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The effect of anesthesia choice on post-operative outcomes in women undergoing exploratory laparotomy for a suspected gynecologic malignancy ☆

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HIGHLIGHTS

- PCEA in gynecologic oncology patients undergoing laparotomy is associated with decreased narcotic use and pain scores.
- TAP blocks are associated with decreased narcotic use on the day of surgery, but not on postop days 2–3.

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ABSTRACT

Objective. To determine how anesthesia choice in women undergoing laparotomy for gynecologic malignancy affects pain control and narcotic use.

Methods. This is a retrospective study of women who underwent laparotomy for suspected gynecologic malignancy from May 2012 to January 2013. Patients were categorized into one of three groups: 1) patient controlled analgesia (PCA); 2) PCA + transversus abdominis plane block (TAP); and 3) patient-controlled epidural analgesia (PCEA). Mean narcotic use and patient reported pain scores were compared.

Results. The analysis includes 112 women (44 PCA, 30 TAP, 38 PCEA). Intraoperative factors were not different between groups with the exception of a significant difference in the rate of intra-operative complications ($p = 0.020$), with lower rates in the PCEA group. The groups differed in intravenous narcotic use in each of the first three postoperative days (day 0: $p = 0.014$; day 1: $p < 0.0001$; day 2: $p = 0.048$), with patients in the TAP group using the least on day 0 and those in the PCEA group using less on postoperative days 1 and 2. In addition, the PCEA group reported lower pain scores on postoperative days 1 and 2 (day 1: $p = 0.046$; day 2: $p = 0.008$).

Conclusions. The use of patient controlled epidural anesthesia after laparotomy for gynecologic malignancy is associated with decreased IV and PO narcotic use and improved pain control without increasing complications or length of hospital stay. Further investigation with prospective randomized trials is warranted to elucidate the optimal post-operative pain management technique.

Introduction

Optimizing postoperative pain control has been shown to improve surgical outcomes [1,2]. Traditional use of systemic opioids provides effective pain relief but is associated with undesired side effects including nausea and delayed recovery of bowel function which are detrimental to global recovery. Recent reports suggest that regional anesthetic techniques such as the epidural and transversus abdominus plane (TAP) blocks may provide effective analgesia without the deleterious systemic effects of narcotic medications. Several meta-analyses of epidural use suggest its superiority to traditional intravenous opioid administration in terms of post-operative analgesia for patients undergoing a laparotomy or thoracotomy [3,4]. Whether these findings can be extrapolated to the gynecologic cancer population, whose surgical complexity and baseline physiologic characteristics may be less favorable to rapid recovery, remains uncertain with data to date demonstrating conflicting results with regard to pain control and return of bowel function [5–7].

TAP blocks, which act distal to the central nervous system but proximal to the surgical wound, were first described in 2001 and have been shown to be effective in many surgical settings [8]. The TAP block is

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performed by injection of a long acting local anesthetic into the neurovascular plane of the abdominal musculature. A recent meta-analysis showed that the use of TAP blocks resulted in decreased morphine use after 24 h and increased time to first request for additional analgesia in a wide variety of surgeries including laparoscopic cholecystectomy, cesarean section through a Pfannenstiel incision, total abdominal hysterectomy and large bowel resection through a vertical midline incision [9]. However, two randomized controlled trials showed no improvement in pain scores or narcotic use with the use of TAP block or On-Q local anesthetic pump in gynecologic oncology patients [10,11]. The goal of the current study is to compare pain control in women undergoing laparotomy for potential gynecologic malignancy using three different modes of postoperative analgesia.

Materials and methods

We performed a retrospective chart review of gynecologic oncology patients at the University of Minnesota Medical Center. Institutional Review Board approval was obtained prior to data collection. All patients undergoing laparotomy via a vertical midline abdominal incision for a known or suspected gynecologic malignancy were identified using the surgical database for the gynecologic oncology department from May 2012 to January 2013. This time frame was used due to the introduction and wide use of TAP blocks during this period. Patients were categorized into one of three groups based on the type of analgesia used in the postoperative setting: 1) patient-controlled intravenous analgesia alone (PCA group) with a basal rate only for those on chronic opioids and demand doses as needed; 2) patient-controlled intravenous analgesia + transversus abdominus pain block (TAP group); and 3) patient-controlled epidural anesthesia (PCEA group). Patients were grouped according to the first analgesia method used post-operatively, even if it was later determined to be non-functional and/or had to be changed. All epidural catheters and TAP blocks were placed by a dedicated regional anesthesia team in the pre-operative area. This same team was responsible for the management and subsequent removal of all indwelling catheters in the post-operative period. Based on the half-life of liposomal bupivacaine the TAP blocks are estimated to last approximately 55–72 h. For PCA management it is our practice to order a basal rate for any patient who is on opiates long term. For those patients who are opiate naïve it is not standard to order a basal rate for a PCA. Our dedicated regional anesthesia team uses 0.125% or 0.0625% bupivacaine with dilaudid 3–6 mcg/ml in the epidural and this is titrated up or down as appropriate based on patient side effects and pain scores, however there could be some variation based on patient medical history.

