GYNECOLOGY

Randomized controlled double-blind trial of transversus abdominis plane block versus trocar site infiltration in gynecologic laparoscopy

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OBJECTIVE: The objective of the study was to determine whether transversus abdominis plane (TAP) block reduces postoperative pain when compared with trocar site infiltration of bupivacaine in gynecological laparoscopy.

STUDY DESIGN: This was a prospective, randomized, double-blinded clinical trial using patients as their own controls. Women undergoing gynecologic laparoscopy using a 4-port symmetrical technique were randomly assigned to right- or left-sided TAP block using 30 mL of 0.25% bupivacaine with epinephrine. Two cohorts of patients were studied. Cohort 1 consisted of anesthesiologist-administered ultrasound-guided TAP block. Cohort 2 consisted of surgeon-administered laparoscopic-guided TAP block. In both cohorts, contralateral port sites were infiltrated with an equal amount of bupivacaine in divided doses. All patients received intraoperative acetaminophen and ketorolac. Postoperative abdominal pain was assessed at 1, 2, 4, 6, 8, 12, 18, 24, and 48 hours on the block and contralateral sides, before and after palpation, using the 10 point visual analog scale. A 2 point difference in the reported pain scores was considered clinically meaningful.

RESULTS: Eighty-eight patients were eligible for statistical analysis: 45 and 43 patients in cohorts 1 and 2, respectively. In both cohorts, most patients reported equal pain on the block side and local side. In cohort 1, there was a statistically significant difference in mean reported pain scores at 2 hours and across time favoring the ultrasound-guided block; however, this did not reach clinical significance. There was no statistically significant difference found at all other time points or when pain scores were objectively assessed after palpation of the incisions. When comparing laparoscopic-guided block with local infiltration, there was no statistically significant difference in reported mean pain scores at all time points or after palpation.

CONCLUSION: As part of this multimodal analgesic regimen, neither block method provided a significant clinical benefit compared with trocar site bupivacaine infiltration.

Key words: bupivacaine, gynecological laparoscopy, local anesthetic, port-site infiltration, postoperative pain, transversus abdominis plane block

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During the last 2 decades, laparoscopic surgery has assumed an important role in gynecological surgery. Studies have demonstrated improved outcomes compared with those of conventional open procedures in terms of cosmesis, postoperative pain, and morbidity.[1,2] Despite the brief recovery time, laparoscopy is certainly not pain free in the acute period, and the issue of controlling pain from port-site wounds remains challenging.[3] Postoperative pain can lead to an increased consumption of opioids, with subsequent nausea, delayed bowel function, and prolonged postoperative recovery.[4]

In an effort to address pain-related complications, various methods of pain control have been attempted.[5-9] Currently, no standard of care exists and management is based on surgeon and anesthesiologist preferences. The transversus abdominis plane (TAP) block is a regional anesthetic technique that has recently gained popularity in open surgery. It blocks the abdominal wall neural afferents by introducing local anesthetic into the neurofascial plane between the internal oblique and transversus abdominis muscles, consequently providing unilateral analgesia between the costal margin and the inguinal ligament.[10] This modality

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proved to be particularly efficacious in reducing postoperative pain scores and opioid requirements after open abdominal surgery[11-15] as demonstrated in a metaanalysis of 18 randomized controlled trials.[16]

In the setting of laparoscopy, TAP block has been suggested as a useful technique.[16-19] However, there are conflicting data regarding gynecological laparoscopy. Whereas TAP block failed to add any analgesic benefit in some comparative trials,[20] pain control was clearly superior in others.[21,22] Optimal perioperative pain management remains controversial, and the debate continues with regard to the best method of local anesthesia that would provide clinically relevant alleviation of postoperative pain.

The rationale for this research is based on our observation that in the setting of multimodal analgesia, patients typically have minimal pain after gynecological laparoscopic surgery. The inference is that additional procedures and costs without demonstrable clinical benefits are not justified.

We hypothesized that TAP block does not reduce postoperative pain compared with traditional trocar site infiltration of bupivacaine in gynecological laparoscopy. Therefore, we designed a prospective, randomized controlled, double-blinded clinical trial comparing the efficacy of port-site infiltration of local anesthetic with ultrasound-guided TAP block and laparoscopic-guided TAP block for postoperative pain relief after laparoscopic gynecological surgery. We used patients as their own controls to avoid the confounding factors limiting prior studies.

