BRIEF REPORT

Intraprocedural Superior Hypogastric Nerve Block Allows Same-Day Discharge following Uterine Artery Embolization

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ABSTRACT

In a single-arm, nonrandomized, retrospective case-control study, 39 patients (mean age, 44 y) who underwent elective outpatient uterine artery embolization (UAE) with the use of superior hypogastric nerve block (SNHB) for pain control over a period of 3 years were identified. Technical success of SNHB was 87%. Of the 34 patients who received SNHB, 97% did not need a patient-controlled analgesia pump. The median opioid requirement for the 17 patients who needed opioid agents was 7.5 morphine milligram equivalents (interquartile range [IQR], 10). The median length of stay was 2.2 hours (IQR, 1.7 h). SHNB offers a safe and effective intervention that significantly reduces pain and the need for opiate agents and allows same-day discharge after UAE.

ABBREVIATIONS

IQR = interquartile range, MME = morphine milligram equivalent, PCA = patient-controlled analgesia, SNHB = superior hypogastric nerve block, UAE = uterine artery embolization

Uterine artery embolization (UAE) is effective in decreasing symptoms of uterine leiomyomata and is associated with a shorter length of hospital stay and faster resumption of daily activities compared with surgical alternatives (1,2). However, a challenge in the management of patients undergoing UAE is postprocedural pain (3). Various postprocedural pain and nausea regimens have been proposed (4). However, narcotic agents in high doses are associated with side effects such as nausea, drowsiness, and constipation, leading to a shift to more local/regional methods of pain control. Superior hypogastric nerve block (SNHB) has been shown to be an effective pain suppressant in chronic pelvic pain, especially neoplastic pain (5), and some studies (6–8) have shown SNHB to be effective in pain control after UAE. The aim of the present study is to examine the impact of SNHB on pain relief and length of hospital stay after UAE.

MATERIALS AND METHODS

Patients

This single-center, singe-arm, nonrandomized, retrospective case-control study was approved by the local institutional review board. A total of 39 patients (mean age, 44 y) who underwent elective outpatient UAE for symptomatic leiomyomata at a tertiary academic center between May 2016 and January 2019 were identified. The primary endpoint of the study was effective pain control after successful SNHB, assessed based on the need for a patient-controlled analgesia (PCA) pump and the amount of postprocedure opioid analgesia (intravenous or oral) administered for pain. To allow comparison of the different opiate drugs administered, the dosages were converted to an opioid oral morphine milligram equivalent (MME) using a standard opiate agent conversion chart (9). Secondary endpoint was length of in-hospital stay before discharge. Return to the hospital for pain-related symptoms was also assessed. Complications were classified according to Society of Interventional Radiology (SIR) criteria (10).

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K.P. receives research support from Terumo (Somerset, New Jersey) and Merit Medical (South Jordan, Utah). None of the other authors have identified a conflict of interest.

https://doi.org/10.1016/j.jvir.2019.08.017

The institutional pain-control protocol for patients undergoing UAE is as follows. Intraprocedurally, patients receive intravenous midazolam and fentanyl as moderate sedation. All patients also receive 60 mg of intravenous ketorolac (Abbott Laboratories, North Chicago, Illinois) at the time of embolization: 30 mg during embolization of each uterine artery side.

Embolization Technique

UAE was performed based on standard protocols and techniques (11). Appropriately sized embolic agents (500–700-μm Embosphere microspheres [Merit Medical, South Jordan, Utah] and 600-μm HydroPearl microspheres [Terumo, Somerset, New Jersey]) were used for embolization. Before starting UAE, not only the wrist or groin, but also the entire lower abdomen, from the umbilicus to the level of the pelvis, was prepared in a surgical sterile fashion in preparation for SNHB block. UAE was completed per protocol with an endpoint of stasis for 3–5 beats.

