Patterns of Skin Luminescence Resulting from the Visualization of Active Acupuncture Points Using Optical Stimulation

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Key Words
Skin surface · Biologically active points · Acupuncture points · Influence · Light pulse · Luminescence · Pattern · Structure · Meridians · Activity

Abstract

Background: In recent years, biologically active points (BAPs) have become the topic of intensive scientific discussion. Innovative investigations of this topic are presented. Methods: Types of skin surface luminescence patterns in the areas of BAPs observed after acting on the area with a short light pulse are analyzed. The device was designed as a laboratory model (NSTU, medical electronics laboratory, Novosibirsk, Russia). Pictures were taken with a PENTAX K10, a PENTAX ist DL as well as a Canon 6D photo camera. Luminescent points can clearly be observed. The pictures were zoomed on a computer and graphically analyzed. Results: Five patterns were found: black center with white ring, black center with 2 rings (white and black), white center with black ring, white center with 2 rings (black and white) and white center with 3 rings (black, white and black). Luminescent BAPs were found on the pericardium and triple energizer meridians. Conclusion: This pilot study can serve as a basis for further investigations in the field of meridian research. The first results are very promising, and future studies are indicated in body acupuncture as well as ear acupuncture.

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Introduction

In modern medical practice, reflexotherapy is rapidly developing. Reflexotherapy is the branch of medicine based on the estimation of parameters of peripheral reflexogenic areas [biologically active points (BAPs)] and acting on them with the purpose of regulating functional systems of an organism [1, 2]. In order to conduct reflexotherapeutic procedures, it is necessary above all to locate appropriate BAPs accurately. Today, locating BAPs is carried out using topography data and electrical resistance. Locating accurate BAPs by topography data can be done only by highly experienced reflexotherapists. Locating by electrical resistance is complicated because the electrical resistance of the skin surface near BAPs depends not only on the condition of the corresponding organ, but also on the condition of the skin as well as external conditions.

The development of new methods for locating BAPs and the devices for the realization of the methods are actual challenges for modern integrative medicine and medical engineering as well. The authors of the present paper demonstrated the possibility of visualization of BAPs by contactless optical methods using the illumination of the skin surface near a BAP with a short light pulse in a previous study [3].

It was shown that a small luminescent point appears on the skin's surface near a BAP when specified acting conditions are satisfied. The physical nature of this phenomenon requires a deep investigation. In the present article we take first steps in that direction – we determine skin surface luminescence patterns in the BAP areas that appear after illuminating the investigated area with a short light pulse.

Materials and Methods

The experiments were carried out with a device designed as a laboratory model (NSTU, medical electronics laboratory, Novosibirsk, Russia), with our proposed method of optical stimulation of acupuncture points by light pulse action with certain parameters. Pictures were taken with a PENTAX K10, a PENTAX ist DL and a Canon 6D photo camera. Figure 1 shows an example of a picture where luminescent points can clearly be observed. These points were among the BAPs; that fact was checked by topography and the skin surface electrical resistance measurements near the luminescent points. The pictures were then zoomed on a computer and analyzed.

Results

The analysis of the images revealed 5 different luminescence patterns: black center with white ring (fig. 2a), black center with 2 rings (white and black; fig. 2b), white center with black ring (fig. 2c), white center with 2 rings (black and white; fig. 2d) and white center with 3 rings (black, white and black; fig. 2e).

A series of pictures for each type of structure is shown in figure 3. These photos correspond to table 1. For each pattern, a set of pictures was obtained. The anatomical location of the discovered points is presented in table 1. Experimental results on the localization of luminescent points according to the topography of acupuncture channels and auricular points are presented in table 2. The topography of luminescent points is described according to anatomical landmarks (the standard notation is presented in parentheses).

The pericardium meridian (PC) starts lateral to the mammilla, then continues to the axilla, descending along the medial aspect of the arm to end at the tip of the middle finger [4];
the function of this channel is the control of the cardiovascular system. The time of maximum activity is from 7 to 9 p.m. The triple energizer meridian starts on the ulnar corner of the nail of the ring finger, ascends along the dorsal side of the hand and arm to the shoulder, circles around the auricle, and runs to the lateral side of the eyebrow [4]. The function of this channel is the control of the vegetative and endocrine systems; the time of maximum activity is from 9 to 11 p.m. The large intestine meridian runs from the radial corner of the index finger nail along the tabatière¹ to the radial and dorsal side of the forearm, then to the radial side of the elbow crease. Along the lateral side of the upper arm, it ascends to the shoulder, continues along the side of the neck to the face and ends lateral to the nose [4]. The function of the channel is the control of exchange and the elimination processes and immunity; the time of maximum activity is from 5 to 7 a.m. The stomach meridian starts below the middle of the eye and ends at the lateral corner of the second toenail [4]. This channel controls the main

¹ A triangular deepening on the radial, dorsal aspect of the hand at the level of the carpal bones, specifically, the scaphoid and trapezium bones forming the floor. The name originates from the use of this surface for placing and then sniffing powdered tobacco, or ‘snuff.’ It is sometimes referred to by its French name.
exchange and digestion; the time of maximum activity is from 7 to 9 a.m. The small intestine meridian starts from the ulnar nail corner of the little finger and ends at the ear [4]. It controls digestion, and, together with other channels, the psychoemotional state; the time of maximum activity is from 1 to 5 p.m. AP (auricular point) 49 corresponds to the knee joint, and AP 92 corresponds to the urinary bladder. The meridians having maximum activity during the hours when experiments were carried out are typed in bold.
Discussion

