AUDIT

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.**

***Design*—In a randomised controlled trial, patients undergoing diagnostic colonoscopy were assigned to one of three groups: standard medication only (midazolam); active TENS plus standard medication; or non-functioning TENS and standard medication. Efficacy of TENS was determined using numerical rating scores for pain and the post-procedural evaluation questionnaire.**

***Setting*—Patients undergoing diagnostic colonoscopy in a teaching hospital.**

***Main outcome*—There was no statistically significant differences between the three groups. However in the active TENS group there was a greater variation in "physical discomfort" and "psychological distress", suggesting TENS may be effective in subgroup of patients.**

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Glenfield Hospital NHS Trust, Leicester, UK
R Robinson
S Darlow

Clarendon Park, Leicester
S J Wright

Department of Clinical Psychology, Leicester General Hospital
C Watters

Gastrointestinal Research Unit, Leicester General Hospital
I Carr
J Mayberry

Society of Electrotherapists, Leicester
G Gadsby

Correspondence to:
Dr Simon Darlow, Department of Gastroenterology, Hospital of St Cross, Barby Road, Rugby CV22 5PX, UK

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Colonoscopy is an uncomfortable and often painful procedure. Most centres currently use a combination of intravenous opiate and short acting benzodiazepine as analgesia. However, the risks associated with this combination are significant, particularly in the elderly.[1] Clinicians are therefore reluctant to use high doses and as a result, many patients find the procedure uncomfortable and even painful. These problems have stimulated a search for safe and effective analgesia.

Transcutaneous electrical nerve stimulation (TENS) is a widely used and safe analgesic which is effective in both acute and chronic pain.[2 3] TENS has also been used successfully as an analgesic during painful procedures in children, and there have been no important side effects.[4] The effect of TENS on pain arising in the intestine has received little attention. However it has been used successfully in patients with functional abdominal pain,[5] and can significantly reduce perception of experimentally induced gut distension in humans.[6]

The principal aims of this pilot study were to assess the efficacy of TENS as analgesia for colonoscopy, and to examine its impact on patients' overall evaluation of the procedure.

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.

Standard medication was intravenous midazolam 5 mg if the patient's weight was greater than 70 kg or 2.5 mg if less than 70 kg. Nalbuphrine hydrochloride was given intravenously in 2.5 mg aliquots as required for pain relief.

The TENS machine used in the study was the V-TENS (Body Clock Health Care) biphasic 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[7]) 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.[8]

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

Variable/group	*Range*	*Active TENS (n=10)*	*Placebo TENS (n=13)*	*Control (n=10)*	*ANOVAs*
Age (years)	24–78	47.80 (18.86)	53.23 (16.45)	56.40 (12.53)	F=0.72; ns
Breakthrough analgesia (mg of nalbuphine hydrochloride)	0–10	4.0 (3.16)	3.85 (3.48)	4.25 (3.74)	F=0.38; ns
Ease of procedure	1 (very difficult) to 4 (very easy)	2.60 (1.35)	2.38 (1.39)	2.00 (1.15)	F=0.54; ns
Pain/self rated	1 (no pain) to 100 (couldn't be worse)	38.20 (31.24)	47.92 (36.37)	38.70 (34.71)	F=0.30; ns
Pain/endoscopist rated	1 (no pain) to 100 (couldn't be worse)	53.50 (38.85)	29.15 (29.49)	50.40 (32.46)	F=1.86; ns
PPEQ					
Physical discomfort*	9 (min)–63 (max)	30.80 (10.24)	33.00 (7.33)	27.30 (7.50)	F=1.32; ns
Psychological distress*	8 (min)–56 (max)	22.90 (10.64)	18.62 (5.97)	16.60 (6.42)	F=1.72; ns
Satisfaction*	8 (min)–56 (max)	49.60 (4.84)	50.69 (4.17)	52.50 (4.40)	F=1.09; ns

*Subscale scores calculated as in Salmon *et al*[9]; ns = not significant.

rating score (as above). Patients' overall evaluation of the procedure was assessed by the post-procedural evaluation questionnaire (PPEQ; a slightly reworded version of Salmon *et al*'s post-colonoscopy questionnaire,[9] to make it applicable to any gastrointestinal investigation) which includes three main components: satisfaction (PPEQ satisfaction), discomfort (PPEQ physical discomfort), and distress (PPEQ psychological distress).

This study was approved by the Leicestershire Ethics Committee.

Results

The results are summarised in table 1, which shows the mean (SD) scores on the six outcome variables. Comparisons of group means using one way analyses of variance are also shown. The results indicate no statistically significant differences between groups for any of the variables. However, the standard deviations were higher within the active TENS group on PPEQ "physical discomfort" and "psychological distress" total scores. This finding suggests that, for some people undergoing colonoscopy, TENS may reduce physical discomfort and psychological distress.

Discussion

The 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.

The electrical parameters chosen for this study were standard conventional TENS settings designed to invoke rapid pain relief via the "gate control" mechanism,[10] and by non-endorphin responses presumed to include the monoamines serotonin and noradrenaline (norepinephrine).[7] We found that TENS was simple to administer, and was not associated with any clinical problems. In practical terms, the leads did not interfere with ease of movement or positioning of the patient during colonoscopy, and no patient reported any complications resulting from TENS.

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.[11] 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.[12]

Results of this pilot study suggest TENS is not an effective analgesic for patients during colonoscopy, although may be effective in a subgroup. Further studies of significantly larger groups of patients might be helpful in identifying individuals who are most likely to benefit from TENS analgesia.

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