleen and small bowel injuries.19 Also, technical difficulties with retrieving the kidney using the EndoCatch bag have resulted in prolonged warm ischemia time.20

A certain event promoted the development of this method. The EndoCatch bag was used through a Pfannenstiel incision. After the bag was cinched and removed from the abdominal cavity the kidney was not in the bag and it was still in the abdominal cavity. At that point the surgeon rapidly inserted a hand through the Pfannenstiel incision and noted that pneumoperitoneum was reestablished with no significant CO2 leakage around the hand. The kidney could then be visualized and retrieved manually. After the kidney was removed the hand was reinserted, pneumoperitoneum was reestablished and hemostasis was verified. We successfully attempted this method in our next cases and achieved an average warm ischemia time of less than 2 minutes. In contrast, during a case of manual retrieval the assistant hand inside the peritoneum prevented massive bleeding from the left renal vein. In that case the endo-gastrointestinal anastomosis stapler was misfired across the renal vein, resulting in an open medial stump after vein division. After kidney retrieval bleeding from the renal vein stump was controlled by direct manual compression. Laparotomy was performed and the bleeding was controlled without the need for blood transfusion in this patient.

At other institutions hand assisted laparoscopy is used throughout laparoscopic donor nephrectomy.13 However, because the hand must reach the upper pole of the kidney, the insertion site is usually in the epigastrium.21 This incisional location has cosmetic and morbid disadvantages for the donor compared with a Pfannenstiel incision. Also, recuperation from an epigastric longitudinal incision is more painful and slower than from a Pfannenstiel incision.21 In this method the surgeon hand is inserted for only about 10 minutes for vascular division and kidney retrieval, obviating the manual fatigue associated with prolonged hand assisted procedures. It is not intended for continuous use instead of a pneumoperitoneum preserving device. In addition, the cost of the hand assisted device is at least $500 per case.

Using our method of manual specimen retrieval we were able to decrease warm ischemia time significantly, have more controlled and safe ambiance during the critical phase of positioning and firing the stapler across the renal vessels and
save the expense of an EndoCatch bag or hand assisted device. This method was safely and successfully used repeatedly with no adverse effects compared with the entrapment bag.

CONCLUSIONS

Live donor nephrectomy with manual specimen retrieval through a modified Pfannenstiel incision has shorter warm ischemia time than EndoCatch specimen retrieval with fewer complications. We recommend this method for kidney retrieval due to its safety, efficiency, decreased cost and improved cosmesis.

REFERENCES