SNHB Technique

After embolization of both uterine arteries, an abdominal aortogram was obtained to evaluate for ovarian arterial flow and to outline the aortic bifurcation anatomy in preparation for SNHB. The aortogram was obtained with the imaging intensifier panel at a craniocaudal tilt (between 5° and 20°) to identify the fifth vertebral body in a true anteroposterior view (Fig 1a). After aortography, all wires and catheters were removed, and a TR Band (Terumo) was placed. In the femoral approach, hemostasis was achieved in most cases with the use of a closure device. SNHB was then performed. The entry site of the needle was visualized by using a hemostat on the skin, typically 2–10 cm below the umbilicus. The entry site was anesthetized with 1% lidocaine. A 20-/21-gauge, 15- or 20-cm Chiba needle (Cook, Bloomington, Indiana) was advanced to the anterior portion of the fifth vertebral body under fluoroscopic guidance. When bony resistance was reached, with the use of a connecting tube, 2–5 mL contrast medium (Isovue 300; Bracco Diagnostics, Monroe Township, New Jersey) was gently injected, which typically revealed a triangular area of contrast blush with no vascular opacification (Fig 1b). The flat panel was then positioned in a lateral view (Fig 1c), and contrast medium was injected. A crescent-shaped contrast area directly in front of the vertebral body was then typically seen. After confirmation of good position and extravascular location of the tip of the needle, 15–20 mL of 0.5% ropivacaine (Naropin; AstraZeneca, Cambridge, United Kingdom), a long-acting local anesthetic agent, was injected. A preliminary test dose of approximately 3 mL of 0.5% ropivacaine was then injected. If there was no change in heart rate or neurologic status, the remaining 17 mL of the total of 20 mL of ropivacaine (total of 75-100mg) was injected slowly with intermittent aspiration. During the entire injection, a slight forward tension was kept on the needle to avoid retraction into other structures such as the peritoneum. The needle was then removed, and a small skin dressing was placed.

Postprocedure

The TR band was deflated according to protocol: the band was left inflated for 45 minutes and then deflated 3 cm^3 every 5 minutes. Oral or intravenous opioid pain medication was administered depending on the amount of pain the patient experienced and the objective judgment of the physician. All patients were discharged with a 7-day pain-medication regimen of ibuprofen 800 mg 3 times daily and oxycodone/acetaminophen 5/325 mg for breakthrough pain. Also, every patient received a telephone call from the study coordinator the day after UAE to primarily assess pain.

Data Analysis

A measure of efficacy of SNHB in controlling postprocedural pain was the need for a PCA pump. Also, details of all opioid medication used for pain management after UAE were collected, and the dosages were converted to an opioid oral MME. Length of stay in hours was calculated as the difference between the combination of procedure date/end time and the combination of discharge date/discharge time. Categoric variables are described as frequencies and percentages. Continuous values are described as medians with interquartile ranges. This is because the distributions of the continuous variables were skewed, so the median appeared to be a better representation of the "middle" than the mean. Interquartile range (IQR), the difference between the 75th and 25th percentiles, was used as a measure of variation for the median.

RESULTS

All UAE procedures were technically successful, with embolization of both uterine arteries. SNHB was attempted in 39 patients and successful in 34 (87%). Success rates improved with operator experience. The 5 technical failures were attributed to large body habitus, large leiomyomas, or inadequate needle length available; 2 attempts were aborted as a result of repeated encounters of blood on aspiration, and bradycardia developed in 1 patient on the administration of the test dose of ropivacaine and did not resolve on needle repositioning. Patients in whom technical failure was encountered did not receive any local anesthetic agent. One SIR class B complication was noted (12). No other serious side effects were noted, such as peritonitis from placing a 21-gauge needle through the bowel or back pain (ie, discitis).

Of the 34 patients who received SNHB, 97% (n = 33) did not need a PCA pump. Of the patients who received SNHB, 50% (n = 17) did not need any opioid medications after UAE (including oral opioid agents). The medial opioid agent requirement for the 17 patients who received SNHB

