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Effect of Acupuncture on Experimentally Induced Itch

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We evaluated the effect of acupuncture on histamine-induced itch and flare in healthy volunteers (n=25) and compared it with the effect of a pseudo-acupuncture procedure and of no-intervention in a single-blind randomized cross-over study. A cumulative itch index is defined and was found to be smaller with acupuncture than with either pseudo-acupuncture (p<0.02) or with no-intervention (p<0.005). The duration of itching was shorter with acupuncture than with either pseudo-acupuncture (p=0.006) or with no-intervention (p<0.001). In addition, maximal flare area was decreased with acupuncture compared with pseudo-acupuncture (p<0.04) and with no intervention (p=0.003). Acupuncture had little or no effect on the itch onset time or on the maximal itch intensity after intradermal injection of histamine. Measurements of itching correlated poorly with measurements of flare size in all three experimental groups. Acupuncture appears to be an effective inhibitor of histamine-induced itch and flare. Moreover, acupuncture points displayed specificity in that needling near-by, non-acupuncture sites resulted in greater itching and larger flares. *Key words: Itch; Pruritus; Histamine; Acupuncture.* (Received May 31, 1983.)

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Our current understanding of the pathophysiology of the itch sensation (1, 2) indicates that it may be closely allied to pain. Both sensations seem to be carried to the central nervous system via small poorly myelinated C fibers and ascend to the brain largely within the spinothalamic tract; and, certain substances released in the vicinity of the C fibers can initiate the stimulus—notably histamine and prostaglandins (3, 4).

Though the mechanism of pain relief remains disputed, the analgesic effect of acupuncture is fairly well established (5). Thus it is of interest to test the hypothesis that an antipruritic effect also exists. Treatment of pruritus is well-described in acupuncture literature (6); yet, the literature accessible to the West does not provide documentation of an anti-pruritic effect.

We studied the effect of acupuncture on histamine-induced itch and flare in humans. This was carried out as a randomized cross-over trial in which the effect of acupuncture on itch intensity and flare size was compared with the effects of no-intervention and a pseudo-acupuncture procedure (i.e. needling at sites not corresponding to classical acupuncture points).

MATERIALS AND METHODS

Subjects: Twenty-five volunteers aged 21–33 were selected. Reasons for exclusion included: (i) pregnancy; (ii) age over 50 years or under 21; (iii) knowledge of acupuncture; (iv) regular use of certain medications such as antihistamines, sedatives, and aspirin; and (v) lack of itch response to intradermal injection of histamine. The sample consisted of 12 women and 13 men.

Itch and flare production. Histamine phosphate (0.03 ml diluted 1 : 1000 in buffered saline) was injected intradermally through a 27 gauge tuberculin syringe on the flexor aspect of the left forearm.

Fresh histamine solutions were made on the day of each experiment. We employed Cormia's method of producing histamine itch and flare (7). All injections were made by the same investigator (M. B.).

Data collection. The two responses measured during the experimental sessions were itch intensity and flare size. To measure itch intensity we used the following six-point scale described by Murray & Weaver (8): 0 = no itch or burning sensation only; 1 = barely perceptible itch; 2 = perceptible itch, but not annoying; 3 = annoying itch; 4 = very annoying itch; 5 = unbearable itch—subject must scratch. Volunteers were asked to note the time until the onset of the itch sensation and to mark the appropriate itch intensity level at 1, 5, 10, 20, 40 and 60 min after the *onset* of itching. The perimeter of the flare was traced onto an acetate film at 1, 5, 10, 20 and 40 min after *injection* of histamine. Later, the areas of these tracings were calculated planimetrically.

At the beginning of each experimental session, we identified personal data which we suspected might influence the response to histamine, namely: number of days since last menses, time since last hot bath or shower, time since subject last exercised, the number of stressors which the subject noted (e.g. moving, promotion, quarrels, etc.), and the subject's opinion of acupuncture. Also, pertinent past medical history including atopic history was noted.

Experimental design. Each volunteer participated in three separate experimental sessions: histamine injection with acupuncture (A), with pseudo-acupuncture (P), and with no-intervention (ϕ). The order in which the sessions occurred was randomized, and no volunteer was informed as to which treatment was acupuncture and which was pseudo-acupuncture. No volunteer participated in more than one experimental session in a 24-hour period, eliminating the refractory response to pruritogenic substances described by Cormia (9). Also, each experiment was carried out at approximately the same time of day to control for the diurnal variation of the itch response (9). Changes in ambient temperature, excessive noise and other distractions were kept to a minimum.

