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Original Paper

Effect of Conversation and Other Nursing Analgesic Techniques on the Electrically Evoked Prick Pain Threshold

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Abstract

The effect of conversation and other nursing analgesic techniques on the electrically evoked pain threshold was studied in thirty female human subjects (ages, 21-35; mean, 24.6 years). The prick pain point, identified first by tungsten wire in the left anterior cubital region, was stimulated by an electric stimulator using 10 train pulses, 1 msec in duration, at a frequency of 0.2-0.5 Hz. The threshold of prick pain was measured (control threshold), and the mean was 39.9 ± 9.6 volts (n=30). Then the threshold was measured during various stimuli, such as massage, a hot compress at 39-41 ℃ in the area of the stimulating electrodes, a hot compress in conjunction with conversation, conversation and a cold compress at 18-20 ℃ or 20-23 ℃. The prick pain threshold increased significantly during all these stimuli (percent increase in the threshold was 8.8 - 20.5 %). A massage or a hot compress accompanied by conversation was more effective than either treatment alone. Moreover, conversation itself was just as effective as skin stimulation and mental arithmetic. These results confirmed that verbal communication plays an important role in pain management.

Introduction

Pain control and analgesia is an important part of nursing care. However, research on pain management in nursing has just begun[1]. It has been reported that skin stimuli, such as a hot or cold compress and massage, reduces acute pain[2-4]. In the clinical setting, human contact, especially verbal communication, seems to benefit patients. The attention of patients in pain can be distracted to other thoughts. Nurses know empirically that this often results in analgesia, but the phenomenon has not been confirmed scientifically. Recently the author developed a new method of inducing prick pain that is more stable and easier than previous procedures[4-7]. This convenient method for producing pain enables

research to clarify the phenomenon in the laboratory. *This study was aimed at investigating how conversation and pain management affect the threshold of electrically evoked pain.*

Method

Subjects. Thirty registered nurses, between the ages of 21 and 35 (average, 24.6), consented to participate in the study. Twenty-eight of the subjects were strangers to the researcher and reseach assistants, and two were friends. None had any physical problems or pain.

Prick pain induction and measurement of the pain threshold. A prick pain point was stimulated electrically. First, prick pain points were located on the inner side of the left anterior cubital region using a tungsten wire (3cm long, 150μm in diameter), one end of which was attached to an acrylic bar for easy handling[5]. A 3 to 4g force was used to bend the wire slightly. When a prick pain point was found, it was marked using red ink. A transparent cover film (3 × 3cm), with tiny hole in the center, 250μm in diameter, was put on it (Fig.1). The hole was placed directly over the red mark designating the prick pain point and conductive paste was put into the hole. Then the negative electrode for an electrocardiogram (TE-1023S, Fukuda Denshi) was attached on the film, and the positive electrode was attached to the periphery. The distance between the electrodes was 3cm. The electrodes were led to an isolator (SS-102J, Nihon Kohden), and to an electric stimulator (SEN-3201, Nihon Kohden). The left anterior cubital region was wrapped with an elastic bandage to stabilize the stimulating area. The probe of an electric thermometer (PTC-5C, Unique Medical) was also placed on the skin near the electrodes.

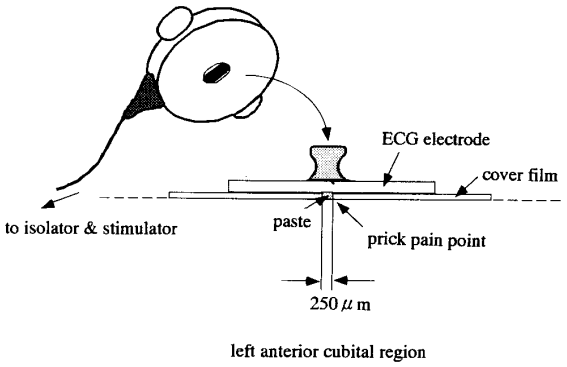

Fig. 1 Method for inducing prick pain by electrical stimulation.
The prick pain point was identified first by a thin tungsten wire in the left anterior cubital region of the subject. The small area of 250μm in diameter on the skin, filled with conductive paste, was connected to an electrode for the electrocardiogram and the stimulator (the positive pole). The negative electrode was set in a peripheral area 3cm away from the positive pole.

Electrical stimulation was done by ten train pulses of 1 msec duration, 200Hz (5msec in each pulse interval), and 0.2 to 0.5Hz in frequency. This stimulus can evoke a prick pain at a comparatively low voltage at a given point. Subjects had been asked to say, "It's painful" as soon as they felt unbearable pain. Then the output switch of the stimulator was turned off immediately, and the value of the threshold was recorded. Prick pain thresholds were measured 2-4 times in the control and each experimental condition described below.

Massage. The researcher rubbed the skin softly with the fingers at the nearest peripheral side of the electrodes using an irregular rhythm. Powder was applied to avoid friction from sweat.

