Published in final edited form as:

J Minim Invasive Gynecol. 2015 ; 22(7): 1260–1265. doi:10.1016/j.jmig.2015.07.013.

Effect of Intraperitoneal Bupivacaine on Postoperative Pain in the Gynecologic Oncology Patient

Colleen Rivard, MD, Rachel Isaksson Vogel, MS, and Deanna Teoh, MD*

Department of Obstetrics, Gynecology and Women's Health (Drs. Rivard and Teoh), and Biostatistics and Bioinformatics, Masonic Cancer Center (Ms. Vogel), University of Minnesota, Minneapolis, Minnesota

Abstract

Study Objective—To evaluate if the administration of intraperitoneal bupivacaine decreased postoperative pain in patients undergoing minimally invasive gynecologic and gynecologic cancer surgery.

Design—Retrospective cohort study (Canadian Task Force classification II-3).

Setting—University-based gynecologic oncology practice operating at a tertiary medical center.

Patients—All patients on the gynecologic oncology service undergoing minimally invasive surgery between September 2011 and June 2013.

Interventions—Starting August 2012, intraperitoneal administration of .25% bupivacaine was added to all minimally invasive surgeries. These patients were compared with historical control subjects who had surgery between September 2011 and July 2012 but did not receive intraperitoneal bupivacaine.

Measurements and Main Results—One-hundred thirty patients were included in the study. The patients who received intraperitoneal bupivacaine had lower median narcotic use on the day of surgery and the first postoperative day compared with those who did not receive intraperitoneal bupivacaine (day 0: 7.0 mg morphine equivalents vs 11.0 mg, $p = .007$; day 1: .3 mg vs 1.7 mg, $p = .0002$). The median patient-reported pain scores were lower on the day of surgery in the intraperitoneal bupivacaine group (2.7 vs 3.2, $p = .05$).

Conclusions—The administration of intraperitoneal bupivacaine was associated with improved postoperative pain control in patients undergoing minimally invasive gynecologic and gynecologic cancer surgery and should be further evaluated in a prospective study.

Keywords

Laparoscopy; Local anesthesia; Bupivacaine; Hysterectomy; Minimally invasive surgery

Introduction

The use of minimally invasive surgical techniques for gynecologic cancer surgery has been increasing since 2006 when the results of a large, randomized, clinical trial showed minimally invasive surgery to be both feasible and safe for the staging of endometrial cancer [1]. The benefits of minimally invasive surgery compared with laparotomy include decreased length of hospital stay, decreased pain, decreased narcotic use, and improved cosmetic outcomes [1–6]. Although incisional pain is decreased compared with laparotomy, additional pain occurs because of stretching of the intra-abdominal cavity, peritoneal inflammation, creation of the pneumoperitoneum, and dissection of the abdominal and pelvic viscera [7–10]. Pain from these sources can be diffuse, poorly localized, and at times referred to other sites. Many patients still require postoperative narcotic pain medication, which is associated with side effects such as nausea, vomiting, and drowsiness. The use of local anesthetics has the potential to improve pain control while minimizing systemic side effects.

Multiple studies in the general surgery literature have shown that administration of intraperitoneal local anesthetics can decrease postoperative pain and postoperative narcotic use [11–14]. The procedures performed and location of the surgical site in gynecologic and gynecologic cancer surgeries (pelvis compared with upper abdomen, intraperitoneal compared with retroperitoneal) are different from general surgery procedures, calling into question whether the results from the general surgery studies can be extrapolated to gynecologic surgeries. The few studies of administration of intraperitoneal local anesthetics during gynecologic surgeries have shown decreased pain scores [15]. However, most of these studies have only included procedures for benign disease such as tubal ligation, ovarian cystectomy, and operative laparoscopy for endometriosis. A recent study by Cruz et al [16] also showed improved pain control in patients undergoing major procedures; however, in this study hysterectomy was performed in only 33% of patients and staging procedures were performed in only 8%.

