

# The Local Anesthetic Infusion Pump in the Control of Post-Operative Pain in Colon and Rectal Surgery

Thorson A, Faria J, The Local Anesthetic Infusion Pump Pain Management System in the Control of Post-Operative Pain in Colon and Rectal Surgery; United European Gastroenterology Week, 2001 Abstract.

## Abstract

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### Background

Effective pain management following abdominal surgery for treatment of colorectal disease is often difficult. The use of a continuous infusion system to provide local anesthetic post-operatively without injected or oral narcotics may be the best pain relief option available for these patients. This retrospective review evaluates the efficacy of the local anesthetic infusion pump system for post-operative pain control.

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### Methods

A consecutive series of 64 patients who had undergone open abdominal surgery for colorectal disease by a single colorectal surgeon using the local anesthetic infusion pump pain management system were compared to a series of 65 consecutive patients undergoing open abdominal operations by the same surgeon in the immediate prior period without the use of the LA infusion pump pain management system. The LA system catheter was placed in a central location within the base of the wound during closure, and the reservoir was filled with 300 cc of a 1:1 solution of 1% lidocaine: 0.5% bupivacaine. All patients could receive post-operative ketorolac for pain unless contra indicated.

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### Results

The mean length of hospitalization was 7.8 days for LA infusion pump patients vs. 8.6 days for controls. Days until return of bowel function in the LA infusion group was significantly less than for controls (3.7 days vs 4.9 days respectively;  $p=0.001$ ). Total narcotic use was significantly less with LA pump (all narcotics were converted to morphine equivalence) vs. controls (62.1 mg vs. 85.8 mg respectively  $p=0.007$ ). Adverse events included seroma (7 LA pump vs. 3 controls  $p=0.2$ ) and wound infection (3 LA pump vs. 3 Control  $p=0.999$ ). Erythema and fistula were reported with LA pump only (1 and 1 respectively); hematoma, ecchymosis and cellulitis were reported with controls only (1,1 and 3 respectively).

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### Conclusions

Use of the Local anesthetic infusion pump pain management system markedly reduced the need for supplemental pain medication following colon resection. There was a more rapid return of bowel function, a reduction in the length of hospital stay and non increased incidence of wound infection.

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## Background

Post-operative pain triggers many physiologic changes that affect the function of almost all systems and interfere with the patient's well being, comfort and recovery. These effects are more pronounced in the elderly and high risk patients. More understanding of the significance of post-operative pain control has led to several methods and combination techniques for pain management. Recently, the combined effect of local anesthetics and opiates has gained great popularity because it reduces the amount of narcotics administered. A new device the Elastometric pump Pain Management System, which delivers a predetermined amount of local anesthetic in a continuous manner has been recently introduced. Although the Pump has been used for sometime, controlled studies in colorectal surgery have not yet been done.

Over the years, more understanding of the significance of post-operative pain control has led to several methods and combination techniques for management of post-operative pain. These include:

1. Systemic opioids via intramuscular route (IM) or intravenous route (IV) and for the last 15 years via the patient control analgesia (PCA) which has revolutionized pain management.
2. Intrathecal or epidural opioids: single dose or continuous administration of opioids via these routes.

3. Non-steroidal anti-inflammatory agents

4. Combination techniques

However, all these modalities of pain control have many side effects such as nausea and vomiting which, although uncommon, can aggravate the patient's post-operative condition and lead to prolonged hospitalization and morbidity. More serious side effects such as respiratory depression, hypotension, and altered mental states are possible, especially in the elderly population. Non-steroidal analgesics can cause bleeding, especially when used for prolonged periods of time.

In recent years, there has been a shift away from the search for the "perfect" analgesics towards combination techniques. In order to decrease the dose of narcotics or non-narcotic analgesics, investigators introduced local anesthetics in the last few years in a single dose wound infiltration for acute pain management. The combined effect of local anesthetics and opioids offers great advantages by decreasing the dose of narcotics therefore leading to less side effects and better pain control. This technique has gained great popularity in recent years because of the aforementioned advantages. Therefore, the Elastometric Pump was produced to deliver a predetermined amount of local anaesthetic in a continuous manner. The results of an open control led trial in 129 patients are reported herein.

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## Objective

The aim of this study is to determine the efficacy of 1:1 1% lidocaine 0.5% bupivacaine delivered via the

Elastometric Pump on controlling post-operative pain as a decrease in the narcotic consumption

in patients undergoing open abdominal colorectal surgery compared to a control group undergoing the same Surgery.

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## Study End Points and Statistical Methods

### Methods

#### Patient Selection / Inclusion Criteria

All patients undergoing open colorectal surgery irrespective of sex, age, or previous surgery.

Incisional wound closed at end of surgery. Written informed consent.

