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Pressure on Acupoints Decreases Postoperative Pain

[Article]

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Outline

Graphics

Abstract^

Our objective was to study the analgesic effect of acupoint pressure on postoperative pain in a controlled single-blind study. Forty patients undergoing knee arthroscopy in an ambulatory surgery unit in a university-affiliated hospital were randomized to receive either an active stimulation (AS) or a placebo stimulation (PS) 30 min after awakening from anesthesia. We stimulated 15 classical acupoints in the AS group, on the side contralateral to surgery, with a firm pressure and a gliding movement across the acupoint. In the PS group, 15 nonacupoints were subjected to light pressure in the same areas as the acupoints in the AS group. We assessed pain using a 100-mm visual analog scale (VAS) before sensory stimulation, after 30 and 60 min, and after 24 h. We recorded heart rate, systolic arterial pressure, and skin temperature before stimulation and after 30 and 60 min. We assessed skin blood flow with laser Doppler before stimulation and after 1 and 30 min. Sixty minutes and 24 h after AS, VAS pain scores were lower than in the placebo group ($p < 0.05$ and 0.0001, respectively). There were no significant changes in the autonomic variables. The results indicate that pressure on acupoints can decrease postoperative pain.

Sensory stimulation is used all around the world for treatment of acute and chronic pain (1). Autonomic nervous adjustments, mostly sympathetic, have been observed in connection with acupuncture (1-3). Studies on acupuncture effects use various kinds of stimuli, e.g., different needling techniques and needle designs or the use of stimulation with electrical current, laser, heat, or vibration (4). One less-evaluated stimulus modality is pressure, although it has been used in various forms for >2000 years (5-7). The purpose of this study was to evaluate the analgesic and some autonomic effects of acupoint pressure on postoperative pain.

METHODS^

Subjects^

Forty day-surgery patients (mean age 36, range 15-66 years; 25 males and 15 females) of 44 consecutive patients scheduled for knee arthroscopy at Linköping University Hospital, Sweden, participated. Two patients declined to participate in the study and 2 were excluded because of complications during surgery. After surgery, by using sealed envelopes, we randomized patients into two groups, 20 in each. None of the subjects had been treated earlier with pressure on acupoints. One group received active stimulation (AS) and the other, placebo stimulation (PS). The arthroscopies were performed without tourniquet, during opioid-free anesthesia, using propofol, isoflurane, and nitrous oxide in oxygen. All subjects gave informed consent before entering the study, which was approved by the Ethics Committee of the Faculty of Health Sciences in Linköping.

Stimulation^

We performed the stimulation with a dentist's tool usually used for tooth fillings (7A, Forssbergs Dental, Stockholm, Sweden). The tool has a 15-cm handle with a ball point at each end. The size of the ball point is 2 mm. In the AS group, 15 classical acupoints (ST1, ST45, SP1, SP21, SP4, BL1, BL67, KI1, KI27, KI4, GB1, GB44, LR1, LR14, LR5) on the side contralateral to surgery were stimulated with the tool in the order mentioned here. The choice of acupoints was based on principles

of traditional acupoint (8) and clinical experience. In traditional acupuncture, the combination of the Luopoints and Yuan-points are often used. Clinically, it seems even more efficient to combine Luo-points with the first and last points of the two coupled meridians, at least with this kind of stimulation. We achieved the stimulation through a combination of firm pressure and a gliding movement across the acupoint. In the PS group, 15 nonacupoints were chosen in the same areas as the acupoints in the AS group, also on the contralateral side to surgery. These points were situated [almost equal to]2 cm from the nearest true acupoint. The stimulation in the PS group was achieved with a pressure perceptible but light enough to avoid active stimulation. We did not inform the subjects about the pressure intensity difference between AS and PS. In both groups, we performed stimulation 30 min after the patient awoke from anesthesia. The patients were considered awake when they opened their eyes on command.

Pain measurements^

A 100-mm visual analogue scale (VAS) (Syntex Nordica AB, Stockholm, Sweden) was used for pain measurements. We recorded data four times: before stimulation and 30 min, 60 min, and 24 h after stimulation. An unknowing, independent observer made all measurements except the last one, which was obtained with a 100-mm paper copy of a VAS and mail answers from the patients. We supplied the patients with tablets (Distalgesic, Lilly, Stockholm, Sweden), each containing dextropropoxyphene (32.5 mg) and acetaminophen (325 mg). They also reported whether they had used any such tablets and, if so, the number of doses.

Cardiovascular measurements^

Skin blood flow was measured on the ventral tibia on the nonoperated leg, 10 cm below the patella, using a laser Doppler flowmeter (Periflux PF 1C, Perimed KB, Stockholm, Sweden). Skin blood flow was calculated as the mean of readings during a 1-min period. We recorded data three times: before stimulation and 1 and 30 min after stimulation. We measured skin temperature on the ventral tibia of the nonoperated leg, 10 cm below the patella and 2 cm lateral to the blood flow probe, using a digital thermometer (Ellab CTD-85, Ellab, Copenhagen, Denmark). Heart rate was measured with a cardioscope (Siemens Sirecust 341, Siemens, Germany). We measured systolic blood pressure with a blood pressure cuff and radial artery palpation. Data on skin temperature, heart rate, and blood pressure were recorded three times: before stimulation and 30 min and 60 min after stimulation. An unknowing, independent observer made all measurements.