Given the higher complexity of oncologic procedures, including retroperitoneal dissection and multi-quadrant surgery, these patients may benefit from intraperitoneal local anesthetics even more than patients undergoing a simple hysterectomy for benign indications. The objective of this study was to evaluate the effect of intraperitoneal bupivacaine at the time of minimally invasive gynecologic oncology surgery on postoperative narcotic use and pain scores.

Methods

We performed a retrospective study of all patients who underwent a minimally invasive surgery (laparoscopic or robotic) with a single gynecologic oncologist (D.T.) from September 2011 through June 2013. Beginning August 2012, at the end of the surgical procedure and before release of the insufflation, a single dose of 20 mL of .25% bupivacaine was instilled intraperitoneally over the vaginal cuff and along the bilateral pelvic sidewalls to the paracolic gutters using the endoscopic applicator during all minimally invasive surgeries performed by this surgeon. Patients undergoing minimally invasive surgery

between August 2012 and June 2013 (named the IP bupivacaine group) were compared with historical control subjects who underwent minimally invasive surgery between September 2011 and July 2012 (named the standard group). Patients in both groups received preperitoneal injections of 10 mL of .25% bupivacaine at the port sites at the end of the procedure. Patients with a documented allergy or contraindication to bupivacaine or related drugs did not receive preperitoneal or intraperitoneal bupivacaine and were excluded from the study. The study was approved by the HealthPartners Institutional Review Board.

Laparoscopic and robotic procedures were performed using the standard techniques of the primary surgeon. The initial 10-mm (laparoscopic) or 12-mm (robotic) port was placed using the open technique. For all laparoscopic procedures 5-mm ports were placed in the bilateral lower quadrants, and an additional 10-mm suprapubic port was placed for all hysterectomies and for more difficult adnexal surgeries. For all robotic procedures all ports were placed in the upper abdomen, including two 8-mm robotic ports on the left and one 8-mm robotic port on the right and a 12-mm assistant port on the left.

The regimens for postoperative pain control were the same for both groups. During surgery and in the postanesthesia care unit patients received intravenous fentanyl for pain control. Unless contraindicated, all patients received ketorolac at the end of surgery and until discharge or a maximum duration of 24 hours postoperatively. After discharge or the first 24 hours in the hospital patients were transitioned to oral ibuprofen 600 mg every 6 hours. Patients received oral oxycodone/acetaminophen for breakthrough pain and intravenous hydrocodone or hydromorphone as needed for pain not controlled with the oral pain medications. Patients used the 10-point visual analog scale to rate their pain, and these data were extracted from the medical record.

The primary endpoint for this study was total narcotic use postoperatively as measured in milligrams of morphine equivalents. The secondary endpoint was self-reported pain score. Demographic data (age; body mass index; medical comorbidities such as diabetes, heart disease, hypertension, pulmonary disease, and bleeding disorders; current anticoagulation; and chronic narcotic use), symptoms before surgery, surgical data (indication for surgery, procedures performed, estimated blood loss, and intraoperative complications), postoperative data (postoperative pain scores and postoperative complications), and final diagnosis were collected from the medical record. Most patients receive all their healthcare through HealthPartners, and prescriptions for all medications were documented in the electronic health record.

At the patient's preoperative visit, the medication list was reviewed and updated, and this auto-populated into the clinic note. Chronic pain conditions were also included in the patient's medical history and auto-populated into the preoperative clinic note. Additionally, each patient was asked about pain at their first visit, and duration of pain symptoms was documented. The preoperative clinic note was reviewed for each patient as part of the data collection process. Data on the use of narcotics were collected in the same fashion in each group. For each patient, the inpatient medication administration record was reviewed. For all postoperative narcotic medication administered, information on medication, dose, and number of times it was administered was collected. For each narcotic medication (e.g.,

morphine, hydrocodone, codeine), the total amount of narcotic administered each day was summed and then converted to morphine equivalents.

