

Communications

Electrical Correlates of Acupuncture Points

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Abstract—Employing a Wheatstone bridge, skin conductance was measured over those putative acupuncture points on the large intestine and pericardium meridians lying between the metacarpophalangeal joints and the elbow. Results were compared to those from anatomically similar locations devoid of acupuncture points. At most acupuncture points on most subjects, there were greater electrical conductance maxima than at control sites.

INTRODUCTION

It has been asserted that acupuncture points exhibit locally decreased DC electrical skin resistance [1]-[3]. Commercial devices intended for clinical application seek to exploit this property [1]-[4]. If true, this would give the technique of acupuncture some physical basis other than hypnosis or suggestion [5].

This assertion has recently been challenged by Noodergraaf and Silage, who reported that no resistance minima could be located on the fingers when care was taken to avoid electrode pressure artifacts [6]. They concluded that they could find no evidence for the objective existence of any acupuncture points.

This study might be considered conclusive as regards the existence of electrical resistance minima at acupuncture points, except for two factors. To establish the existence of acupuncture points, it would be sufficient to establish that they are electrical resistance minima *with respect to the surrounding tissue*. It is not necessary to show that these points are absolute minima in resistance. Noodergraaf and Silage reached their conclusion on the basis of the second and needlessly stronger criterion of existence. Furthermore, their study was confined to acupuncture points on the fingers and their results possibly do not apply to other anatomical areas.

In view of both its importance and the scarcity of available information, we decided to re-examine the question. Our object was to determine whether the DC resistance of acupuncture points differs from that of surrounding tissue.

METHOD AND PROCEDURE

We limited our inquiry to easily accessible parts of two meridians, the large intestine (Li) and pericardium (P) [7], [8], located between the metacarpophalangeal joints and the elbow (see Fig. 1).

Skin resistance measurements were made employing a Wheatstone bridge with the subjects connected in parallel with one leg of the bridge (Fig. 2). The bridge was designed so that its imbalance current was directly proportional to the subject conductance (the reciprocal of resistance). Our data are therefore presented in terms of increased conductance, rather than decreased resistance. Two kinds of electrodes were used during the course of the measurements. One measuring electrode was

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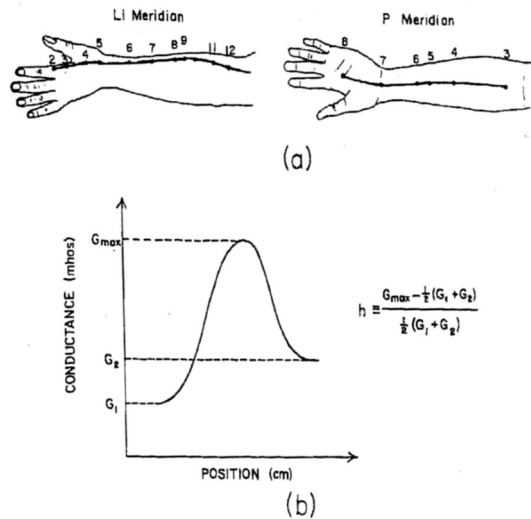


Fig. 1. (a) Approximate locations of acupuncture points on the large intestine (Li) and pericardium (P) meridians [6], [7]. (b) Idealization of conductance peaks seen at acupuncture points and the computational method employed to characterize the peaks. The fractional increase in conductance, h , implies a correction for individual differences in skin conductance level similar to that advocated by Lykken [9].

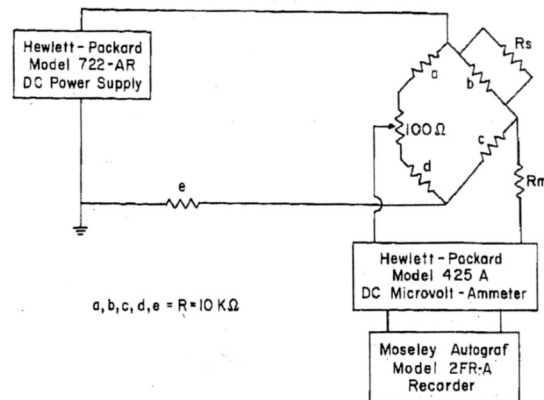


Fig. 2. The current across the unbalanced Wheatstone bridge is $I = V/[8R_s(1 + R_m/R) + 3R + 5R_m]$ [10]. As long as R_m (meter resistance) $\ll R \ll R_s$ (subject resistance), $I = V/8R_s = VG_s/8$ and the voltage across the subject is $V/4$ (V = input voltage). We set $V = 8$ V throughout the experiment, and found I to be on the order of 1 μ amp, with a current density through the probe on the order of 10 μ amp/cm².

a rod 1.5 mm in diameter; the other was a specially designed wheel electrode which is illustrated and described in Fig. 3. The reference electrode for both was a hand-held cylinder, 10 cm long and 3 cm in diameter. All electrodes were made of stainless steel.

The standard charts are in agreement as to the anatomical locations of the acupuncture points shown in Fig. 1(a). However, we quickly found that they are insufficient to allow their precise location on the subjects. Invariably, there was an area of about 1 cm², anywhere in which the point might exist and

In conclusion, it was found that most points on the pericardium and large intestine meridians, as defined and described by the standard charts, are points of local electrical conductance maxima on most subjects. These points, therefore, have an objective existence in most subjects.

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