Statistics^

The median (25-75% range) is given. Data were analyzed with the Mann-Whitney test.

RESULTS^

The demographic data and the use of analgesics are given in Table 1. There was no significant difference between the groups regarding the surgical procedures or anesthesia times. Nor was there any significant difference between the groups regarding the consumption of ketobemidone (Ketogan

Novum, Lundbeck, Helsingborg, Sweden) during the 30 min before the sensory stimulation, or of analgesics after stimulation. The placebo group did tend to need more doses of analgesics than the active group (21 and 7, respectively).

TABLE 1. *Demographic data and use of analgesics*

As evident from Fig. 1, the VAS pain score differed between groups at 60 min and 24 h after stimulation. At 60 min, the 95% confidence intervals were 1.8 to 3.0 cm in the placebo group and 1.1 to 1.9 cm in the AS group. At 24 h, they were 1.7 to 3.1 and 0.4 to 0.9, respectively.

FIG. 1. The visual analogue scale (VAS) pain scores in the two groups. Median (25-75%) range. Open bars, control patients; cross-hatched bars, active stimulation. Significant difference between groups is indicated (*, $p < 0.05$; ***, $p < 0.0001$).

The cardiovascular variables (Table 2) did not differ between the groups. One minute after active stimulation, skin blood flow tended to be larger, compared to the placebo group [40 (38-47) vs. 50 (40-52) mV, median (25-75% range), $p = 0.09$, not shown in Table].

TABLE 2. *Hemodynamic variables*

Seven of the subjects in the AS group had an instantaneous bradycardia at the start of the stimulation. The drop in heart rate was [almost equal to]20 beats/min and lasted <2 min.

DISCUSSION^

The present study shows that pressure on acupoints can decrease postoperative pain. The choice of acupoints was based on principles of traditional acupuncture (8) and clinical experience. In classical acupuncture, it is not unusual to stimulate on the contralateral side when treating acute pain. According to traditional Chinese medicine, acute pain often represents “excess of energy” and stimulation on the contralateral side “reduces the energy” and this leads to a decrease in pain. A more neurophysiological explanation may be found in a study by Steffens and Schomburg (9): Stimulation of nociceptive afferents facilitated transmission in various ipsilateral pathways and inhibited pathways that are activated by cutaneous and group II muscle afferents on the contralateral side. Clinical experience has also shown that it is often effective to use contralateral stimulation on acute pain.

We measured the changes in pain with VAS (10) and the skin blood flow with laser Doppler, an instrument proven useful in measuring changes in skin blood flow (11). We found no significant differences among the cardiovascular measurements or skin blood flow. Similar findings have been made in studies with acupuncture and transcutaneous nerve stimulation (3,7,12,13), and there are known interactions between cardiovascular and pain regulatory systems (14). The arthroscopies were performed during opioid-free anesthesia, consisting of propofol, isoflurane, and nitrous oxide in oxygen (15). The opioid-free anesthesia was used to avoid interaction between opioids and possible endogenous opioid effects of the stimulations.

The analgesic effects of needle acupuncture are well documented (16-18). The mechanisms by which acupuncture exerts its pain-inhibiting effects are not yet fully known (1,4,19-22). Pressure on acupoints might activate high-threshold mechanoreceptors, most of which are located in the skin (19). One acupuncture technique that seems to use the same physiological reactions as pressure is *superficial acupuncture*—the insertion of needles only a few millimeters into the skin (17).

One major problem with studies on acupuncture is finding a suitable placebo. The placebo stimulation must resemble the active treatment as much as possible but still be ineffective. The placebo stimulation must have the same psychological effect as the active treatment (23-25). With acupuncture, it is difficult to obtain a placebo that fulfills these two demands satisfactorily. With pressure stimulation, it is slightly easier. With the kind of stimulation we used as AS, the subject should feel a pin-prick pain. This sensation is a sign that a nociceptor, probably a high-threshold mechanoreceptor, is stimulated. The sensation of pin-prick pain seems to be specific for this kind of stimulation and differs in that way from the classical “de-qi” feeling of acupuncture. In this study, the subjects receiving AS were watched for jump signs or any other indications of pin-prick pain, to ensure that AS had been achieved.

In the PS group, we carefully used the same amount of time and attention as in the AS group. We achieved the stimulation in the PS group with a pressure perceptible but light enough to avoid active stimulation. This light pressure should not be able to activate the gate-control mechanism because it is momentary and at segments distant from the pain source. Since none of the subjects had been treated earlier with pressure on acupoints and was not informed of the different intensities of the pressure, it is unlikely that they knew what kind of stimulation they received.

This study suggests that pressure on acupoints is a treatment modality for pain. The need for noninvasive sensory stimulation techniques increases with the now ever-present threat of HIV, hepatitis, and resistant bacteria. Especially in the Third World, it could be a low-risk and cost-effective treatment for pain. Increased research concerning the effects of pressure on acupoints is needed, especially concerning effects on the autonomic nervous system.

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