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Acute Benefits After Liposomal Bupivacaine Abdominal Wall Blockade for Living Liver Donation: A Retrospective Review

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Abstract

Objective: To investigate whether the addition of liposomal bupivacaine abdominal wall blocks to a multimodal analgesic regimen improves postoperative numeric rating scale pain scores and reduces opioid consumption in patients undergoing living liver donation.

Patients and Methods: We conducted a single-center, retrospective review of patients who underwent living liver donation from January 1, 2011, through February 19, 2016, and received multimodal analgesia with (block group) or without (control group) abdominal wall blockade. The block solution consisted of liposomal bupivacaine (266 mg) mixed with 30 mL of 0.25% bupivacaine. Both groups received intrathecal hydromorphone. Main outcome measures were pain scores, opioid requirements, time to full diet, and bowel activity.

Results: Postoperative day 0 pain scores were significantly better in the block group (n=29) than in the control group (n=48) (2.4 vs 3.5; *P*=.002) but were not significantly different on subsequent days. Opioid requirements were significantly decreased for the block group in the postanesthesia care unit (0 vs 9 mg oral morphine equivalents; *P*=.002) and on postoperative day 0 (7 vs 18 mg oral morphine equivalents; *P*=.004). Median (interquartile range) time to full diet was 23 hours (14-30 hours) in the block group and 38 hours (24-53 hours) in the control group (*P*=.001); time to bowel activity was also shorter in the block group (45 hours [38-73 hours] vs 67 hours [51-77 hours]; *P*=.01).

Conclusion: Abdominal wall blockade with liposomal bupivacaine after donor hepatectomy provides an effective method of postoperative pain control and decreases time to full diet and bowel activity.

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The critical shortage of deceased donor liver allografts and the increased morbidity and mortality that patients experience while awaiting transplant have led to the use of living donor liver transplant.[1,2] Because donor hepatectomy involves major upper abdominal surgery in healthy donors, analgesia is important for mitigating postoperative morbidity and is a primary concern for patients considering living donation.[3] Although epidural analgesia has historically been the standard of postoperative pain control, recent studies have found that postoperative coagulopathy may put patients at risk for neuraxial hematoma.[1,4] Accordingly, alternative analgesic methods that avoid this risk have been used in the search for safe but effective pain management.[4,5]

Abdominal wall blockade involves depositing local anesthetic into the fascial plane superficial to the transversus abdominis muscle to anesthetize the distal branches of the anterior rami of the lower thoracic and upper lumbar nerve roots.[6] Although single-injection transversus abdominis plane (TAP) blocks can provide excellent analgesia for major abdominal surgery, their primary shortcomings include limitations in dermatomal spread and short duration, with comprehensive analgesia rarely extending beyond 12 hours.[6,7] To extend analgesia duration, some investigators have placed TAP catheters to facilitate infusion

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of local anesthetic.[4,5] To date, however, this technique has been limited by high failure rates of secondary analgesia.[8]

The novel, long-acting, encapsulated local anesthetic liposomal bupivacaine has been reported to produce detectable serum bupivacaine concentrations for up to 96 hours.[9] Therefore, liposomal bupivacaine may extend the analgesia of abdominal wall blockade and improve postoperative pain control for living liver donation patients. Recently, Mayo Clinic added a multi-injection abdominal wall technique (specifically, lateral TAP and multi-injection subcostal TAP) with a liposomal bupivacaine mixture to our practice. This regional approach targets broader dermatomal innervation of the abdominal wall and may improve both coverage and duration of blockade.

We hypothesized that abdominal wall blockade for living liver donation patients would improve postoperative pain scores and reduce opioid consumption.

PATIENTS AND METHODS

After receiving Mayo Clinic Institutional Review Board approval, we searched the institutional liver transplant database to identify all patients undergoing living liver donation at Mayo Clinic, Rochester, Minnesota, from January 1, 2011, through February 19, 2016. Living donor hepatectomy patients aged 18 to 60 years were included. Exclusion criteria were chronic pain syndromes (fibromyalgia, complex regional pain syndromes) and chronic opioid use (daily opioid consumption of >15 mg/d oral morphine equivalents [OME] for more than 1 month before liver donation).

American Society of Anesthesiologists (ASA) status, body mass index (calculated as the weight in kilograms divided by the height in meters squared), sex, and age were recorded for all patients. Patients were then screened for eligibility into 2 groups based on anesthetic intervention: use of abdominal wall blocks (block group) or no use of abdominal wall blocks (control group). The primary outcome measure was postoperative numeric rating scale (NRS) pain scores (0 = no pain to 10 = worst pain) on postoperative days (PODs) 0 and 1. Secondary outcomes included NRS pain scores in the postanesthesia care unit (PACU) and on PODs 2, 3, and 4; opioid consumption in the PACU and on PODs 0, 1, 2, 3, and 4; treatment for nausea and vomiting on PODs 0, 1, 2, 3, and 4; time to ingestion of clear fluids and a full diet; time to bowel activity; and hospital length of stay. Data were extracted from the electronic medical record using institutional perioperative database software by electronic query and via manual retrieval from the electronic medical and anesthesia records.

Multimodal Analgesia and Perioperative Protocol

Mayo Clinic's multimodal analgesic clinical pathway for living liver donation consists of preoperative oral medications, perioperative systemic opioids and nonopioid medicines, and a preoperative intrathecal opioid. On arrival at the preoperative area, the patient is administered 800 mg of oral gabapentin. The patient is then transferred to the operating room suite, where a hydromorphone (100-150 μg) spinal is aseptically administered using primarily a 25-gauge Whitacre needle. General anesthesia is maintained with volatile anesthesia, intravenous (IV) opioids (fentanyl, <500 μg), nonopioid adjuvants (ketorolac, 15 mg IV, +/− ketamine, 10 mg IV), and aggressive antiemetic prophylaxis (granisetron, 0.1 mg IV, or ondansetron, 4 mg IV, +/− scopolamine transdermal patch, 1.5 mg, applied for 24-72 hours +/− droperidol, 0.625 mg IV).

The regional anesthesia technique, when performed, was after wound closure. All the patients were extubated and transported to the PACU, where they were assessed for postoperative pain control and anesthetic recovery. On PACU departure they are transferred to the intensive care unit and monitored for 24 hours.

Surgical Technique

The surgical incision for living liver donation involves a primary right subcostal incision with a midline extension to the xiphoid. All the patients underwent a right or left hepatectomy with incidental cholecystectomy.

Abdominal Wall Injection Technique

All ultrasound-guided abdominal wall blocks were placed under general anesthesia at the end of surgery, with patients in a supine position and with the sterile field intact. The block solution consisted of 20 mL (266 mg) of