Postoperative Continuous Infusion of Local Anesthesia in Hand-Assisted Retroperitoneoscopic Living Donor Nephrectomy

R. Wahba[a,*], R. Kleinert[a], M. Hellmich[b], C. Kurschat[c], N. Heiermann[a], G. Dieplinger[a], J. Löser[d], and D.L. Stippel[a]

[a]Department of General, Visceral and Cancer Surgery, Division of Transplantation Surgery, Transplant Center Cologne, University of Cologne, Germany; [b]Institute of Medical Statistics, Informatics and Epidemiology, University of Cologne, Germany; [c]Department of Medicine, Renal Division, Transplant Center Cologne, University of Cologne, Germany; and [d]Department of Anesthesiology and Operative Intensive Care Medicine, University of Cologne, Germany

ABSTRACT

Introduction. Postoperative pain management in living kidney donor nephrectomy plays a key role in donor comfort and is important for the further acceptance of living kidney donation in times of organ shortage. Standard pain treatment (SPT) based on opioids is limited due to related side effects. Continuous infusion of local anesthesia (CILA) into the operative field is a promising alternative. The aim of this study was to evaluate whether CILA could reduce the dose of opioids in living kidney donors operated with hand-assisted retroperitoneoscopic donor nephrectomy (HARP).

Methods. An observational study on 30 living donors was performed. The primary outcome was the difference of morphine equivalents (MEQ) administered between CILA and SPT.

Results. On day 0 and 1, living donors with CILA received significant less MEQ compared to the SPT group, although on day 1 this effect was not statistically significant (day 0: 6.3 mg, interquartile range [IR] 4.2–11.2 vs 16.8 mg, IR 10.5–22.1, $P = .009$; day 1: 5.25 mg, IR 2.1–13.3 vs 13.3 mg, IR 6.7–23.8, $P = .150$). On days 2 and 3 there was no difference (day 2: 13.3 mg, IR 0.0–20.0 vs 13.3 mg, IR 6.7–13.3, $P = .708$; day 3: 13.3 mg, IR 0.0–26.7 vs 13.3 mg, IR 6.7–20, $P = .825$). Overall (days 0 to3) MEQ was also less for CILA without reaching statistical significance (39.6 mg, IR 10.9–70.5 vs 59.6 mg, IR 42.4–72.9, $P = .187$).

Conclusions. CILA seems to be an effective instrument for donor pain management in the first 24 hours after HARP. Its effect abates by 48 hours after surgery, especially if highly potent nonopioids are given.

LIVING kidney donation is a safe procedure, and most donors are healthy, are young, and have not previously had a visceral operation [1]. Donor comfort must be optimal, and pain is a negative influence on quality of life after living kidney donor nephrectomy [2]. Minimally invasive surgery technique is one step to reduce pain and improve donor comfort [3], but early postoperative pain management is still challenging. The current standard treatment is based on opioids with increasing analgesic potency in combination with nonopioids, according to the World Health Organization's pain relief ladder [4]. For breakthrough pain, often a high dose of opioids is needed, although side effects such as nausea, vomiting, and decreased bowel movement occur. Continuous epidural analgesia is an effective alternative, with an additional risk of severe complications [5]. Although single-shot wound infiltration after laparoscopic surgery showed no clear

*Address correspondence to Dr. Roger Wahba, MD, Department of General, Visceral and Cancer Surgery, Division of Transplantation Surgery, Transplant Center Cologne, University of Cologne, Kerpener Straße 62, 50937 Cologne, Germany. E-mail: roger.wahba@uk-koeln.de

0041-1345/16
http://dx.doi.org/10.1016/j.transproceed.2016.03.053

benefit [6], continuous infusion of local anesthesia (CILA) is a possible technique. There is some evidence for its effectiveness in open living donor nephrectomy [7]. For minimally invasive procedures, including laparoscopic living donor nephrectomy, evidence is less clear [8–11]. In this observational study, 30 consecutive living donors who underwent surgery with hand-assisted retroperitoneoscopic donor nephrectomy (HARP) received either standard pain treatment (SPT) based on opioids or CILA and opioids. The aim of this study was to evaluate whether CILA could reduce the dose of opioids in living kidney donors who underwent surgery with HARP.

MATERIALS AND METHODS

Approval for this study was obtained from the institutional review board. Written informed consent for the use of the CILA system was given by every donor. The declarations of Helsinki and Istanbul, national laws, and guidelines were followed.

