Is transcutaneous electrical nerve stimulation an effective analgesia during colonoscopy?

R Robinson, S Darlow, S J Wright, C Watters, I Carr, G Gadsby, J Mayberry

Abstract
Objectives—To evaluate the efficacy of transcutaneous electrical nerve stimulation (TENS) as analgesia during colonoscopy.

Methods
Thirty three unselected patients attending a teaching hospital for diagnostic colonoscopy participated in a randomised prospective intervention study. Having a cardiac pacemaker, or previous experience of TENS, were used as exclusion criteria. On arrival in the department, the study was explained to eligible patients and written, informed consent obtained. A system of sealed envelopes was used to assign patients into one of three groups, and envelopes shuffled to ensure random allocation:

(1) Standard medication plus TENS.
(2) Standard medication plus placebo TENS (identical and fully functional unit but with non-functioning output leads).
(3) Standard medication only.

The TENS machine used in the study was the V-TENS (Body Clock Health Care) biphase waveform unit. An amplitude of 3 amps at a frequency of 80 pulses per second and a pulse width of 80 microseconds were chosen as the conventional TENS parameters. TENS was administered for the five minutes before colonoscopy, during the procedure, and for five minutes afterwards. Electrodes were positioned at UB 25 (posteriorly, 1.5 cm lateral to the fourth lumbar vertebra. This is the point indicated for treatment of abdominal distension, colonic disorders, diarrhoea, and constipation) and the anterior abdominal wall (just lateral to the umbilicus, which is the site of most pain during colonoscopy). TENS was administered by a single trained operator (IC) and patients were informed that they may or may not experience a slight tingling sensation.

All colonoscopies were carried out by one of two experienced operators who were blind to study group. On completion of the colonoscopy, the operator estimated the degree of difficulty of the procedure, noted the amount of “breakthrough” analgesia required, and estimated the amount of pain experienced by the patient using a numerical rating score. Thirty minutes after the procedure, the patient was assessed. Assessments were conducted by an assistant psychologist (CW) who did not attend the colonoscopy and was blind to study group. Severity of pain experienced during the procedure was assessed using a numerical
Table 1  Group mean (SD) for the outcome variables, plus analysis of variance (ANOVA) comparisons

<table>
<thead>
<tr>
<th>Variable/group</th>
<th>Range</th>
<th>Active TENS (n=10)</th>
<th>Placebo TENS (n=13)</th>
<th>Control (n=10)</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>24–78</td>
<td>47.80 (18.86)</td>
<td>53.23 (16.45)</td>
<td>56.40 (12.53)</td>
<td>F=0.72; ns</td>
</tr>
<tr>
<td>Breakthrough analgesia (mg of nalbuphine hydrochloride)</td>
<td>0–10</td>
<td>4.0 (3.16)</td>
<td>3.85 (3.48)</td>
<td>4.25 (3.74)</td>
<td>F=0.38; ns</td>
</tr>
<tr>
<td>Ease of procedure</td>
<td>1 (very difficult) to 4 (very easy)</td>
<td>2.60 (1.35)</td>
<td>2.38 (1.39)</td>
<td>2.00 (1.15)</td>
<td>F=0.54; ns</td>
</tr>
<tr>
<td>Pain/self rated</td>
<td>1 (no pain) to 100 (couldn’t be worse)</td>
<td>38.20 (31.24)</td>
<td>47.92 (36.37)</td>
<td>38.70 (34.71)</td>
<td>F=0.30; ns</td>
</tr>
<tr>
<td>Pain/endoscopist rated</td>
<td>1 (no pain) to 100 (couldn’t be worse)</td>
<td>53.50 (38.85)</td>
<td>29.15 (29.49)</td>
<td>50.40 (32.46)</td>
<td>F=1.86; ns</td>
</tr>
<tr>
<td>PPEQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical discomfort*</td>
<td>9 (min)–63 (max)</td>
<td>30.80 (10.24)</td>
<td>13.00 (7.33)</td>
<td>27.30 (7.50)</td>
<td>F=1.32; ns</td>
</tr>
<tr>
<td>Psychological distress*</td>
<td>8 (min)–56 (max)</td>
<td>22.90 (10.64)</td>
<td>18.62 (5.97)</td>
<td>16.60 (6.42)</td>
<td>F=1.72; ns</td>
</tr>
<tr>
<td>Satisfaction*</td>
<td>8 (min)–56 (max)</td>
<td>49.60 (4.84)</td>
<td>50.69 (4.17)</td>
<td>52.50 (4.40)</td>
<td>F=1.09; ns</td>
</tr>
</tbody>
</table>

*Subscale scores calculated as in Salmon et al;* ns = not significant.

There are a number of limitations with this pilot study which need to be considered when interpreting the results. Administering TENS for five minutes before colonoscopy may have resulted in suboptimal stimulation, since it has been suggested that TENS should be operated at the maximal comfortable setting for up to 20 minutes before onset of pain. However the electrical parameters chosen were standard conventional TENS settings designed to invoke rapid pain relief via the “gate control” mechanism and by non-endorphin responses. This “gate control” response should therefore be almost instantaneous. The number of patients included in this pilot study was small, and a larger study group might have detected a significant difference between the groups. Furthermore, since the intervention is “physical”, patients and operator cannot be completely blinded to the control group. In addition, non-functioning TENS is not a true placebo since patients often experience a sensation.

Results of this pilot study suggest TENS is not an effective analgesic for patients undergoing colonoscopy. We were unable to demonstrate any significant differences in physical pain or discomfort (either self reported or as evidenced by the amount of breakthrough analgesia required), psychological distress, or overall satisfaction with the procedure between active and placebo TENS groups. The greater variance in scores on two of the PPEQ subscales in the active TENS group however, suggests that TENS might relieve discomfort and distress for some people undergoing colonoscopy.

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