Demographic, surgical, and postoperative data were summarized and compared to determine if there were any differences between the standard and IP bupivacaine groups using χ^2 and Fisher's exact tests as appropriate. Use of chronic pain medication at the time of surgery was collected as a dichotomous variable, and the proportion in each group using chronic pain medications was calculated. The relationship between bupivacaine use and intraoperative complications (yes/no) was assessed using χ^2 and Fisher's exact tests. The effect of bupivacaine use on narcotic use (milligrams of morphine equivalent); average reported pain for days 1, 2, and 3 (scale of 0–10); and length of the surgery (minutes) was analyzed using nonparametric methods (Wilcoxon 2-sample 2-sided tests) due to the violation of the normality assumption. Adjustments for complications and age at time of surgery were also considered. All statistical analyses were performed using SAS 9.3 (SAS Institute, Cary, NC), and $p < .05$ were considered to be statistically significant.

Results

A total of 130 patients underwent a minimally invasive surgery during the study period. Of these, 77 were in the standard group and 53 in the IP bupivacaine group. There were no differences in prior narcotic use, reported pain before surgery, or body mass index between the 2 groups. However, there was a nonsignificant tendency for those who received bupivacaine to be older (mean age, 59.6 years vs 55.8 years; $p = .11$; Table 1).

The proportion of patients who had laparoscopic (41.5% vs 41.6%) and robotic (58.5% vs 58.4%) procedures were the same in the IP bupivacaine and standard groups, respectively ($p = .996$). There were no statistically significant differences in the surgical procedures performed. In particular, 41.5% of patients in the IP bupivacaine group and 28.6% of patients in the standard group underwent a cancer staging procedure in the form of lymphadenectomy with or without other staging procedures (omentectomy, peritoneal biopsies) ($p = .126$). The estimated blood loss and rate of intraoperative complications did not differ between the groups. A statistically significantly greater proportion of patients in the IP bupivacaine group had cancer (62.3%) compared with the standard group (42.9%; $p = .03$); however, there was no difference in the malignant or benign diagnoses (Table 2).

Postoperative narcotic use and patient-reported pain scores for each group are presented in Table 3. Median narcotic use was statistically significantly decreased in the IP bupivacaine group on day of surgery (7.0 mg morphine vs 11.0 mg morphine, $p = .007$) and postoperative day 1 (.3 mg morphine vs 1.7 mg morphine, $p = .001$) compared with the standard group. The self-reported median pain score was lower in the IP bupivacaine group on the day of surgery (2.7 vs 3.2, $p = .05$), and there was a trend toward a lower median reported pain score on postoperative day 1 (3.0 vs 3.5, $p = .078$).

There was no statistically significant difference in the proportion of intraoperative or postoperative complications. Complications related to bupivacaine are rare outside of its use in epidural anesthesia but include cardiac arrhythmias, hypotension, altered mental status,

and respiratory depression. Two patients in the standard group experienced respiratory distress of unclear etiology. Three patients experienced cardiac complications, 2 of whom were in the IP bupivacaine group. The first was a 57-year-old woman who underwent a robotic-assisted laparoscopic hysterectomy and bilateral salpingo-oophorectomy for endometrial cancer who had a syncopal episode on the morning of postoperative day 1. Electrocardiogram showed sinus bradycardia, attributed to atenolol use (baseline pulse 65 beats per minute). She was discharged to home on postoperative day 2 without further incident. The second was a 75-year-old woman with type 1 diabetes mellitus and hypertension who underwent a robotic-assisted laparoscopic staging procedure for endometrial cancer. She developed hypotension in the postanesthesia care unit that was unresponsive to a fluid bolus and required a phenylephrine drip to maintain a systolic blood pressure > 95 mm Hg. She was weaned off the phenylephrine by postoperative day 1. Evaluation failed to identify an etiology for the hypotension, and cardiac rhythm was normal. She was discharged to home on postoperative day 2 with instructions to continue holding her antihypertensive medications.

Discussion

The findings from this retrospective study support the general surgery literature showing that the instillation of local anesthetic directly into the peritoneal cavity after minimally invasive surgery is associated with improved pain control. In our study, administration of intraperitoneal bupivacaine was associated with lower postoperative narcotic use and lower patient-reported pain scores.