Study Design

The study was performed as an observational study. Fifteen consecutive living kidney donors (May 2013 to November 2013) represented the control group with SPT. Nineteen consecutive donors (November 2013 to August 2014) were screened to recruit 15 subjects for the intervention group with CILA. Every living kidney donor during this time frame was screened without exclusion criteria.

Procedure

All donors underwent surgery with the HARP technique described by Wadstrom et al. [12]. At the end of the operation the donors were extubated, and regardless of the perioperative risk, went postoperatively to the intensive care unit/postanesthesia care unit (ICU/PACU) for 1 night (day 0). On postoperative day 1, they were transferred to the transplantation ward. From postoperative day 3 to 4, 24-hour urine was collected for renal clearance evaluation. After that, donors were in general discharged.

SPT

After admission to ICU/PACU, all donors were evaluated for pain every hour by the nursing staff. If pain was >4 according to a visual analog scale (VAS, range 0 to 10) or expressed spontaneously, intravenous piritramide (rapid-onset opioid) was administered until the patient was free of pain. In addition, all donors received 1 g intravenous/oral metamizole/dipyrone (ampyrone sulfonate analgesic, nonnephrotoxic, higher analgesic potency compared to paracetamol/acetaminophen) every 6 hours as nonopioid analgesia for the first week. After transfer to the transplant ward, the patients were evaluated 3 times per day for pain by the nursing staff (VAS). If patients expressed pain, additional opioids (tilidine/naloxone, oxycodone/naloxone, morphine oral) were administered.

CILA

The CILA system (ON-Q Pain Buster, B. Braun AG, Melsungen, Germany) was filled with 400 mL ropivacaine 0.5%, and the 2 delivery catheters (12.5-cm soaker catheters) were placed supraumbilical via a trocar/peel-away system at the end of the HARP. The first catheter was placed into the retroperitoneal cavity lying across the intercostal, ilioinguinal, and iliohypogastric nerves. The second catheter was placed into the Pfannenstiel incision. Then both catheters were primed with 5 mL ropivacaine (7.5 mg/mL). After that, the catheters were connected to the CILA system and the infusion was started with 4 mL/h (2 mL/h through each catheter). After 72 hours (end of day 3), the CILA system was removed on the ward.

The postoperative dose of opioids was normalized to morphine equivalents (MEQ) by the following equianalgesic dose ratio: piritramide to morphine 0.7:1; tilidine/naloxone to morphine 15:1; oxycodone/naloxone to morphine 0.5:1 [13]. MEQ was evaluated day-by-day and compared between both groups. Day 0 represents the stay on the ICU/PACU and day 1 to 3 the period on the transplantation ward.

Statistics

The main variable was the dose of opioids normalized to MEQ in milligrams (mg) and the difference between donors with SPT vs CILA. Statistical analysis was performed using SPSS statistical software (version 23, IBM Corp., Armonk, New York, USA). Data are shown as median ± interquartile range (IR). Mann-Whitney *U* test was used to analyze the difference between the groups. A *P* value <.05 was considered as statistically significant.

RESULTS

The data of all donors for MEQ were complete. No donors were excluded from the analysis. There was no conversion to open donor nephrectomy. The CILA system worked in all cases without complications. No statistical differences were seen between the main characteristics of the living donors (Table 1).

MEQ

On day 0, living donors with CILA received significantly less MEQ compared to the standard pain treatment group (MEQ 6.3 mg, IR 4.2–11.2 vs 16.8 mg, IR 10.5–22.1, $P = .009$). On day 1, the CILA group also required less MEQ

Table 1. Characterization of the Living Kidney Donors

	Standard Pain Treatment, n = 15	Continuous Infusion of Local Anesthesia, n = 15
Age (y)	51.4 (41.1–54.4)	50.0 (43.0–57.0)
Sex (female/male)	6/9	7/8
Weight (kg)	76 (65–92)	72 (64–85)
Preoperative 24-h urine creatinine clearance (mL/min)	114* (105–137)	130* (125–161)
Preoperative creatinine (mg/dL)	0.85 (0.80–0.91)	0.81 (0.72–0.91)
Operation time (min)	98 (85–115)	108 (91–124)
Warm ischemia time (s)	107 (74–134)	101 (78–149)
Side (left/right)	9/6	8/7
Postoperative 24-h urine creatinine clearance (mL/min)	64 (55–87)	61 (51–83)
Postoperative creatinine (mg/dL)	1.38 (1.24–1.63)	1.34 (1.25–1.58)

All values are given as median and interquartile range.
*Significant difference, $P = .04$.