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#### Statistical Methods

Data collection prospective in E pump group  
Data collection retrospective in control group  
Analysis of variance model to test for difference among treatment groups

Wilcoxon rank sum test used to test between group effects repeated measures  
A NOVA to analyze treatment effect over time  
Pearson's chi-square to test sex across treatment groups and adverse events

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#### Study End Points

Length of hospitalization  
Narcotic consumption  
Time to first bowel movement  
Pain scores via VAS pain questionnaire

#### Exclusion Criteria

Allergy to lidocaine or bupivacaine  
Needing emergency surgery

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## Results

### Demographic Characteristics

Characteristics	LA pump	Controls (N=65)	p-value
<b>Age (years)</b>			
Mean (95% CI)	62.6 (59.0, 66.2)	65.8 (61.9, 70.0)	P=0.226
Minimum – Maximum	29 - 88	33 - 102	
<b>Sex</b>			
Males	35 (54.7%)	41 (63.1%)	P=0.333
Females	29 (45.3%)	24 (36.9%)	

Analysis of variance was used to analyze age across treatment groups, whereas sex was analyzed using Pearson's chi-square test.

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## Adverse Events

Characteristics	ON-Q (N=65)	Controls (N=68)	Differences; p-value
<b>Patients with at least 1 AE (Adverse Event)</b>	14 (21.5%)	10 (14.7%)	0.306
<b>Seroma</b>	7 (10.8%)	3 (4.4%)	0.200
<b>Wound Infection</b>	3 (4.6%)	3 (4.4%)	0.999
<b>Erythema</b>	1 (1.5%)	0	-
<b>Fistula</b>	1 (1.5%)	0	-
<b>Hematoma</b>	0	1 (1.5%)	-
<b>Ecchymosis</b>	0	1 (1.5%)	-
<b>Cellulitis</b>	0	3 (4.4%)	-

Pearson's chi-square test was used when cell counts > 5, else Fisher's exact test was used. When cells contain zero values no analysis was performed.

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## Primary and Secondary Analysis

Characteristics	ON-Q (N=65)	Controls (N=68)	Differences; p-value
<b>Postoperative Pain (DAY 1)</b>			
Mean (95% CI)	3.5 (2.9, 4.2)	3.6 (3.0, 4.3)	-0.1 (-1.0, 0.8); p=0.813
Missing values	17	20	
<b>Postoperative Pain (DAY 2)</b>			
Mean (95% CI)	2.6 (2.0, 3.3)	3.3 (2.8, 3.8)	-0.6 (-1.5, 0.2); p=0.113
Missing values	13	22	
<b>Days until first Bowel Movement</b>			
Mean (95% CI)	3.7 (3.2, 4.2)	4.9 (4.4, 5.5)	-1.3 (-2.0, -0.5); p=0.001
Minimum – Maximum	1-11	2-10	
Missing values	7	16	
<b>Length of Stay (Days)</b>			
Mean (95% CI)	7.8 (6.2, 9.4)	8.6 (7.2, 10.0)	-0.8 (-3.0, 1.3); p=0.449
Minimum – Maximum	3-36	1-31	
Missing values			

Analysis of variance was used to analyze post-operative pain, days until first bowel movement, and length of stay.

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## Total Amount of Narcotic Use in Recovery Room and Post-Operative

(All Narcotics were converted into Morphine Equivalence)

Characteristics	LA pump	Controls (N=68)	p-value
<b>Total (mg)</b>			
(Recovery Room & Postoperative)			
<b>Mean (95% CI)</b>	62.1 (50.3, 73.8)	85.8 (73.0, 98.6)	<b>0.007</b>
Median	50	79.8	
Min – Max	0 - 255	0 - 257	
<b>Recovery Room (mg)</b>			
<b>Mean (95% CI)</b>	12.0 (9.3, 14.8)	13.3 (9.1, 17.5)	<b>0.607</b>
Median	10		
Min – Max	0 - 58	0 - 110	
<b>Total Postoperative (mg)</b>			
<b>Mean (95% CI)</b>	50.1 (39.7, 60.4)	72.5 (59.5, 85.4)	<b>0.008</b>
Median	42	64.6	
Min – Max	0 - 232	0 - 255	
<b>Postoperative Day 1 (mg)</b>			
<b>Mean (95% CI)</b>	30.4 (24.1, 36.7)	45.7 (36.9, 54.5)	<b>0.006</b>
Median	26	34.2	
Min – Max	0 - 136	0 - 152.5	
<b>Postoperative Day 2 (mg)</b>			
<b>Mean (95% CI)</b>	19.6 (14.9, 24.4)	26.8 (19.8, 33.8)	<b>0.098</b>
Median	16	20.1	
Min – Max	0 - 96	0 - 175.5	

