The ON-Q pain management system in elective gynecology oncologic surgery: Management of postoperative surgical site pain compared to intravenous patient-controlled analgesia

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Objective
The goal of this study was to compare postoperative surgical site pain in gynecologic cancer patients who underwent elective extended lower midline laparotomy and managed their pain with either the ON-Q pain management system (surgical incision site pain relief system, ON-Q pump) or an intravenous patient-controlled analgesia pump (IV PCA).

Methods
Twenty gynecologic cancer patients who underwent elective extended lower midline laparotomy were divided into two groups. One group received a 72-hour continuous wound perfusion of the local anesthetic ropivacaine (0.5%, study group) into the supraperitoneal layer of the abdominal incision through the ON-Q pump. The other group received intravenous infusion pump of patient-controlled analgesia (fentanyl citrate 20 mg/mL·kg+ondansetron hydrochloride 16 mg/8 mL+normal saline). Postoperative pain was assessed immediately and at 6, 24, 48, 72, and 96 hours after surgery using the visual analogue scale.

Results
Postoperative surgical site pain scores at 24, 48, and 72 hours after surgery were lower in the ON-Q group than the IV PCA group. Pain scores at 24 hours and 48 hours after surgery were significantly different between the two groups ($P = 0.023$, $P < 0.001$). Overall painkiller administration was higher in the ON-Q group but this difference was not statistically significant (5.1 vs. 4.3, $P = 0.481$).

Conclusion
This study revealed that the ON-Q pain management system is a more effective approach than IV PCA for acute postoperative surgical site pain relief after extended lower midline laparotomy in gynecologic cancer patients.

Keywords: Analgesia; Gynecologic neoplasm; Local anesthesia; Postoperative pain

Introduction
Surgery is a major stressor that induces secretion of various substances such as prostaglandin, serotonin, and histamine as a reaction to localized tissue damage. In laparotomies with larger incisions, intra-abdominal surgical incision site pain is the most significant cause of acute postoperative pain. Extended lower midline laparotomies have relatively long incisions, and thus effective pain control of the surgical incision site is particularly important. Pain at the intra-abdominal incision site which is not effectively controlled interferes with the
deep breathing necessary for early ambulation and recovery from atelectasis. Uncontrolled pain can also affect the respiratory, cardiovascular, digestive, urinary and musculoskeletal system, thereby making it difficult to recover quickly from surgery, as well as affecting the overall success of the surgery. Various methods including epidural anesthesia, intraspinal anesthesia, intrapleural anesthesia, and intravenous patient controlled analgesia are used to control postoperative pain, and parenteral narcotics are commonly used as anesthesia. Even though parenteral narcotics play a key role in the reduction of postoperative pain, they include many side effects such as nausea, vomiting, an itching sensation, palpitation, low blood pressure, weakening of muscles, and dizziness. Other serious side effects include difficult urinating, paralytic ileus, miosis, increased intracranial pressure and respiratory suppression. There have been many attempts to reduce these side effects, such as combining parenteral narcotics with other drugs or adjusting the dose of narcotic analgesia, but some side effects still persist.

Continuous injection of local analgesia into the surgical incision site has been effectively used to reduce the side effects of narcotics [1-16]. The ON-Q pain management system (ON-Q PainBuster, referred to as ON-Q pump) created by the I Flow Corp. (Lake Forest, CA, USA) is a device that continuously administers local analgesia directly into the intra-abdominal surgical wound site. Studies comparing the use of this device to a placebo have been carried out over the past several years in numerous surgical departments [4,17-19]. However, no study has evaluated postoperative surgical incision site pain using the ON-Q pump, and compared postoperative intra-abdominal surgical incision site pain between a group that administered local analgesia directly into the incision site wound by ON-Q infusion pump, and a group that administered parenteral narcotics via intravenous patient-controlled analgesia (referred to as IV PCA).

**Materials and Methods**

Gynecology oncologic patients who completed baseline studies with a confirmed diagnosis of carcinoma between November 2011 and April 2012 at the Department of Obstetrics and Gynecology, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea were selected as study subjects. Twenty patients consented to use a pain control device following gynecology oncologic surgery and were randomly divided into two groups of ten. Postoperative intra-abdominal surgical incision site pain was compared between the group that administered local analgesia through an ON-Q pump (ON-Q pain management system, I Flow Corp.) inserted into the surgical incision site, and the group that administered parenteral narcotics via IV PCA. The groups consisted of patients who underwent laparotomy through a lower midline incision that extended 6 to 7 cm above the umbilicus from the pubic bone. Surgeries were limited to the staging operation, including total abdominal hysterectomy (or radical abdominal hysterectomy) and bilateral pelvic lymph node dissection, but could be modified by each diagnosis. Patients who received an American Society of Anesthesiologist grade of more than IV; had an allergic reaction to ropivacaine hydrochloride, fentanyl citrate or ketorolac tromethamine; had a history of drug or alcohol addiction in the last six months; or had serum creatinine levels greater than 2 mg/dL were excluded from this study.

![Verbal descriptor scale](Fig. 1. Visual analogue scale (VAS): The VAS provides a simple and efficient measure of pain intensity that has been used widely and consists of a 10 cm horizontal line with the two endpoints labeled as “no pain” and “worst pain.” The distance (centimeters) between the low end of the VAS and the patient’s mark is used as a numerical index of pain intensity.}