The use of intraperitoneal local anesthetics during laparoscopic surgery to decrease postoperative pain dates back to the early 1990s. The general surgery literature first reported use of intraperitoneal local anesthetics for minimally invasive cholecystectomies [17,18]. A meta-analysis of 30 studies of laparoscopic cholecystectomies showed a decrease in the amount of narcotics used postoperatively as well as decreased postoperative pain scores [18].

The reported effect of intraperitoneal local anesthetics has been mixed in the gynecologic literature. A metaanalysis of 7 randomized controlled trials performed in gynecologic surgery patients showed an association between the use of intraperitoneal local anesthetics and decreased pain scores initially; however, pain scores were similar at 24 hours [15]. A subsequent prospective study showed that the use of port site plus intraperitoneal ropivacaine resulted in decreased pain and opioid usage in benign gynecologic surgical patients [16]. A recently published randomized controlled trial compared nebulization with instillation of ropivacaine at the time of laparoscopic ovarian cystectomy [19]. Nebulization of the anesthetic was associated with a higher proportion of patients reporting a numeric pain score of 3 or less within the first 4 hours of surgery ($p < .05$) and a lower proportion of patients requiring narcotics (82% vs 96%, $p < .05$) without a difference in mean amount of morphine used or length of hospital stay. Our data support these studies and confirmed the limited duration of the local anesthetic effect with decreased narcotic use and pain scores on the day of surgery and the first postoperative day but no differences on the second postoperative day. Most previous studies included only minor gynecologic procedures such

as tubal ligations, adhesiolysis, and adnexal procedures [19–26]. The results of our study as well as a study by Cruz et al [16] demonstrated that the superior pain control achieved with intraperitoneal administration of local anesthetic extends to patients undergoing minimally invasive hysterectomies and cancer staging procedures.

To our knowledge, there are 2 randomized controlled studies in patients undergoing laparoscopic hysterectomy among women with benign indications. The first compared instillation of 100 mg bupivacaine in 100 mL normal saline with instillation of 100 mL normal saline [27]. The second compared a 48-hour infusion of 100 mL of .5% levobupivacaine to an infusion of 100 mL normal saline [28]. All patients in both studies were given narcotics via intravenous patient-controlled analgesia pumps initially and then transitioned to oral pain medication. Neither study found an improvement in pain control, narcotic use, length of hospital stay, or overall patient satisfaction associated with use of bupivacaine. The conclusions of these trials may differ from that of our study for numerous reasons. First, we included women undergoing surgery for a suspected malignancy. Second, our patients were given oral narcotic pain medication and had intravenous narcotic medication available only for breakthrough pain. Third, although the absolute difference in amount of narcotic used in the randomized clinical trials (4.3 mg and 4.5 mg) was similar to our study (4 mg), the median amounts of narcotics used in the clinical trials were higher in both the IP bupivacaine and placebo groups (23.2 mg and 18.5 mg vs 25.7 and 23 mg, respectively). Finally, the data reported here are from a retrospective study with potentially unmeasured differences between the groups confounding the result; a randomized controlled trial including all patients is necessary to confirm the results.

The difference in the median amount of narcotic pain medication administered in the IP bupivacaine versus standard group was only 4 mg. The clinical significance of this difference is unclear; however, because side effects such as nausea, constipation, dizziness, fatigue, and confusion can occur after a single dose of narcotic pain medication, a decrease of even 1 dose of narcotic administration may improve patient comfort and satisfaction. Additionally, adverse side effects from bupivacaine are rare outside of its use in epidural anesthesia, and in our study there were no differences in cardiopulmonary complication rates.

The primary strength of this study is the relatively large number of major gynecologic procedures performed, including 101 hysterectomies and 44 cancer staging procedures. All surgeries were performed by a single surgeon, which may call into question the generalizability of the findings. However, all surgeries were performed using the same techniques and all patients received the same postoperative pain regimen, suggesting the differences in pain control were truly due to the administration of intraperitoneal bupivacaine. The limitations to this study are due to the retrospective nature of the study design and include selection and information bias. Additionally, the IP bupivacaine group was compared with historical control subjects, and we cannot control for temporal trends in pain assessment or management. All patients received intravenous fentanyl during their procedure and in the postanesthesia care unit per the anesthesia team's protocol. Patients in the IP bupivacaine group received a mean total dose of 42.72 µg compared with 49.81 µg in the standard group, which translates to a difference of .71 mg morphine equivalents. All