Acupuncture treatment. Fifteen minutes prior to injection of histamine, acupuncture was performed by inserting needles into points: left Quchi (LI 11), right Xuehai (sp 10), and right Sanyinjiao (sp 6) (Fig. 1). Electrical stimulation was applied to the needles in the lower extremity using the WJ 2000 acupuncture point stimulator manufactured in Sri Lanka. This instrument provides a low voltage biphasic wave stimulus at alternating frequencies of 80 and 40 cps. Voltage was adjusted to tolerance. Thirty-gauge stainless steel Shanghai-type acupuncture needles were used and were retained throughout the experimental procedure. All needles were autoclaved prior to use.

Pseudo-acupuncture treatment. A pseudo-acupuncture treatment was carried out in exactly the same fashion as acupuncture except that needles were inserted at sites near but away from the classical acupuncture points named above (Fig. 1). These loci were selected to be within the same or adjacent dermatomes as the acupuncture points, but not themselves corresponding to known acupuncture points. All acupuncture and pseudo-acupuncture treatments were carried out by the same investigator (M. B.).

Cumulative itch index. By reasoning that the amount of discomfort associated with itch is related to the intensity and duration, we devised a cumulative itch index (CII) to reflect both of these variables in a single statistic. The CII is defined as the area under the function $I(t)$ which is the itch intensity at time t. $I(t)$ is determined for t=1, 5, 10, 20, 40 and 60 min and provides an approximation to the theoretical itch intensity curve.

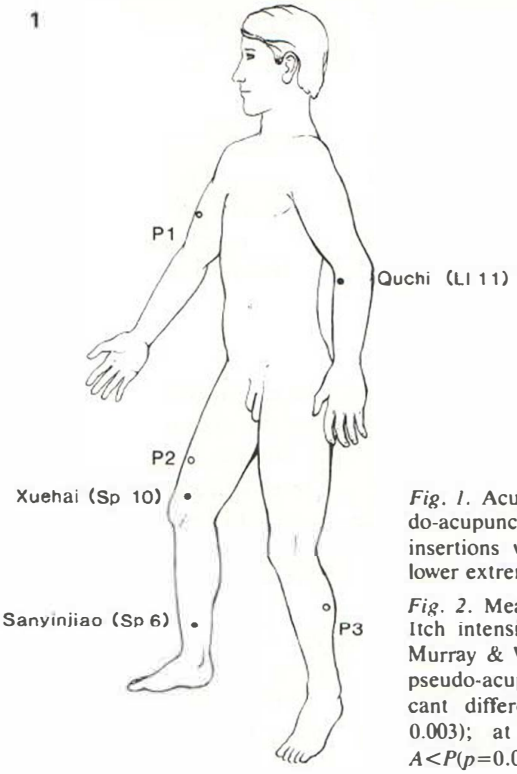
RESULTS

Itch intensity. Mean itch intensities were plotted against time for the three experiments ϕ, P and A (Fig. 2). At each measured time interval from the onset of itching, the relation $A<P<\phi$ holds true.

CII. The mean value for CII while receiving acupuncture was about one-half that with pseudo-acupuncture ($p<0.02$) and about one-third that with no-intervention ($p<0.001$) (Table I).

Maximal itch intensity. The maximal itch intensities achieved during each experiment were not significantly different.

Itch duration. The itch duration was significantly different in all three experimental groups and showed the same relation $A<P<\phi$ which held for itch intensity and CII. Specifically, the itch sensation lasted 11.8 min while receiving acupuncture as compared with 24.0 min with pseudo-acupuncture ($p=0.006$) and 30.0: min with no-intervention ($p<0.001$) (Table I).



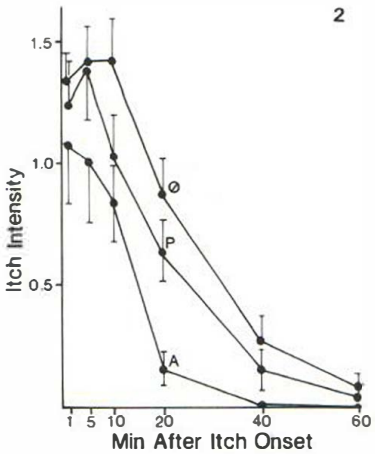


Fig. 1. Acupuncture and pseudo-acupuncture loci. Pseudo-acupuncture sites are labeled P1, P2, P3. All needle insertions were carried out in the left upper and right lower extremities.