Mental arithmetic. The subjects performed mental arithmetic by doing easy multiplication problems along a test table.

Hot compress. A steam pack was used for the hot compress on the skin area. The skin surface temperature was monitored and regulated at 39-41℃.

Cold compress. Two ice bags covered with towel were used for the cold compress, one in the area around the prick pain point, and the other on the opposite side of arm. The skin temperatures were maintained at 20-23℃ in experiment 1, 18-20℃ in experiment 2.

Conversation. The reseacher and the subject talked along prescribed lines. The topics of conversation included: self-introductions, the recent weather, the birth place, the numbers of brothers and sisters, ways and time of commuting, the lunch menu, the number of night shifts a month and how to spend days off. Generally, the researcher led the conversation, using client centered communication techniques, such as reflection, clarification and summary mainly.

Procedure. The two experiments were conducted in an interview room of a hospital in the summer; the room temperature was 28℃ under the air conditioner.

Experiment 1. 1) Thirteen subjects signed the informed consent form. 2) The prick pain point was identified using the tungsten wire. 3) The electrodes were set for stimulation. 4) The prick pain threshold was measured as a control. 5) The pain threshold was measured during application of a hot compress. 6) The pain threshold was measured during conversation and application of the hot compress. 7) The pain threshold was measured after the skin temperature returned to the control level. 8) The pain threshold was measured while the subjects did mental arithmetic. 9) The pain threshold was measured during application of a cold compress at 20-23℃.

Experiment 2. The remaining 17 subjects, including the two friends of the researcher and assistants, participated in this experiment. Procedures 1) - 4) were the same as in experiment 1. 5) The prick pain threshold was measured during massage. 6) = 4). 7) The pain threshold was measured during massage accompanied by conversation. 8) The pain threshold was measured during conversation. 9) The pain threshold was measured during application of a cold compress at 18-20℃.

Results

The control threshold of the prick pain. The

Table 1 Changes of prick pain thresholds during various stimuli in experiment 1.

Threshold of prick pain M±SD (Volt)	Hot compress	Hot compress with conversation	Mental arithmetic	Cold compress at 20-23℃
control	40.2 ± 8.5		43.3 ± 7.7	
during stimulus	43.7 ± 7.8**	44.1 ± 6.8*	47.4 ± 8.1**	49.1 ± 9.0**

level of significance by t test: *, $p<0.05$; **, $p<0.01$ (n=13)

Table 2 Changes of prick pain thresholds during various stimuli in experiment 2.

Threshold of prick pain M±SD (Volt)	Massage	Massage with conversation	Conversation	Cold compress at 18-20℃
control	38.1 ± 9.9			
during stimulus	42.3 ± 9.4***	43.1 ± 8.8***	42.3 ± 7.2**	43.9 ± 8.0**

level of significance by t test: **, $p<0.01$; ***, $p<0.001$ (n=15)

author arbitrarily defined the threshold of prick pain, induced electrically without any accompanying stimulation, as the control pain threshold. The mean and standard deviation of the control threshold was 39.9 ± 9.6 volts (n = 30). The values in each experiment are shown in Tables 1 and 2. The control thresholds ranged from 29 to 60 volts, and the coefficient of variation (CV) was around 20.0. Before the thermal stimulation of the skin, the control threshold was constant in each subject (CV, within 3.0), even though measurements were occasionally done at different times during the experiment.

Experiment 1. Typical examples are shown in Fig.2a. In both subjects A and B, the threshold of electrically induced prick pain increased markedly during application of the hot compress, hot compress in conjunction with conversation, mental arithmetic and application of the cold compress at 20-23℃. The results of experiment 1 are summarized in Table 1. When the skin temperature had returned to normal (30-34℃; mean, 32.5℃) several minutes after the hot compress, the control threshold increased by about 3 volts, but not significantly (Table 1). The pain thresholds increased significantly during hot and cold compresses as well as mental arithmetic. However, there were no significant differences among the effects of the various stimuli.

The percent of increasing threshold ((pain threshold during nursing care−control threshold)/control threshold × 100) was calculated in each case. The values for hot compress, hot compress with conversation, mental arithmetic and cold compress at 20-23℃ were 10.7%, 12.5%, 8.8% and 14.1%, respectively.

Experiment 2. Four typical examples from experiment 2 are shown in Fig. 2b. The subject E and F were strangers to the researcher, while C and D were acquaintances. Massage, massage accompanied by conversation, conversation and cold compress at 18-20℃ increased the pain thresholds in all the subjects. The effect of the cold compress was the largest in subjects C, D and E. The results in experiment 2 are summarized in Table 2. All the nursing analgesic care techniques increased the pain thresholds significantly. In experiment 2, neither an analysis of variance nor t test showed any differences among the various stimuli. The high threshold level after cooling persisted for several minutes even when the skin temperature returned to normal.