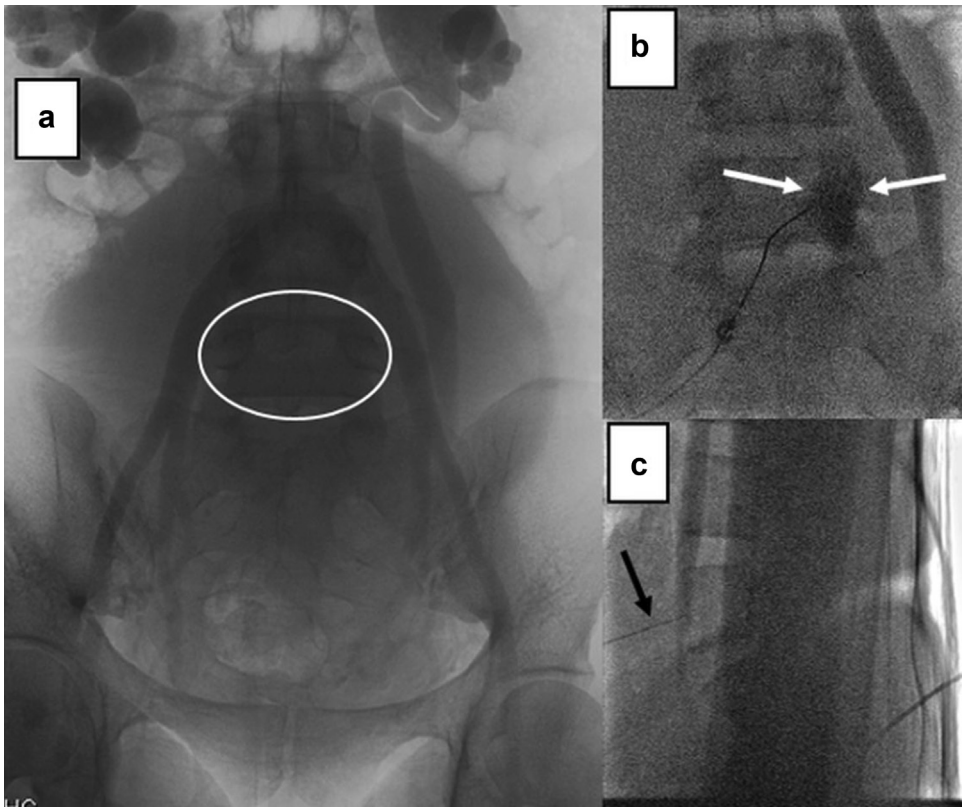

Figure 1. SNHB after UAE. **(a)** Abdominal aortogram (bone window) in a caudal projection delineates the aortic bifurcation and iliac vessels as well as the L5 vertebral body (circle). **(b)** A 21-gauge needle is advanced anteriorly until bony resistance is felt when it contacts the anterior L5 vertebral margin. Contrast medium injection shows an area of extravasation (arrows) with no vascular opacification. **(c)** The imaging intensifier is then moved to a lateral position to confirm the position of the tip of the needle (arrow) abutting the anterior margin of the L5 vertebral body.

and needed opioid medications was 7.5 MME (IQR, 10). The median length of stay for those who received SNHB was 2.2 hours (IQR, 1.7 h). Only 1 patient returned to the hospital within 48 hours of the procedure. The mean overall procedure time (including performance of SNHB) for those who received successful or attempted SNHB was 123 minutes (IQR, 45.4 min).

DISCUSSION

Rapp et al (13) demonstrated in a randomized, double-blind control trial that SNHB is effective as postoperative pain treatment after abdominal hysterectomy. In 2004, Rasuli et al (6), and in 2015, Binkert et al (7) demonstrated that SHNB is a safe and effective way to reduce pain after UAE. In the present study, only 2.9% (n = 1) of the 34 patients who received a block needed a PCA pump for pain control (**Fig 2**). Similarly, patients with successful SNHB were significantly less likely to need any opioid medications (including oral opioid agents) for pain control after UAE. Even when patients in the SNHB group required opioid agents, the requirement was very low, at 7.5 MME (IQR, 10). Also, the performance of intraprocedural SNHB appears to be technically straightforward for a trained interventional radiologist. Technical success rate was high in the present study (87%), which included operators who were not initially experienced with this procedure.

In a prospective, randomized, double-blind, parallel clinical trial, Yoon et al (8) randomized patients to undergo SNHB or sham treatment. Although SNHB reduced the use of pain-related narcotic and antiemetic agents after UAE compared with sham treatment, no difference in hospital admissions was observed between the 2 groups. Most UAE practices adopt a 23-hour in-house stay for patients after UAE, mainly for pain control. In the present study, only 2 patients in the SNHB group stayed overnight, whereas 32 went home on the day of the procedure. The median length of stay for those who received SNHB was 2.2 hours (IQR, 1.72 h; **Fig 3**). Ropivacaine has a half-life of approximately 6.8 hours when used as a peripheral block (14). Although there is a concern for breakthrough pain after the effect of ropivacaine wears off, only 1 patient returned to the hospital within 48 hours of the procedure. She described moderate pain and shortness of breath, which was managed with pain medication. No hospital admission was needed.

