Journal of Anesthesia and Clinical Research

Enten et al., J Anesth Clin Res 2018, 9:6
DOI: 10.4172/2155-6148.1000835

Research Article Open Access

Analgesia Post Abdominal Surgery: Intravenous *vs.* Continuous Thoracic Epidural Pain Management

Enten G*, Puri S, Copeland M, Mangar D and Camporesi E

Department of Anesthesia, TEAM Health Research Institute, 1 Tampa General Circle, Tampa, Florida, USA

***Corresponding author:** Garrett Enten, Department of Anesthesia, TEAM Health Research Institute, 1 Tampa General Circle, Tampa, Florida, USA, Tel: (954) 319-5451; E-mail: garrett_enten@teamhealth.com

Received date: June 07, 2018; **Accepted date:** June 19, 2018; **Published date:** June 25, 2018

Abstract

Introduction/Background: This study evaluates the effects of continuous thoracic epidural analgesia (TEA) *vs.* intravenous pain control methods on the narcotics requirement for common laparoscopic abdominal surgeries. The introduction of new guidelines at Tampa General Hospital for the year 2017 afforded the opportunity for a sequential case series analysis of these two methods of pain management.

Methods: A sequential case-series on patients undergoing laparoscopic or robot assisted abdominal surgery was performed. Patients were recruited upon request of surgeons using the same nurses and resident support team. Data were obtained from retrospective chart review following local IRB approval and evaluated for the effects of intravenous analgesia compared to continuous T9-10 epidural analgesia. Primary outcomes were intraoperative, 24 h and post-24 h opioid use in morphine milligram equivalents (MME). Length of hospital stay and VAS pain scores were also collected.

Results: There was no significant difference in terms of age, gender, and BMI between groups. When compared patients who received epidural reported significantly lower pain scores in the first 24 h after surgery ($p<0.05$) and for the remainder of their hospital stay ($p<0.05$). Significant decreases in narcotic requirement was noted in the PACU ($p<0.001$), the first 24 h after surgery ($p<0.001$), and aggregate use per day ($p<0.01$).

Conclusions: Continuous thoracic epidural analgesia is a viable alternative to intravenous pain control for patients undergoing common laparoscopic surgeries. Further research is required to determine the risks and benefits of TEA for laparoscopic colorectal surgery.

Keywords: Analgesia; Surgery; Pain management

Introduction

Colorectal surgery is often associated with pain, complications, high costs, and long hospital lengths of stay [1]. Factors contributing to these associations include: high rates of ileus, anastomosis, surgical site infection, and readmission [2,3]. It is for this reason that this subset of surgeries has been the target for further development of enhanced recovery after surgery (ERAS) techniques over the past years. Specific implementation of ERAS techniques, or enhanced recovery protocols (ERPs), have been associated with improved outcomes and reduced length of stay when compared to techniques outlined in more conventional clinical practice guidelines [3]. Further, some ERPs have been associated with reduced healthcare costs and improved patient satisfaction [4]. A Cochrane review of an 8 year long ERP initiative identified early mobilization, early discontinuation of intravenous fluids and nutrition, early removal of urinary catheter, and opioid sparing analgesia or non-opioid analgesia as the greatest contributors to reduced complications and length of hospital stay [5].

ERPs include multi-modal pain management techniques that are utilized to minimize patient narcotic requirements. In addition to the routine use of nonsteroidal anti-inflammatory drugs (NSAIDs) such as acetaminophen and ketorolac, neuraxial techniques can be also implemented. ERP Guidelines recommend the use of thoracic epidural analgesia (TEA) for open colorectal procedures [1]. However, there is much debate as to whether the benefits associated with TEA are conferred to patients receiving laparoscopic surgery.

This study is an evaluation of TEA as an opioid sparing technique. The establishment of a new ERP at Tampa General Hospital that included the use of TEA as a multi-modal opioid sparing technique afforded the opportunity for analysis of a sequential case series of standard patient controlled analgesia (PCA) *vs.* TEA for laparoscopic colorectal surgery.

Methods

Prior to January 2017, Tampa General Hospital utilized a "Fast Track Protocol" for colorectal surgery. This ERP included: preoperative counseling where patients were provided with a written description of the surgery and of the specific "fast track" interventions to be utilized; a preoperative course of antibiotics; maintained normothermia for the duration of the surgery; a maximum 500 ml/h for intraoperative fluids during the first two hours of surgery; supplemental oxygen in the first 24 h after surgery; early ambulation; early oral nutrition; and early catheter removal. Anesthesia was induced with fentanyl (200 mcg-500 mcg) and propofol (200 mg). Postoperative pain course included hydromorphone PCA in standard dosage and lockout regimens. IV bolus meperidine, morphine, hydromorphone, and/or ketorolac were utilized as rescue analgesics and were given on an as-needed basis.