The percents of increasing thresholds dur-

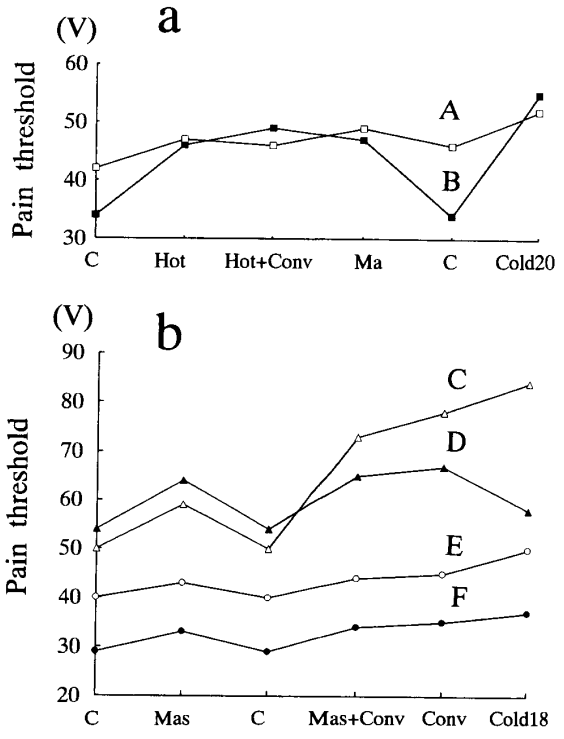

Fig. 2 Changes in the prick pain threshold during various stimuli.

a, experiment 1; b, experiment 2. The vertical axis indicates the prick pain threshold in volts. C, control; Hot, hot compress at 39-41℃; Conv, conversaion; Ma, mental arithmetic doing easy multiplication; Cold20 or 18, cold compress at 20-23℃ or 18-20℃; Mas, massage by hand.

ing massage, massage accompanied by conversation, conversation and cold compress at 18-20℃ were 12.6 %, 15.4 %, 14.2 % and 20.5 %, respectively. The increases in subjects C (19-68 %) and D (18-24 %) during massage, massage and conversation, and conversation were larger than in subjects E and F. The increase in the pain threshold of subject D was only 7 % during application of the cold compress.

Discussion

In this study, the author used a non-invasive electrical stimulation to evoke prick pain in a restricted portion of the skin, the prick pain point. This is a new method for inducing experimental pain easily and is more reliable than other methods using filter paper electrodes[6] or agar-ringer electrodes[7]. The skin region for electrical stimulation can be kept stable in this method, so that it can be stimulated with a constant intensity even when the subjects move their hands accidentally. The thresholds returned to normal after application of each analgesic stimulus except for warming (Table 1). Moreover, thermal or touch sensation was not evoked by this method as is the case in procedures described in other reports[4][5][7].

The analgesic effect of thermal skin stimulus on electrically induced prick pain was confirmed in this study as well as in a previous study[5], where the distribution density of prick pain points was measured as the pain threshold. The practitioners reported similar effects from hot or cold compresses on acute pain[2][3]. The control threshold measured after warming increased by 7.5 % (Table 1). The effect of skin warming or cooling may persist for at least several minutes after skin temperature has returned to normal as others have reported[8]. The effect of cooling at 18-20℃ seemed most effective in this experiment as in a previous study[4]. The increase in the threshold after cooling (skin surface temperature fall of 10-16℃) may be larger than that by warming (rise of 5-11℃).

The massage of the contralateral skin region was effective in only half of the subjects in a previous study[4], while massage as well as other stimuli in the peripheral region caused significant effects in this experiment. Signals from the ipsilateral mechanoreceptors may work better to reduce prick pain than those from the contralateral receptors in the gate control system[9].

Conversation, as well as mental arithmetic, also increased the prick pain threshold. It is apparent that conversation itself induced analgesia, and that nursing care techniques in conjunction with conversation seemed more effective than those without it. When people concentrate their attentions on something interesting or difficult to do, they often forget their distress for a while. This is also true in patients who have bodily pain. This is called "distraction"[1][10].

The mechanism of all the phenomena in this study can be explained by the diffuse noxious inhibitory control system[11]. The author believes that effective nursing intervention itself, which is always accompanied by physical touch or human interaction, is an integral part of this system.

Although Beecher[12] reported that it is difficult to observe the psychological factors of pain in experimentally induced pain, the results in this study showed that the pain thresholds of acquaintances were higher and that the nursing care techniques tested were more effective on them than on subjects who were strangers to the researcher (Fig. 2b). On some topics the two acquaintances laughed during the conversation, while the strangers did not. Moreover, during massage and conversation, the pain thresholds of the friends

increased more. These results suggest that human relationships are very important in nursing care[1)10)13)]. Further studies are necessary to examine the effects of human relationships on the pain threshold and pain responses.

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