Journal of Acupuncture Research

Journal homepage: http://www.e-jar.org

Original Article

The Lungs' Real-time States are Reflected in the Tissue at its Related Acupuncture Points

Fletcher Kovich*

Curepoint Acupuncture in Bristol, Bristol, UK

Article history:
Submitted: February 11, 2019
Revised: April 10, 2019
Accepted: May 3, 2019

Keywords:
acupuncture, impedance, lungs

ABSTRACT

Background: The intelligent tissue hypothesis on how acupuncture works, states that real-time organ states are reflected in the tissue at an organ's related acupuncture points (acupoints). Any such changes in the tissue would produce corresponding changes in the impedance at those locations.
Methods: To test this hypothesis in relation to the lungs, the impedance at key lung-related acupoints was monitored in real time while the patient breathed normally, then breathed deeply, then quickly, then held his breath.
Results: When breathing deeply this produced a notable decrease in the impedance at 1 acupoint, while breathing quickly produced a decrease at another acupoint, suggesting that these different functions taxed different aspects of the lungs, which was then reflected at different acupoints. The impedance at all the acupoints also contained low-amplitude waves that reflected the base rate of the respiration pacesetter, and the amplitude of these waves also varied to reflect different real-time states in the lungs.
Conclusion: These real-time impedance patterns suggested that corresponding physical patterns were present in the tissue at these acupoints, and these physical patterns mirrored the real-time variations in function strength of the related organ (the lungs). These results were consistent with the hypothesis.

https://doi.org/10.13045/jar.2019.00045
pISSN 2586-288X eISSN 2586-2898

Introduction

The studies reported here are part of the author's ongoing research project to obtain objective experimental data to validate the intelligent tissue hypotheses on what the meridians are, what acupuncture is and how it corrects organ malfunctions.

A previous study in this project [1] demonstrated that the impedance at key stomach acupoints varies throughout the day and is proportional to the strength of the stomach function (i.e. when the stomach was actively digesting a meal, the impedance at its acupoints rose significantly). Another study [2] demonstrated that a sudden impediment to the stomach function (induced by swallowing chilled water) produced an immediate reduction in the impedance at the stomach's related acupoints. And other studies have found that when the lungs [3,4] or heart [5,6] are diseased, the impedance at their acupoints is reduced, which suggests that when an organs' function is weak, this is reflected in reduced impedance at its acupoints.

The intelligent tissue hypothesis states that organ information is communicated body-wide on electromagnetic waves. This is filtered so that each organ's information is emphasized along the path of its meridian. Body tissue constantly interprets this information, which causes each organ's states to be reflected in the tissue at its related meridian and acupuncture points (acupoints). Hence, when an organ is stressed in some way, this causes anomalies in the tissue at its acupoints. This causes the key acupoints to become tender when pressed, or to be cold or red; or for boils, painful joints, or shooting pains to eventually occur along the meridian (phenomena familiar to traditional Chinese medicine practitioners). By needling such acupoints, this relaxes the local tissue, which reverts to its normal state; and this "return to normal function" is also communicated body-wide via the same electromagnetic waves. When these arrive at the related organ, this persuades the organ to follow the same transformation and to also revert to normal function [7].

The current study was devised to record the outward communication from the lungs to some of their related acupoints. The impedance at 4 lung-related acupoints was monitored while

*Corresponding author.
15 Westward Gardens, Long Ashton, Bristol, BS41 9HU, UK
E-mail: fletcher@curiouspages.com
ORCID: Fletcher Kovich https://orcid.org/0000-0002-9098-8520

the patient's lungs were taxed. If the hypothesis is correct, any stress in the lungs ought to produce real-time physical changes in the local tissue at the acupoints, which would be detectable as changed impedance of the skin and/or the underlying tissue.