On January 1st 2017, to minimize narcotics use perioperatively, continuous infusion epidural was added to the Fast Track Protocol. Epidural catheter was inserted before anesthesia induction at T9-10. Catheter position was confirmed with a single bolus injection of 1% lidocaine with epinephrine. The intraoperative epidural consisted of a basal dose of ropivacaine 0.1% at a basal rate of 8-9 ml/h, additional bolus doses of 2.5 ml ropivacaine 0.1% were given based on the clinical needs of the patient for a max of 13-14 ml/h. Epidural analgesia continued in the post anesthesia recovery unit (PACU) and was administered by continuous infusion with an additional patient-controlled bolus capability (PCEA). Epidural dosage, patient pain, and adverse effects were monitored by TGH acute pain service.

Sample Characteristics		
	IV analgesia	**Epidural Analgesia**
Sample Size	n=29	n=29
Mean Age (years)	58.3	53.5
Mean BMI (kg/m^2)	28.7	28.3
Gender Ratio (% Male)	43	41
Group Surgery Composition		
Surgeries Performed		
Laparoscopic Bowel Resections	21	20
Bowel Stoma Creations	3	4
Rectoplexies	3	4
Other	2	1

Table 1: Case-series on patients undergoing laparoscopic or robot assisted abdominal surgery.

	Epidural Analgesia:	**IV Analgesia:**	
	Mean (SD)	**Mean (SD)**	**P Value**
LOS (days)	6.7 (4.9)	9.8 (9.3)	0.1084
Sx Duration (min)	271 (124)	229 (91)	0.1494
LOS PACU (min)	240 (105)	189 (86)	0.0504
Pain Score PACU	3.4 (2.4)	4.2 (2.5)	0.2714
Pain Score 24 h	4.8 (2)	5.7 (1.7)	0.0499*
Pain Score Post-24 h	4.2 (1.3)	5.1 (1.5)	0.0183*
MME INTRA OP	62.4 (28.3)	118.7 (89.9)	0.0016**
MME PACU	14.2 (28.9)	44.3 (31.6)	0.0004**
MME 24 h	87.9 (122.5)	272.5 (202.2)	0.0001**
MME Total	466.9 (616.3)	1460.7 (2768.1)	0.0602
MME Total/day	69.6 (85.2)	131.8 (101.8)	0.0097*

Table 2: Data were evaluated for the effects of continuous epidural analgesia.

Upon obtaining approval for the University of South Florida Investigational Review Board, a retrospective sequential case-series on patients undergoing laparoscopic or robot assisted abdominal surgery was performed. Chart review comprised a series of patients from January 2016 to July 2017. A total of 29 cases utilizing standard intravenous analgesia were assembled from January 2016 to December 2016. From January 2017 to July 2017, a total of 29 cases utilizing T9-10 continuous epidural analgesia were collected. Group surgery composition is outlined in Table 1. Staffing for every patient's post-operative course was drawn from the same pool of nurses and both groups utilized the same resident support team. Data were evaluated for the effects of continuous epidural analgesia. Primary outcomes were intraoperative, 24 h and post-24 h opioid use in morphine milligram equivalents (MME). Length of hospital stay and VAS pain scores were also collected Table 2.

Results

Data were analyzed using a non-paired two-tailed t-test, significance was determined at a p-value <0.05. Groups were comparable in age, gender, BMI, and surgeries performed. When compared to the patient series from January 2016 to Dec 2016, patients from Jan 2017 onward who received epidural reported significantly lower pain scores in the first 24 h after surgery ($p<0.05$) and for the remainder of their hospital stay ($p<0.05$). Additionally, a significant decrease in narcotic use as measured by MME was noted in the OR ($p<0.05$), PACU ($p<0.001$), the first 24 h after surgery ($p<0.001$), and aggregate use per day ($p<0.01$). While reduction in aggregate total use was not statistically significant, due to the large variance, a clinically significant reduction in total narcotic use was noted in a majority of patients. A nonsignificant but clinically important decrease in length of stay was also noted from 9.9 to 6.7 days.

Discussion

Current guidelines provided by the American Society of Colon and Rectal Surgeons (ASCRS) and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) recommend the combination a small dose of local anesthetic and lipophilic opioids for open abdominal procedures as it has been shown to provide better analgesia than TEA or PCA opioids alone [1]. This effect has also been observed in laparoscopic surgery [6]. However, whether this contributes to reduced narcotics requirement and whether or not this contributes to overall better postsurgical outcomes in patients undergoing laparoscopic surgery is still under debate.

Kappa, Mu, and Delta opioid receptors that regulate cholinergic transmission in the mesenteric plexus have been identified in the intestinal tract [7]. As a result opioids have a dose-dependent inhibitory effect on intestinal motility and can be a contributing factor to postoperative ileus. Postoperative ileus is associated with significant increased hospital length of stay, costs, and 30-day readmission rates [8,9]. While our data suggests an on average reduced length of stay of 3 days, none of the patients' charts reflected ileus as a complication. Thus, this observed reduction may be due to other contributing factors. Current literature reflects that TEA has no effect on rates of postoperative ileus for laparoscopic colorectal surgery [3].

