

# Adjunct High Frequency Transcutaneous Electric Stimulation (TENS) for Postoperative Pain Management during Weaning from Epidural Analgesia Following Colon Surgery: Results from a Controlled Pilot Study

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Received November 18, 2014;  
Accepted August 27, 2015.

**Conflict of Interest:** All authors declare no competing interests and full freedom to interpret the data according to strict scientific rationale.

1524-9042/\$36.00  
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<http://dx.doi.org/10.1016/j.pmn.2015.08.006>

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## ■ ABSTRACT:

The potential benefit of nonpharmacological adjunctive therapy is not well-studied following major abdominal surgery. The aim of the present study was to investigate transcutaneous electrical nerve stimulation (TENS) as a complementary nonpharmacological analgesia intervention during weaning from epidural analgesia (EDA) after open lower abdominal surgery. Patients were randomized to TENS and sham TENS during weaning from EDA. The effects on pain at rest, following short walk, and after deep breath were assessed by visual analog scale (VAS) grading. Number of patients assessed was lower than calculated because of change in clinical routine. Pain scores overall were low. A trend of lower pain scores was observed in the active TENS group of patients; a statistical significance between the groups was found for the pain lying prone in bed ( $p < .05$ ). This controlled pilot study indicates benefits of TENS use in postoperative pain management during weaning from EDA after open colon surgery. Further studies are warranted in order to verify the potential

## beneficial effects from TENS during weaning from EDA after open, lower abdominal surgery.

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### INTRODUCTION

Pain is one of the most prominent symptoms following surgery. Effective postoperative analgesia management is a key element in the recovery process, as adequate pain control improves patient satisfaction and facilitates mobilization and ambulation, thus reducing the risk for side effects caused by prolonged bed rest. One of the standard postoperative analgesic interventions after major surgery is epidural analgesia (EDA; Pöpping, et al., 2014). Still, pain ratings of more than four 4 out of 10 on the numeric rating scale (NRS) the first postoperative days are not uncommonly seen following open lower abdominal surgery (e.g. colon surgery), indicating a need for improvements in pain management for this kind of surgery (Gerbershagen, et al., 2013). EDA is applied intraoperatively and commonly terminated on the second or third postoperative day after lower abdominal surgery. Following EDA termination, pain management is based on systemic analgesics (SA) administered orally supplemented by intravenous (i.v.) as needed (Gustafsson, et al., 2013). It is of importance to maintain adequate pain control during transition from EDA to SA. Multimodal pain management is basic standard, combining nonopioid analgesics such as paracetamol; if not contraindicated, a nonsteroidal anti-inflammatory drug (NSAID) or Cixb; and an additional opioid as needed. Several complementary and integrative nonpharmacological analgesia therapies have been investigated such as acupuncture, aromatherapy, and relaxation in order to further improve pain control (Demir, 2012). In surgical care, transcutaneous electrical nerve stimulation (TENS) has been used as a complement to the standard pharmacological pain management for several conditions. By applying electrodes on the skin in the area or the representative area of the pain and applying a electric voltage between the pads with a frequency between 2 and 150 Hz and at an amplitude perceived by the recipient as strong but not painful, activation of a complex neural network results in pain-relieving or pain-protective effects (Vance, Dailey, Rakel, & Sluka, 2014). Current evidence is inconclusive about the clinical effect of TENS on postoperative pain, mostly due

to lack of high-quality studies (Vance et al., 2014). However, if applied with strong but not painful intensity, it has been shown effective at handling postoperative pain (Bjordal, Johnson, & Ljunggreen, 2003). TENS has few, if any, side effects and is thus an attractive option for pain management in general and especially in the fragile patient.

Our research group has previously studied the efficacy of TENS at the transition from EDA to SA in a pilot study after major upper gastrointestinal surgery (Bjerså & Andersson, 2014). There are, to our knowledge, no previously published studies addressing its use as adjunct to pharmacological pain management following lower abdominal surgery.

The aim of the present study was to investigate effectiveness of TENS as adjunctive nonpharmacological analgesia intervention at the termination of EDA after open lower abdominal surgery.

### METHODS

#### Design

This study was conducted as a randomized, single-blinded study. Patients scheduled for open colon resection with initial postoperative pain management with EDA were included. Exclusion criteria were use of a pacemaker, not speaking Swedish as the native language, cognitive or psychiatric diagnosis, active abuse of alcohol or drugs, non-TENS naïve, and additional or unexpected surgery after the primary operation. Patients scheduled for colon surgery were recruited and randomized into one of two groups before termination of the EDA: active TENS with high frequency, strong intensity, or sham TENS with high frequency, barely noticeable intensity. An independent person who was not involved in the study performed the randomization procedure. This person randomly put information about allocation to the two groups in opaque, sealed envelopes. Each subject was randomized by taking the prepared envelopes consecutively. The patients were blinded to the group to which they were randomized. Of the 83 approached patients, 50 were included, and 28 completed the full study protocol (see Fig. 1).

#### Treatment

All patients were treated according to a standard care protocol and postoperatively given epidural analgesia with an infusion of bupivacaine 1 mg/mL, fentanyl 2 µg/mL, and ephinephrine 2 µg/mL. When EDA infusion was terminated, analgesia was given orally as 20 mg/day oxycodone (Oxycontin 10 mg twice daily) and 4 g/day acetaminophen (Panodil two 500-mg

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