Materials and Methods

The monitored acupoints were bilateral LU-1 (*Zhongfu),* right *LU-6 (Kongzui),* and right LU-9 *(Taiyuan).* And two control locations were also monitored, at 35 mm/15 mm medial/caudal to left LU-1; and 30 mm medial to right LU-6. The acupoints were first located by an acupuncturist with 13 years experience in traditional Chinese acupuncture, then the location of lowest impedance was verified electrically, and this was used as the test location. A thermistor was also placed under the patient's nose to monitor the breath at his nostril. At each acupoint, a pair of custom-made electrodes were used, set at a distance of 6 mm apart (the second electrode acting as a further control), and a standard ECG electrode was attached at 4-10 cm from each acupoint, as an earth. Gel was used on each electrode. A 40 kHz 200 mv sine wave was passed through the electrodes, and the voltage monitored. A custom-made unit converted the monitored voltages to DC, then passed these to a data logger which sampled the voltages at 1 kHz. The thermistor was attached to a simple voltage divider circuit and a direct current passed through it. The voltage across the thermistor was monitored by another data logger, also sampling at 1 kHz. An Access database and macro was used to control the data loggers and convert the voltage samples into kΩ and Celsius values, before they were imported into Matlab and filtered to produce the plots. The accompanying online dataset contains links to documents that describe in detail all the equipment and techniques used, including how to reliably locate acupoints electrically [8].

The patient was a male, aged 34. In Chinese medicine terms, he suffered poor stomach and pancreas function (usually known as "Stomach chi deficiency" and "Spleen chi deficiency"); and also poor "kidney" function (known as "Kidney chi deficiency"). However, in the context of biomedicine, the patient did not have any significant conditions, and would be considered healthy.

On the morning of the study, 20 July 2018, he did not eat a meal. The recording then began at 12:37 PM. During the recording, he raised a finger on his left hand to indicate the start and end of the periods when he changed his breathing. The researcher pressed a software switch to mark these moments, which produced 6 time values, marked on the plots with vertical green lines. The recording lasted for 360 seconds (6 minutes). At 86 seconds, he took 4 deep breaths, lasting for 15.7 seconds in total. At 168 seconds, he breathed rapidly for 8.6 seconds, and at 236 seconds, he held his breath for 25 seconds.

Informed consent was obtained.

Results

The raw study data is available online in a dataset [8], which includes the Matlab scripts used to filter the data to produce the plots. Matlab's findpeaks function was used to locate the peaks in each plot, so that wave analysis could be performed. Such values are given as mean ± SD (all calculations are included in the accompanying dataset [8]).

Fig. 1 shows that during the deep breathing (first pair of vertical dashed lines), the impedance at left LU-1 began to fall, then fell sharply, by a further 38.4% (from 1.342 to 0.824 kΩ) over 52 seconds. This change occurred inversely in the plot of the impedance at 6 mm perpendicular to the acupoint, which contrary motion is a feature of organ information reflected at acupoints [9].

The lower plot of Fig. 1 shows that this same sharp fall in the impedance was not present at locations 29 mm and 35 mm medial to the acupoint. At these locations, the impedance traces followed a different pattern. At the 35 mm location, the impedance gently fell by 6.6% (from 2.003 to 1.871 kΩ) over 360 seconds. And the impedance at the 29 mm location changed inversely to this. Since the 35 mm location was centred on the stomach meridian (near to ST-14 *Kufang*), this contrary motion would be expected.

Fig. 2 shows that the right LU-1 electrodes did not provide meaningful values, and it is assumed that the electrodes were either located incorrectly, or too high a pressure was used to hold them in place, or both (see Fig. A in the dataset [8]).

The impedance at right LU-6 fell in a similar fashion to that at left LU-1, except that the sharpest decline occurred in response to the rapid breathing (the second pair of vertical dashed lines). Here, the level fell by 43% (from 0.58 to 0.33 kΩ) in 89 seconds.

The lower plot of Fig. 2 shows that this sharp decline in the impedance was not present at locations 24 mm and 30 mm medial to the acupoint. Instead there was only a shallow decline at the 30 mm location, which was mirrored in contrary motion at the 24 mm location. The 30 mm location was centred on the pericardium meridian, which accounts for the contrary motion.