Contrary to our results, the literature shows TEA may in fact worsen surgical outcomes in terms of hospital length of stay, risk of urinary tract infection, and overall cost of hospitalization [3,10,11]. This however has yet to be confirmed by a sufficiently large prospective

randomized clinical trial. As of now, whether TEA affects average hospital length of stay is still unconfirmed. Within the literature only 1 study corroborates our findings of a reduced average length of stay [12] other larger studies have either shown that length of stay is either unaffected or extended by including TEA as part of the anesthetic [2,3,6]. This may explain why perioperative use of epidural analgesia in laparoscopic colorectal surgery is limited within the United States [3].

A majority of the literature does agree that TEA results in an overall reduction in perioperative pain [6,10-12]. These findings were supported by our data. Postoperative pain saw limited improvements, but a significant pain reduction was observed within the first 24 h of PACU discharge and for the remainder of the subjects hospital stay. This has been previously reported within the literature; reductions in perioperative pain are often described as "minimal" or "modest" [5,6]. However, pain benefits have been reported longitudinally. A meta-analysis of local and regional analgesia compared to conventional analgesia has shown that TEA reduces the rate of persistent postoperative pain [13]. A meta-analysis published in 2018 performed by Weinstein et al., reviewed 63 randomized controlled trials, a total of 3143 subjects, and found TEA reduces persistent postoperative pain at 3 to 18 months for thoracotomy and 3 to 12 months for radical mastectomy. Unfortunately, results for open colorectal surgery and laparotomy were confounded by clinical heterogeneity, attrition and sparse outcome data. Moving forward, longitudinal outcomes such as persistent postoperative pain may be considered in determining whether or not TEA is warranted.

Our study indicates that for patients undergoing common abdominal surgical procedures, continuous thoracic epidural analgesia is a viable alternative to intravenous pain control during the postoperative period. Further, average MME use for the first 24 h after surgery and resulted in quicker discharge time on average of 3 days. This study is limited by its small sample size and retrospective case series structure. A more refined comparison should be obtained by conducting a prospective randomized trial with both treatments administered in parallel.

References

1. Carmichael JC, Keller DS, Baldini G, Bordeianou L, Weiss E, et al. (2017) Clinical Practice Guidelines for Enhanced Recovery After Colon and Rectal Surgery From the American Society of Colon and Rectal Surgeons and Society of American Gastrointestinal and Endoscopic Surgeons. Dis Colon Rectum 60: 761-784.
2. Kang CY, Chaudhry OO, Halabi WJ, Nguyen V, Carmichael JC, et al. (2012) Outcomes of laparoscopic colorectal surgery: data from the Nationwide Inpatient Sample 2009. Am J Surg 204: 952-957.
3. Halabi WJ, Kang CY, Nguyen VQ, Carmichael JC, Mills S, et al. (2014) Epidural analgesia in laparoscopic colorectal surgery: a nationwide analysis of use and outcomes. JAMA Surg 149: 130-136.
4. Thiele RH, Rea KM, Turrentine FE, Friel CM, Hassinger TE, et al. (2015) Standardization of care: impact of an enhanced recovery protocol on length of stay, complications, and direct costs after colorectal surgery. J Am Coll Surg 220: 430-443.
5. Bakker N, Cakir H, Doodeman HJ, Houdijk AP (2015) Eight years of experience with Enhanced Recovery After Surgery in patients with colon cancer: Impact of measures to improve adherence. Surgery 157: 1130-1136.
6. Senagore AJ, Delaney CP, Mekhail N, Dugan A, Fazio VW (2003) Randomized clinical trial comparing epidural anaesthesia and patient-controlled analgesia after laparoscopic segmental colectomy. Br J Surg 90: 1195-1199.
7. Sternini C, Patierno S, Selmer IS, Kirchgessner A (2004) The opioid system in the gastrointestinal tract. Neurogastroenterol Motil 2: 3-16.
8. Gan TJ, Robinson SB, Oderda GM, Scranton R, Pepin J, et al. (2015) Impact of postsurgical opioid use and ileus on economic outcomes in gastrointestinal surgeries. Curr Med Res Opin 31: 677-686.
9. Augestad KM, Delaney CP (2010) Postoperative ileus: impact of pharmacological treatment, laparoscopic surgery and enhanced recovery pathways. World J Gastroenterol 16: 2067-2074.
10. Liu H, Hu X, Duan X, Wu J (2014) Thoracic epidural analgesia (TEA) vs. patient controlled analgesia (PCA) in laparoscopic colectomy: a meta-analysis. Hepatogastroenterology 61: 1213-1219.
11. Borzellino G, Francis NK, Chapuis O, Krastinova E, Dyevre V, et al. (2016) Role of Epidural Analgesia within an ERAS Program after Laparoscopic Colorectal Surgery: A Review and Meta-Analysis of Randomised Controlled Studies. Surg Res Pract 2016: 7543684.
12. Senagore AJ, Whalley D, Delaney CP, Mekhail N, Duepree HJ, et al. (2001) Epidural anesthesia-analgesia shortens length of stay after laparoscopic segmental colectomy for benign pathology. Surgery 129: 672-676.
13. Weinstein EJ, Levene JL, Cohen MS, Andreae DA, Chao JY, et al. (2018) Local anaesthetics and regional anaesthesia versus conventional analgesia for preventing persistent postoperative pain in adults and children. Cochrane Database Syst Rev 4: CD007105.