postoperative gynecologic oncology patients were admitted to the same inpatient unit with a relatively stable nursing staff; however, we cannot account for individual differences in administration of narcotic pain medications or assessment of pain scores using the visual analog scale. Although we were able to show that intraperitoneal bupivacaine was associated with significantly decreased use of postoperative narcotic pain medications, there was only a borderline decrease in patient-reported pain scores, and it is unclear if this difference is clinically meaningful. However, given that similarly low pain scores can be achieved with the administration of more pain medication, narcotic pain medication use is a more objective measure of differences in pain control.

In conclusion, our study showed that the administration of intraperitoneal bupivacaine was associated with decreased postoperative narcotic use and a trend toward decreased patient-reported pain scores in patients undergoing minimally invasive surgery, including major procedures such as hysterectomy and cancer staging procedures. Further investigation with prospective randomized trials is warranted to confirm the efficacy of intraperitoneal local anesthetics for postoperative pain control for patients undergoing laparoscopy for a known or suspected gynecologic malignancy.

Acknowledgments

Supported by National Institutes of Health grant P30 CA77598 using the Biostatistics and Bioinformatics Core shared resource of the Masonic Cancer Center, University of Minnesota, and by the National Center for Advancing Translational Sciences of the National Institutes of Health award number UL1TR000114.

References

1. Walker JL, Piedmonte MR, Spirtos NM, et al. Laparoscopy compared with laparotomy for comprehensive surgical staging of uterine cancer: Gynecologic Oncology Group Study LAP-2. *J Clin Oncol*. 2009; 27:5331–5336. [PubMed: 19805679]
2. Chalermchokchareonkit A, Tekasakul P, Chaisilwattana P, et al. Laparoscopic hysterectomy versus abdominal hysterectomy for severe pelvic endometriosis. *Int J Gynaecol Obstet*. 2012; 116:109–111. [PubMed: 22093496]
3. Nieboer TE, Hendriks JC, Bongers MY, et al. Quality of life after laparoscopic and abdominal hysterectomy: a randomized controlled trial. *Obstet Gynecol*. 2012; 119:85–91. [PubMed: 22183215]
4. Obermair A, Janda M, Baker J, et al. Improved surgical safety after laparoscopic compared to open surgery for apparent early stage endometrial cancer: results from a randomized controlled trial. *Eur J Cancer*. 2012; 48:1147–1153. [PubMed: 22548907]
5. Spirtos NM, Schlaerth JB, Gross GM, et al. Cost and quality-of-life analyses of surgery for early endometrial cancer: laparotomy versus laparoscopy. *Am J Obstet Gynecol*. 1996; 174:1795–1799. [PubMed: 8678142]
6. Kluivers KB, Ten Cate FA, Bongers MY, et al. Total laparoscopic hysterectomy versus total abdominal hysterectomy with bilateral salpingo-oophorectomy for endometrial carcinoma: a randomized controlled trial with 5-year follow-up. *Gynecol Surg*. 2011; 8:427–434. [PubMed: 22081769]
7. Alexander JL. Pain after laparoscopy. *Br J Anaesth*. 1997; 79:369–378. [PubMed: 9389858]
8. Mouton WG, Bessell JR, Otten KT, et al. Pain after laparoscopy. *Surg Endosc*. 1999; 13:445–448. [PubMed: 10227938]
9. Fredman B, Jedeikin R, Olsfanger D, et al. Residual pneumoperitoneum: a cause of postoperative pain after laparoscopic cholecystectomy. *Anesth Analg*. 1994; 79:152–154. [PubMed: 8010427]