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## Conclusions

This retrospective evaluation of the efficacy of the LA pump Pain Management System following abdominal colorectal surgery suggests that utilization of the device might result in a decreased length of stay. The markedly reduced utilization of narcotic analgesia was associated with more rapid return of bowel function. This may explain the earlier dismissal

from the hospital. Although not easily documented, informal evaluations by nursing staff and family members suggested that patients utilizing the LA pump system returned to their rooms much less sedated and were quicker to converse and ambulate than their counterparts without the device. Patients with the device described an absence of discomfort

in the wound itself noting instead soreness in the lateral abdominal wall. Those who had previous experience with post-operative pain frequently noted experience improvement in pain management with

the device. These results suggest the need for a randomized, prospective evaluation to confirm these potential benefits.

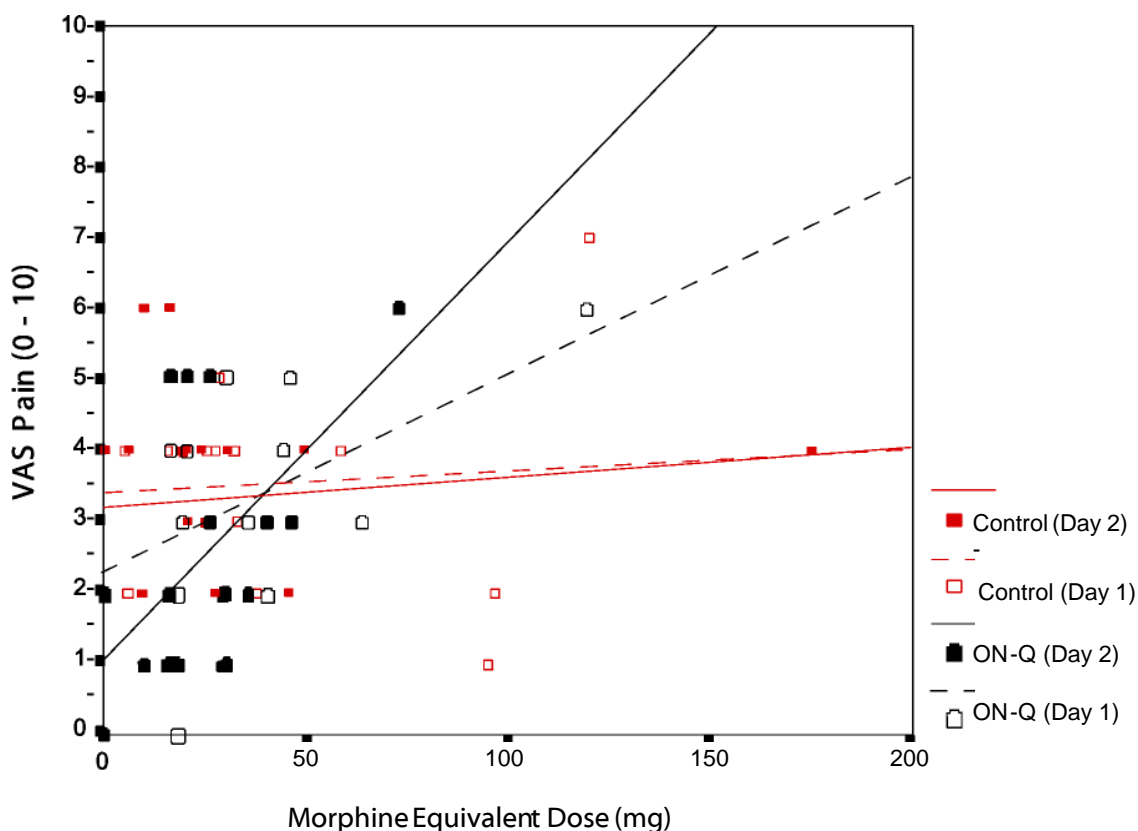
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## Regression Model for Post-Operative Pain and Morphine Use

In the graphic display, the vertical axis represents an objective evaluation of pain, while the horizontal axis represents the Morphine equivalents over 24 hours (in milligrams) necessary to maintain pain control. The steeper the slope of the curve, the more inelastic the demand for morphine will be (the less morphine that is needed to control post-operative pain at a given level). For example, in comparing post-operative pain on Day 1, 100 mg controlled level 5 pain with an LA infusion pump but

only level 3 pain with out the LA pump. On day 2, the same amount of morphine could control level 7 pain with an LA pump but still only level 3-4 without it. Extrapolating further, the flat (elastic) nature of the control curve suggests that level 10 pain would be difficult to control with any dose of morphine alone on either Day 1 or Day 2. However a 150 mg equivalent dose would manage similar pain on Day 2 with an LA pump in place.

### Regression Models for Post-operative Pain and Morphine Use



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