Previous studies (6,7) have demonstrated that SHNB is safe, with no major complications reported. In the present study, complications were rare, with no major adverse effects such as bowel perforation, discitis, or vascular injuries. Although complications related to systemic toxicity caused by intravascular injection of local

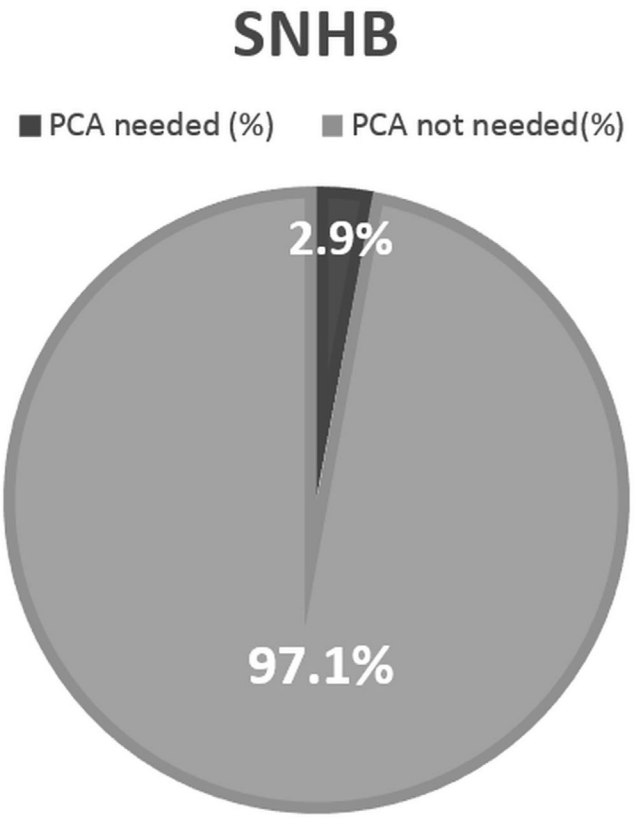

Figure 2. Pie chart of percentage of patients who needed PCA in the SNHB group.

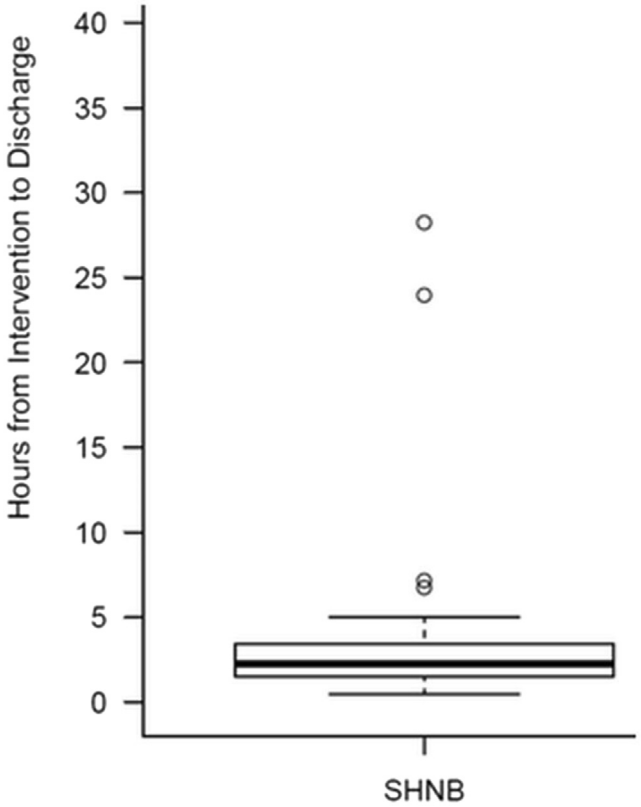

Figure 3. Length of stay in hours for patients who received SNHB. In the box plot, the line in the middle of the box is the median, with the top of the box indicating the 75th percentile and the bottom of the box the 25th percentile (ie, the box area represents the IQR). The whiskers show the majority of the rest of the data, and the circles show outliers (any values greater or less than 1.5 × IQR).

anesthetic agents is very rarely seen, we previously reported a case of local anesthetic systemic toxicity following SNHB (after completion of bilateral embolization) with ropivacaine (12). This patient had a seizure immediately following injection of 30 mL of 0.5% ropivacaine during SNHB. After the seizures, the patient exhibited a complete neurologic recovery with no permanent sequelae. Interestingly, this patient did not need a PCA pump or any opioid medications for pain control (12).

Although the access site is not the focus of the present paper, the role of transradial access in facilitating early discharge was also evaluated. At our institution, we have adopted a radial-first transradial access approach for all UAE procedures since May 2016. This has meaningfully improved patient experience, as transradial access does not require the patient to keep her leg straight for 2–4 hours. This is particularly relevant for UAE when patients are most uncomfortable because of pain, which is exacerbated by not being able to move their legs or use the restroom (15). A total of 85% of the 34 patients with SNHB in the present study had transradial access and were discharged in 2.2 hours (IQR, 29 h). Of these, 14 were discharged home in less than 2 hours, 7 in less than 1.5 hours.