10. Madsen MR, Jense KE. Postoperative pain and nausea after laparoscopic cholecystectomy. *Surg Laparosc Endosc.* 1992; 2:303–305. [PubMed: 1341550]
11. Cha SM, Kang H, Baek CW, et al. Peritrocal and intraperitoneal ropivacaine for laparoscopic cholecystectomy: a prospective, randomized, double-blind controlled trial. *J Surg Res.* 2012; 175:251–258. [PubMed: 21658722]
12. Louizos AA, Hadzilia SJ, Leandros E, et al. Postoperative pain relief after laparoscopic cholecystectomy. *Surg Endosc.* 2005; 19:1503–1506. [PubMed: 16328673]
13. Park YH, Kang H, Woo YC, et al. The effect of intraperitoneal ropivacaine on pain after laparoscopic colectomy: a prospective randomized controlled trial. *J Surg Res.* 2011; 171:94–100. [PubMed: 20605604]
14. Hilvering B, Draaisma WA, van der Bilt JDW, et al. Randomized clinical trial of combined preincisional infiltration and intraperitoneal instillation of levobupivacaine for postoperative pain after laparoscopic cholecystectomy. *Br J Surg.* 2011; 98:784–789. [PubMed: 21412996]
15. Marks JL, Ata B, Tulandi T. Systematic review and metaanalysis of intraperitoneal instillation of local anesthetics for reduction of pain after gynecologic laparoscopy. *J Minim Invasive Gynecol.* 2012; 19:545–553. [PubMed: 22763313]
16. Cruz J, Diebolder H, Dogan A, et al. Combination of pre-emptive portsite and intraoperative intraperitoneal ropivacaine for reduction of postoperative pain: a prospective cohort study. *Eur J Obstet Gynaecol Reprod Biol.* 2014; 179:11–16.
17. Joris J, Thiry E, Paris P, et al. Pain after laparoscopic cholecystectomy: characteristics and effect of intraperitoneal bupivacaine. *Anesth Analg.* 1995; 81:379–384. [PubMed: 7618731]
18. Kahokehr AM, Sammour T, Soop M, et al. Intraperitoneal use of local anesthetic in laparoscopic cholecystectomy: systematic review and metaanalysis of randomized controlled trials. *J Hepatobil Pancreat Sci.* 2010; 17:637–656.
19. Catenacci SS, Lovisari F, Peng S, et al. Postoperative analgesia after laparoscopic ovarian cyst resection: double blind multicenter randomized control trial comparing intraperitoneal nebulization and peritoneal instillation of ropivacaine. *J Minim Invasive Gynecol.* 2015; 22:759–766. [PubMed: 25820113]
20. Barclay K, Calvert JP, Catling SJ, et al. Analgesia after laparoscopic sterilization: effect of 2% lignocaine gel applied to Filshie clips. *Anaesthesia.* 1994; 49:68–70. [PubMed: 8311217]
21. Chou YJ, Ou YC, Lan KC, et al. Preemptive analgesia instillation during gynecologic laparoscopy: a randomized trial. *J Minim Invasive Gynecol.* 2005; 12:330–335. [PubMed: 16036193]
22. Ezeh UO, Shoulder VS, Martin JL, et al. Local anaesthetic on Filshie clips for pain relief after tubal sterilization: a randomized double-blind controlled trial. *Lancet.* 1995; 346:82–85. [PubMed: 7603217]
23. Shaw IC, Stevens J, Krishnamurthy S. The influence of intraperitoneal bupivacaine on pain following major laparoscopic gynaecological procedures. *Anaesthesia.* 2001; 56:1041–1044. [PubMed: 11703235]
24. Wheatley SA, Millar JM, Jadad AR. Reduction of pain after laparoscopic sterilization with local bupivacaine: a randomized, parallel, double-blind trial. *Br J Obstet Gynaecol.* 1994; 101:443–446. [PubMed: 8018619]
25. El-Sherbiney W, Saber W, Askalany AN, et al. Effect of intra-abdominal instillation of lidocaine during minor laparoscopic procedures. *Int J Gynaecol Obstet.* 2009; 106:213–215. [PubMed: 19477443]
26. Helvacioglu A, Weis R. Operative laparoscopy and postoperative pain relief. *Fertil Steril.* 1992; 57:213–215.
27. Arden D, Seifert E, Donnellan N, et al. Intraperitoneal instillation of bupivacaine for reduction of postoperative pain after laparoscopic hysterectomy: a double-blind randomized controlled trial. *J Minim Invasive Gynecol.* 2013; 20:620–626. [PubMed: 23706546]
28. Andrews V, Wright JT, Zakaria F, et al. Continuous infusion of local anaesthetic following laparoscopic hysterectomy—a randomized controlled trial. *Br J Obstet Gynaecol.* 2014; 121:755–761.