Fig. 2. Mean itch intensity after intradermal histamine. Itch intensity ± SE based on six-point (0-5) scale of Murray & Weaver (8). A = with acupuncture, P = with pseudo-acupuncture, ϕ = with no-intervention. Significant differences at 10 min: $P<\phi(p<0.03)$, $A<\phi(p=0.003)$; at 20 min: $P<\phi(p<0.03)$, $A<\phi(p<0.0001)$, $A<P(p=0.003)$; at 40 min: $A<\phi(p=0.005)$, $A<P(p<0.04)$.

Flare. The maximal flare area achieved while receiving acupuncture was significantly smaller than with pseudoacupuncture ($p<0.04$) or no-intervention ($p=0.003$) (Table I).

Sources of bias. Next, we investigated the role of environmental and personal factors on our results. We considered sex, menstrual cycle, exposure to heat, exercise, stress, opinion of acupuncture, and atopic history. Using the Pearson's Product Moment Correla-

Table I. *Itch and flare statistics* [a]

Expt [b]	Itch onset (min)	Itch duration (min)	Max itch intensity [c]	CII [d]	Max flare area (sq. in.)
ϕ	3.56±0.79	30.0±3.13	1.80±0.13	8.34±1.00	2.62±0.21
P	2.20±0.38	24.0±3.42	1.68±0.22	6.16±0.95	2.58±0.20
A	1.68±0.36	11.8±1.96	1.36±0.24	3.16±0.65	2.28±0.19
$P<\phi$	NS [e]	($p<0.05$)	NS	($p=0.005$)	NS
$A<\phi$	($p=0.03$)	($p<0.001$)	NS	($p<0.001$)	($p=0.003$)
$A<P$	NS	($p=0.006$)	NS	($p<0.02$)	($p<0.04$)

[a] Presented as mean values ±SE.
[b] Intradermal injection of histamine with acupuncture (A), with pseudo-acupuncture (P) and with no-intervention (ϕ).
[c] Based on six-point subjective scale (0-5) of Murray & Weaver (8).
[d] Cumulative itch index defined as the area under the function $I(t)$ which gives the itch intensity at time t.
[e] NS = not statistically significant. Comparisons made using Student's t-test comparing independent sample means.

tion Coefficient or the Student *t*-test where appropriate, no association was found between the factors listed above and CII, itch onset, itch duration, maximal itch intensity, or maximal flare area—with the following exceptions: (i) A positive history of atopy was associated with a *greater* maximal itch intensity and a *smaller* flare; but the differences reached significance ($p<0.05$) in the acupuncture experiment only. (ii) The number of hours since the subject's last hot bath or shower prior to an experiment showed a positive correlation with CII in experiment ϕ (coeff.=0.6, $p<0.001$) and in experiment *A* (coeff.=0.4, $p<0.05$), but not in *P* (coeff.=0.03, $p=0.4$). Interestingly, itch intensity and flare size appeared to be unrelated with respect to any of the parameters mentioned.

DISCUSSION

The differences between using acupuncture to treat pruritus and using it to investigate its effect on experimentally induced itch are noteworthy: first, pruritus generally represents a pathologic state in an individual with an illness such as hepatobiliary disease, renal disease, or allergy, or the result of a lowered peripheral neural threshold. In experimentally induced itch, individuals have no underlying related illness. A single localized chemical insult is applied, and attempts to modify the itch and flare are limited to a single acupuncture session. Thus, itch induction, acupuncture, and assessment of results all occur within about a one-hour period.

It is generally accepted that counter-stimulation will temporarily inhibit pruritus. The use of transcutaneous nerve stimulation has been shown to provide hours of relief (10). even in experimentally induced itch in a limb, counter-irritation in an opposite limb has been shown to inhibit the sensation (8). These facts suggested that it was necessary to include a pseudo-acupuncture procedure both as a control for placebo effect and to control for the effect of counter-irritation inhibition of itching.

Our results suggest that acupuncture does have a dampening effect on histamine-induced itch by decreasing both the intensity and duration of itching. In addition, maximal flare size was also significantly smaller under acupuncture than with either pseudo-acupuncture or no-intervention. Acupuncture appears to have little or no effect on itch onset time or on maximal itch intensity after histamine injection. Individuals with a history of atopy responded to histamine wih greater itching and smaller flares—a phenomenon previously described by other investigators (11, 21).

We conclude that acupuncture is an effective inhibitor of histamine-induced itch and flare. Moreover, the acupuncture points display specificity in the sense that inserting needles at near-by non-acupuncture sites will not elicit the same degree of inhibition.

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