Medical records were reviewed for demographic data, surgical information, prior narcotic use, postoperative pain scores, postoperative narcotic use and any complications. Surgical procedures were classified into 1 of 4 groups based on type of surgery performed 1) <TAH: no hysterectomy or debulking (e.g. adnexal procedure), 2) TAH: hysterectomy +/− adnexal procedure, 3) Debulking: any staging (omentectomy, lymph node dissection, peritoneal biopsies) or tumor debulking beyond hysterectomy/salpingo-oophorectomy, excluding bowel surgery, and 4) Bowel surgery: any small or large bowel procedure. Pain scores and narcotic use during hospitalization were the primary outcomes of interest. Pain scores were recorded multiple times each day and mean pain score was calculated for each postoperative day. Pain scores are recorded with vital signs which are standardly recorded every 2 h for two readings, then every 4 h for two more readings and then every shift for the remainder of their hospital stay pending any changes due to patient status. Narcotic use was calculated from any systemic (intravenous or oral) narcotics that were utilized by the patients but did not include any narcotics given through the epidural.

Demographic and clinical characteristics were summarized by group using descriptive statistics. The relationship between pain management method and intra-operative complications (yes/no) was assessed using Chi-squared and Fisher's exact tests as appropriate. The effect of pain management method on systemic narcotic use (morphine equivalents in milligrams), average reported pain score for postoperative days 0, 1 and 2 (0–10 on the visual analog scale) along with the length of the surgery (minutes) was analyzed using Wilcoxon two-sample two-sided tests. The effect of pain management method on the length of the post-surgical hospital stay (number of days) was assessed using Poisson regression, adjusting for over-dispersion. Experience of intra- or post-operative complications and age at time of surgery were also considered in regression models. All statistical analyses were performed using SAS 9.3 (SAS Institute, Cary, NC) and p-values of <0.05 were considered statistically significant. Analysis was by intention to treat.

Results

A total of 112 patients met the inclusion criteria. Group distribution by primary post-operative pain control method was 44 (39.3%) PCA, 30 (26.8%) TAP and 38 (33.9%) PCEA. Ten patients (26%) in the PCEA group were unable to achieve adequate pain control and were thus switched to a PCA; per intention to treat analysis, these patients were analyzed in the PCEA group. None of the patients in the PCA or TAP groups subsequently had epidurals placed. Patients in all three groups had high rates of the expected medical co-morbidities of the gynecologic oncology population including diabetes, hypertension, and obesity, with a mean BMI of 30.4 kg/m^2 for the entire study population. Groups were generally well balanced for studied baseline factors with no statistically significant differences in age, body mass index (BMI), rates of pre-operative narcotic use, diabetes, obstructive sleep apnea or final surgical pathology (benign or malignant) between the three groups (Table 1). There were more patients with hypertension in the PCA group ($p = 0.018$).

Surgical procedures, length of surgery and estimated blood loss were similar across the groups. Eighty five percent of the laparotomy incisions extended above the umbilicus, and this was not statistically significantly different between groups. There were 6 patients in the PCA group, 4 patients in the TAP group and 2 patients in the PCEA group for which it is unknown if their incision extended above the umbilicus. We recorded any intra-operative complications that occurred, however there were only urinary tract injuries and transfusions that occurred. Intraoperative complication rates were significantly different by group (Table 2). In particular, the PCEA group did not require any blood transfusions whereas 13.6% and 10% of those in the PCA and TAP groups, respectively, were transfused at least one unit of packed red blood cells ($p = 0.043$). There were no complications attributed to the placement of the epidural catheters or TAP blocks.

On postoperative day 0 (day of surgery), use of systemic narcotic pain medication (morphine equivalents in milligrams) was significantly different by group ($p = 0.014$), with those in the TAP group using less than those in the PCA and PCEA groups, though all three reported similar pain scores (Table 3). On postoperative days 1 and 2 there were also significant differences in pain ($p = 0.046$ and $p = 0.008$) and systemic narcotic pain medication use ($p < 0.0001$, $p = 0.048$) by group, with those in the PCEA group reporting lower pain scores and using less systemic narcotic pain medication.

The proportion of patients experiencing postoperative complications was not significantly different between groups (Table 4). Only one patient developed hypotension in the PCA group, compared to none in the TAP or PCEA groups. The fact that 46% of patients in the PCEA group were hypertensive at baseline could account for the lack of postoperative hypotension seen in this group. We also find that hypotension is avoided in this patient population due to the responsiveness of our dedicated regional anesthesia team. There was no difference in the rates of postoperative ileus or urinary retention. After adjusting for age and complications arising both intra- and post-operatively, there was a borderline significant difference in length of hospital stay by group ($p = 0.071$), with those in the TAP group having the longest