Table 1

Demographics by bupivacaine use (n = 130)

Variable	Bupivacaine (n = 53)	No bupivacaine (n = 77)	p
Mean age, yr (SD)	59.6 (13.9)	55.8 (13.1)	.110
Mean body mass index (SD)	31.5 (7.1)	32.6 (10.6)	.507
Prior narcotic use			.866
No	47 (88.7)	69 (89.7)	
Yes	6 (11.3)	8 (10.4)	
Diabetes			.287
No	47 (88.7)	63 (81.8)	
Yes	6 (11.3)	14 (18.2)	
Hypertension			.835
No	30 (56.6)	45 (58.4)	
Yes	23 (43.4)	32 (41.6)	
Obstructive sleep apnea			.304
No	50 (94.3)	76 (98.7)	
Yes	3 (5.7)	1 (1.3)	

SD = standard deviation.

Values are number of cases with percents in parentheses, unless otherwise noted.

Table 2

Surgical characteristics by bupivacaine use (n = 130)

Variable	Bupivacaine	No bupivacaine	p
Surgical approach			.996
Laparoscopic	22 (41.5)	32 (41.6)	
Robotic	31 (58.5)	45 (58.4)	
Hysterectomy			.351
No	14 (26.4)	15 (19.5)	
Yes	39 (73.6)	62 (80.5)	
Lymphadenectomy			.126
No	31 (58.5)	55 (71.4)	
Yes	22 (41.5)	22 (28.6)	
Mini-laparotomy *			.400
No	52 (98.1)	72 (93.5)	
Yes	1 (1.9)	5 (6.5)	
Intraoperative complication			1.000
No	51 (96.2)	75 (97.4)	
Yes	2 (3.8)	2 (2.6)	
Cancer			.030
No	20 (37.7)	44 (57.1)	
Yes	33 (62.3)	33 (42.9)	
Diagnosis			.204
Cervical cancer	3 (5.7)	1 (1.3)	
Endometrial cancer	19 (35.9)	27 (35.1)	
Ovarian cancer	8 (15.1)	4 (5.2)	
Other cancer	2 (3.8)	1 (1.3)	
Cervical dysplasia	0 (.0)	1 (1.3)	
Benign uterine pathology	7 (13.2)	13 (16.9)	
Benign ovarian neoplasm	10 (18.9)	26 (33.8)	
Endometriosis	2 (3.8)	2 (2.6)	
Genetic risk reduction	2 (3.8)	2 (2.6)	

Values are number of cases with percents in parentheses.

* Mini-laparotomy is defined as an incision approximately 6 cm in length used to remove an enlarged uterus and/or adnexal mass intact.

Table 3

Patient outcomes by bupivacaine use (n = 130)

Outcome	IP bupivacaine group		Standard group		p
	n	Median (range)	n	Median (range)	
Narcotic use, mg [*]					
Day of surgery	53	7.0 (0–26.3)	77	11.0 (0–42.0)	.007
Postop day 1 [†]	38	.3 (0–5.0)	63	1.7 (0–44.0)	<.001
Postop day 2 [‡]	5	.0 (0–.7)	14	1.2 (0–6.0)	.094
Pain score [§]					
Day of surgery	53	2.7 (0–5.8)	77	3.2 (1–6.8)	.050
Postop day 1 [†]	38	3.0 (0–7.5)	63	3.5 (0–8.0)	.078
Postop day 2 [‡]	5	2.0 (0–6.3)	15	3.2 (0–6.8)	.730

^{*} Converted to morphine equivalents.[†] Among those who stayed in the hospital overnight.[‡] Among those who stayed in the hospital 2 nights.[§] Measured by the visual analog pain scale 0–10.