Materials and Methods

After approval by the Institutional Review Board at White Plains Hospital Center, written informed consent was obtained preoperatively from women 18 years old or older undergoing gynecological laparoscopic surgery using a 4-port symmetrical technique. Patients with a known allergy to local anesthetic were not enrolled. Cases requiring a conversion to a laparotomy or the use of more than 4 laparoscopic ports were also excluded from the analysis. After informed consent, patients were randomized according to a computer-generated randomization list in sealed white envelopes to either right- or left-sided TAP block (experimental arm), and in each case the contralateral side of the abdomen was treated with a trocar site infiltration of anesthetic (control arm). Patients and postoperative assessors were blinded to the treatment assignment.

All patients received general anesthesia with endotracheal intubation. A standard multimodal intraoperative intravenous analgesic regimen was used including 1 g of acetaminophen and 30 mg of ketorolac. All the surgeries were performed by a single surgeon trained in advanced laparoscopy and a fellow in minimally invasive gynecology.

The surgical approach consisted of 4 laparoscopic ports inserted at or below the umbilicus: 1 periumbilical balloon trocar of 12 mm (T10 dermatome), 2 accessory ports of 5 mm inserted into the right lower quadrant and the left lower quadrant, and 1 accessory port of 5 or 12 mm in the suprapubic region (T12-L1 dermatomes). In every case, peritoneal access was obtained using an open port placement technique in the periumbilical area.

The control arm consisted of a total of 30 mL of 0.25% bupivacaine with epinephrine injected in divided doses in the trocar sites on 1 side of the abdomen: the lateral port received 40% of the dose, the midline umbilical port was injected with 40% on the control side only, and the suprapubic site was injected with 20% on the control side only.

The experimental arm consisted of the same total amount of 30 mL of 0.25% bupivacaine with epinephrine injected in the midaxillary line between the costal margin and the iliac crest.

In cohort 1, the TAP block was performed using a posterior approach under ultrasound guidance by 1 of 2 anesthesiologists, both with significant experience with this technique. A high-frequency linear ultrasound probe was positioned in a transverse plane on the anterolateral abdominal wall in the midaxillary line, between the lower costal margin and the iliac crest.

A 20-gauge 10 cm needle was inserted in the plane of the ultrasound beam and followed visually until it reached the plane between the internal oblique and the transversus abdominis muscles. Two milliliters of the local anesthetic solution were injected to visualize the spread of the solution and confirm correct needle position after which the remainder of the 30 mL was administered (Figure 1).

In cohort 2, the surgeon performed the TAP block injection under laparoscopic guidance. A 20-gauge 10 cm needle attached to a syringe of 30 mL of 0.25% bupivacaine with epinephrine was introduced through the abdominal wall using the same anatomic landmarks. After skin puncture, the needle was advanced to the level of the parietal peritoneum under direct laparoscopic visualization. Loss of resistance was felt while the needle passed through the external oblique and the internal oblique muscles. As the needle approached the peritoneum, slow injection was performed to tent the peritoneum, and the needle was then slightly withdrawn to infiltrate the correct plane. A diffuse bulge could be visualized expanding anterior to the peritoneum and transversus abdominis (Figure 2). The needle was withdrawn and redirected in the event of incidental peritoneal perforation.

All treatments were performed at the end of the surgical procedure and immediately prior to extubation. In all patients, the total amount of 0.25% bupivacaine with epinephrine used did not exceed the recommended safe dose of 2.5 mg/kg. Patients weighing less than 60 kg received a reduced amount of local anesthetic; otherwise, patients received a total volume of 60 mL. Careful aspiration was performed prior to all injections to minimize the risks of intravascular entry and subsequent local anesthetic toxicity.

At the completion of the surgery, patients were transferred to the postanesthetic care unit (PACU). Throughout the postoperative period, analgesic medications including acetaminophen, nonsteroidal antiinflammatory drugs, and systemic narcotics were administered upon patient request. Postoperative