# The Efficacy of Local Anaesthetic Infiltrated at the Incision Site for Post-Operative Pain Management Following Abdominal Surgery: An Application to Fast-Track Surgery

**Sumithra Krishnan**

**Discipline of Surgery, The University of Adelaide &**

**The Department of Clinical Pharmacology, The Queen Elizabeth Hospital**

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**DECLARATION**

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Sumithra Krishnan Date

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**ABSTRACT**

Post-operative pain is the most commonly encountered and therapeutically difficult problem on a surgical ward. Pain can be a preventable outcome of surgery but its treatment is inadequate for many patients, as 30-70 % of patients continue to suffer from pain post-operatively. Current pharmacological approaches used for pain management consist mainly of opioids, which cause serious adverse effects and may increase patient morbidity and prolong recovery. Therefore, this may be reduced with appropriately delivered local anaesthesia, as a favourable adjuvant.

The aim of this study was to test whether a continuous 96 hour infusion of the local anaesthetic, levobupivacaine, using a commercial infiltration device (Painbuster®, IFlow Corp, USA), delivered into the deeper muscle layers where pain fibres penetrate, can minimise or eliminate the need for opioid analgesia following laparoscopic or open abdominal surgery. The novel aspects of the study include the higher dosage of the local anaesthetic, the longer duration of infusion, and the location of the catheter in the deeper tissue layers aimed at maximising response, all as part of a fast-track surgery approach.

Patients scheduled for laparoscopic or open abdominal surgery who consented into this randomised double-blinded placebo-controlled trial, were allocated (2:1) to receive either the active drug (0.5% levobupivacaine infusion) or placebo (0.9% saline infusion) in the Painbuster®. Blood samples were collected over the 96 hr infusion period in order to measure the total plasma levobupivacaine concentration and patients were placed under a fast-track surgery protocol intended to enhance recovery. Patients had available opioids via a patient-controlled-analgesia system for break-through pain. Pain scores and total opioid consumption were used as an index of efficacy.

Eighty-one patients were recruited in the study: laparoscopic active (n=31); laparoscopic placebo (n=20); open active (n=24) and open placebo (n=6). The four treatment groups were well controlled for age, body mass index and gender. There was a trend towards lower opioid consumption and pain scores in the open active group compared to the open placebo group, however, paradoxically the

laparoscopic active group had higher opioid consumption and pain levels than the laparoscopic placebo group at particular time-points, which may be influenced by the presence of stomas, drains and gender differences. Although a significant difference in length of hospitalisation was evident between laparoscopic and open cases (laparoscopic- 6.5 days; open- 9.8 days, p= 0.003), the active treatment was not associated with an earlier time of bowel movement and mobilisation nor reduction in hospitalisation. The mean patient total plasma levobupivacaine concentrations were below the toxicity threshold, but need to be interpreted in the light of increased protein binding (to AAG) post-operatively, as total concentrations may over-estimate the risk of toxicity.

These findings suggest that a 96 hr continuous local anaesthetic infusion post abdominal surgery may be a favourable method of pain control in patients undergoing open surgery. This could be due to the well located catheter, the increased local anaesthetic concentration and a longer post-operative infusion period.

## PUBLICATIONS AND PRESENTATIONS DURING CANDIDATURE

### Publications

Krishnan S, Tou S, Hewett P, Karatassas A, Field J, Morris R. Continuous local anaesthetic infusion in open and laparoscopic colorectal surgery: a double blind randomised study. For submission to the Aust NZ J Surg, Manuscript in Preparation.

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Krishnan S, Morris RG, Hewett P, Karatassas A, Tonkin J, Field J. Local anaesthetic infused at the incision site for post-operative pain management following abdominal surgery: An interim analysis. TQEH Research Day, Oct 2009, Adelaide, Australia.

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**Awards**

Best Poster Presentation Winner, TQEH Research Day, Oct 2010, Adelaide, Australia.

## LIST OF ABBREVIATIONS

| | |
|---|---|
| AAG | Alpha1-acid glycoprotein |
| ACTH | Adrenocorticotropic hormone |
| APS | Acute Pain Services |
| BMI | Body Mass Index |
| Cb | Bound drug concentration |
| CCK | Cholecystokinin |
| CGRP | Calcitonin gene-related peptide |
| $Cl_{int}$ | Intrinsic clearance |
| CONSORT | Consolidated Standards of Reporting Trials |
| Ct | Total drug concentration |
| Cu | Unbound drug concentration |
| DOSA | Day of Surgery Admission |
| FDA | Food and Drug Administration |
| Fu | Unbound Fraction |
| Fu% | Fraction unbound (as a percentage) |
| HAL | Hand Assisted Laparoscopy |
| HPLC | High Performance Liquid Chromatography |
| ICU | Intensive Care Unit |
| IV | Intravenous |
| LA | Laparoscopic Active |
| LLOQ | Lower Limit of Quantification |
| LP | Laparoscopic Placebo |
| NMDA | N-Methyl-D-aspartic acid |
| NSAID | Non-Steroidal Anti-Inflammatory Drug |
| OA | Open Active |

| | |
|---|---|
| OP | Open Placebo |
| PAC | Pre-Admission Clinic |
| PCA | Patient Controlled Analgesia |
| PCEA | Patient Controlled Epidural Analgesia |
| PCOA | Patient Controlled Oral Analgesia |
| PHR | Peak Height Ratio |
| PROSPECT | PROcedure SPECific postoperative pain managemenT |
| QC | Quality Control |
| TQEH | The Queen Elizabeth Hospital |
| Tmax | Time to peak concentration |
| VAS | Visual Analogue Scale |
| VNRS | Verbal Numerical Rating Scale |