There are some limitations to the present study. As data were retrospectively collected from the electronic health records of patients, we were unable to adjust for all confounding variables. Also, as data were collected from a single academic medical center, the generalizability of the study may be limited. Some technical details of SNHB were not reported, including the number of needle repositionings. Postprocedural visual analog scale pain scores were not obtained from the patients, which may have affected the decision to provide a PCA pump.

In conclusion, SHNB offers a safe and effective intervention that can significantly reduce pain, reduce or even eliminate the need for opiate agents after UAE, and enable same-day discharge in patients after UAE. The technique of SNHB was reproducible in the present series. The health, economic, and social impact of same-day discharge has the potential to make UAE an even more attractive option for middle-aged women with symptomatic leiomyomas as an alternative to hysterectomy.

ACKNOWLEDGMENTS

The authors acknowledge the input from T.L.W., who performed statistical analysis; and Roshni Parikh, MD, Jerome Kao, MD, Adam Fang, MD, Sameer Gadani, MD (Department of Vascular and Interventional Radiology, Saint Louis University, St. Louis, Missouri), who were involved in patient care.

REFERENCES

1. Scheurig-Muenkler C, Koesters C, Powerski MJ, Grieser C, Froeling V, Kroencke TJ. Clinical long-term outcome after uterine artery embolization: sustained symptom control and improvement of quality of life. J Vasc Interv Radiol 2013; 24:765–771.
2. Hehenkamp WJ, Volkers NA, Birnie E, Reekers JA, Ankum WM. Pain and return to daily activities after uterine artery embolization and hysterectomy in the treatment of symptomatic uterine fibroids: results from the randomized EMMY trial. Cardiovasc Intervent Radiol 2006; 29:179–187.
3. Spencer EB, Stratil P, Mizones H. Clinical and periprocedural pain management for uterine artery embolization. Semin Intervent Radiol 2013; 30: 354–363.
4. Pisco JM, Bilhim T, Duarte M, Santos D. Management of uterine artery embolization for fibroids as an outpatient procedure. J Vasc Interv Radiol 2009; 20:730–735.
5. Plancarte R, Amescua C, Patt RB, Aldrete JA. Superior hypogastric plexus block for pelvic cancer pain. Anesthesiology 1990; 73:236–239.
6. Rasuli P, Jolly EE, Hammond I, et al. Superior hypogastric nerve block for pain control in outpatient uterine artery embolization. J Vasc Interv Radiol 2004; 15:1423–1429.
7. Binkert CA, Hirzel FC, Gutzeit A, Zollikofer CL, Hess T. Superior hypogastric nerve block to reduce pain after uterine artery embolization: advanced technique and comparison to epidural anesthesia. Cardiovasc Intervent Radiol 2015; 38:1157–1161.
8. Yoon J, Valenti D, Muchantef K, et al. Superior hypogastric nerve block as post-uterine artery embolization analgesia: a randomized and double-blind clinical trial. Radiology 2018; 289:248–254.
9. Centers for Disease Control and Prevention. US Department of Health and Human Services. Calculating total daily dose of opioids for safer dosage. Available at https://www.cdc.gov/drugoverdose/pdf/calculating_total_daily_dose-a.pdf. Accessed April 1, 2019.
10. Khalilzadeh O, Baerlocher MO, Shyn PB, et al. Proposal of a new adverse event classification by the Society of Interventional Radiology Standards of Practice Committee. J Vasc Interv Radiol 2017; 28:1432–1437.e3.
11. Dariushnia SR, Nikolic B, Stokes LS, Spies JB. Quality improvement guidelines for uterine artery embolization for symptomatic leiomyomata. J Vasc Interv Radiol 2014; 25:1737–1747.
12. Pereira K, Salamo RM, Morel-Ovalle LM, Patel N, Patel R. Ropivacaine-induced local anesthetic systemic toxicity after superior hypogastric nerve block for pain control after uterine artery embolization. J Vasc Interv Radiol 2018; 29:1315–1317.
13. Rapp H, Ledin Eriksson S, Smith P. Superior hypogastric plexus block as a new method of pain relief after abdominal hysterectomy: double-blind, randomised clinical trial of efficacy. BJOG 2017; 124:270–276.
14. US Food and Drug Administration. Naropin (ropivacaine HCl). Available at https://www.accessdata.fda.gov/drugsatfda_docs/label/2010/020533s020s021lbl.pdf. Accessed April 1, 2019.
15. Resnick NJ, Kim E, Patel RS, Lookstein RA, Nowakowski FS, Fischman AM. Uterine artery embolization using a transradial approach: initial experience and technique. J Vasc Interv Radiol 2014; 25:443–447.