BAPs, also known as low-resistance spots on the human skin surface, have a lower electrical resistance than the surrounding tissues [5–7]. Scientific studies have shown that reflex diagnostics based on measurements of energy characteristics and BAP investigations can facilitate an early prediction and differential diagnosis of diseases [8]. In the last years, several studies in the Russian as well as in the English language were published on this topic. Nikitin et al. [9] applied laser puncture to influence BAPs in order to have some effect of treatment of...
bronchial asthma with chronic accompanying rhinosinusitis. The positive effect could be proved by positive dynamics of clinical findings as well as instrumental and spirometrical indices and X-ray examinations [9]. Another example shows that good results for the prediction and early diagnosis of diseases from the reaction energy of BAPs are obtained using complicated fuzzy logic decision making systems [10]. Last but not least, a publication from Al-Kasasbeh et al. [11] should be mentioned here. The analysis of mathematical models of the interaction of the internal and BAPs of meridian structures allows the specification of a list of gastric diseases for which reflex diagnostics and reflex therapy methods are most effective [11].

These 3 clinical examples clearly show that basic research on the topic of BAPs is very important, and that the development of quantification methods in this field of research is of great interest.

**Conclusions**

From our present study we can draw the following conclusions:
1. We found 5 patterns of skin surface luminescence near BAPs.
2. Most of the luminescent BAPs (68.5%) were found along the pericardium and triple energizer meridians. The experiments were conducted from June to October 2014, between 7 and 10 p.m. According to the literature [12, 13], during that time of the day, the pericardium and triple energizer meridians have their maximum activity; the data in table 2 support this idea.
3. Analysis of the data in tables 1 and 2 leads to the following: the induced luminescence is observed for BAPs located close to the meridians that are supposed to have a maximum activity at the hours when the experiments were conducted. In order to explain the different patterns we observed, further and deeper research is required.
Table 1. Description of the luminescence pictures (also compare fig. 3)

| Fig. | Pattern type | LP topography |
|------|--------------|---------------|
| 1    | Black center with white ring (1) | Right palm, to the elbow side from thenar line, between II and III metacarpal bones (LP 1.1; fig. 3a) | Center of right palm, between III and IV metacarpal bones (LP 1.2; fig. 3b) | Palm side surface of the left hand middle finger base, slightly higher than III metacarpalphalangeal joint (LP 1.3; fig. 3c) | – |
| 2a   | Black center with white ring (2) | Palm side surface of the right hand middle finger proximal phalanx (LP 2.1; fig. 3d) | Center of right palm, slightly below III metacarpalphalangeal joint, in the projection of transverse palm wrinkle (LP 2.2; fig. 3e) | Left ear flap, on the border of the middle of the upper peduncle antihelix and the navicula (LP 2.3; fig. 3f) | Between ear tragus and temporomandibular joint on the left (LP 2.4; fig. 3g) |
| 2b   | White center with black ring (3) | Palm side surface of the right hand ring finger base, slightly higher than IV metacarpophalangeal joint (LP 3.1; fig. 3h) | Upper part of the left ear flap cavity (LP 3.2; fig. 3i) | Palm side surface of the left hand middle finger distal phalanx (LP 3.3; fig. 3j) | To the front and above the right ear tragus (LP 3.4; fig. 3k) |
| 2c   | White center with black ring (4) | Palm side surface of the left hand ring finger base, slightly higher than III metacarpophalangeal joint (LP 4.1; fig. 3l) | Palm side surface of the left hand middle finger, space between I and II metacarpal bones (LP 4.2; fig. 3m) | Back surface of the left hand middle finger, middle of the middle phalanx (LP 4.3; fig. 3n) | Back surface of the left hand middle finger, distal interphalangeal joint (LP 4.4; fig. 3o) |
| 2d   | White center with 2 rings (black and white) (5) | Back surface of the right hand middle finger distal phalanx base (LP 5.1; fig. 3p) | Palm side surface of the right hand index finger distal phalanx (LP 5.2; fig. 3q) | Palm side surface of the left hand IV finger base (LP 5.3; fig. 3r) | Right temple, above the middle of the cheek-bone arch (LP 5.4; fig. 3s) |

LP = Luminescent point.

Table 2. Experimental results on the location of LPs in accordance with the topography of the acupuncture channels or auricular correspondence system

| Pattern type | LP topography |
|--------------|---------------|
| 1            | LP 1.1        | LP 1.2        | LP 1.3        | –            |
|              | PC            | PC            | PC            |              |
| 2            | LP 2.1        | LP 2.2        | LP 2.3        | LP 2.4       |
|              | PC            | PC            | AP 49         | SI           |
| 3            | LP 3.1        | LP 3.2        | LP 3.3        | LP 3.4       |
|              | TE            | AP 92         | PC            | TE           |
| 4            | LP 4.1        | LP 4.2        | LP 4.3        | LP 4.4       |
|              | PC            | LI (projection on the palm surface) | PC            |              |
| 5            | LP 5.1        | LP 5.2        | LP 5.3        | LP 5.4       |
|              | PC            | LI            | TE            | ST           |

LP = Luminescent point; SI = small intestine meridian; TE = triple energizer meridian; LI = large intestine meridian; ST = stomach meridian.
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Disclosure Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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