Fig. 3 shows that the impedance at right LU-9 displayed a trend with much less response to the variation in breathing. There was a gentle rise of 63Ω over the first 165 seconds (from 2.406 to 2.469 kΩ, a rise of only 0.03%), followed by a slight decline after the rapid breathing, of 5Ω over 25 seconds (from 2.469 to 2.464 kΩ, a drop of 0.005%).

Fig. 3 shows a finer Y scale than that used in Figs 1 and 2, and due to this, clear respiration waves are visible throughout both impedance plots (with an overall mean wavelength of 3.86 ± 0.382 seconds), which continued when the breath was held.

To produce the lower plot of Fig. 4, the bandpass filter range was 0.167 - 0.333 Hz, which isolated wavelengths between 6 - 3 seconds. In a previous study [10], it was noted that the respiration waves captured in the impedance at lung-related acupoints were related to the base rate of the respiration pacesetter, rather than the actual respiration cycle (i.e. the current speed of the pacesetter).

In the current study, this is confirmed by the fact that these waves continued when the patient held his breath (Figs 3 and 4); that at the start of the recording, the actual respiration cycle was 5.58 ± 1.08 seconds, while that of the base rate of the pacesetter was only 3.34 ± 0.48 seconds (Fig. 4).

As seen in Fig. 4, when the patient began breathing deeply, the amplitude of the reflection of the pacesetter's base-rate waves notably increased (to around 18Ω, from around 6Ω), and after the deep breathing ceased (15 seconds later), the actual respiration rate was now almost identical to the pacesetter's base rate. After the patient held his breath for 25 seconds, the amplitude of the reflection of the pacesetter's base-rate waves again notably increased (to around 40Ω, from a base level of around 6-8Ω) and also speeded up slightly (from 4.07 ± 1.34 to 3.46 ± 0.36 seconds). These 2 sections of notably increased amplitude can also be clearly seen in Fig. 1, which confirms that these features in the lower plot of Fig. 4 are genuine features of the pacesetter's base-rate wave, as reflected in the impedance at left LU-1, rather than being an anomaly produced by the bandpass filter.

It is not suggested that the amplitude of the respiratory pacesetter's base-rate wave ever changes notably, but rather that when this "signal" is interpreted by the local tissue at these lung-related acupoints, the increased amplitude may reflect states in the lungs. Possible interpretations are as follows. In the first instance, the fact that the deep breathing had adopted the rate of the pacesetter's base-rate (whereas the patient's breathing was

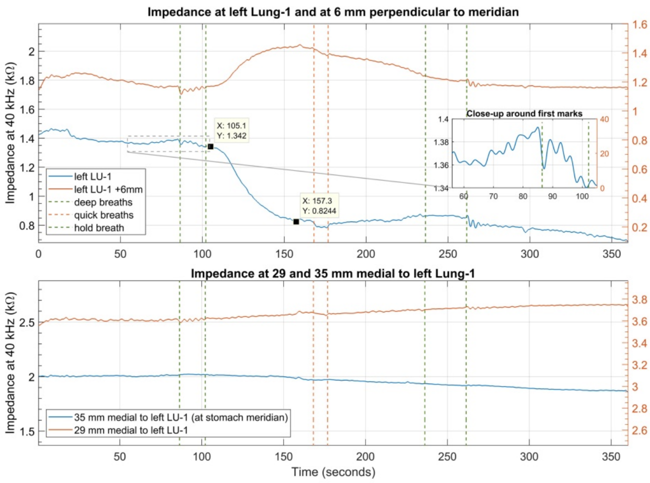

Fig. 1. Impedance at left LU-1 and at 6 mm perpendicular to the meridian (upper plot); and at 29 and 35 mm medial (and 15 mm caudal) to left LU-1 (lower plot).

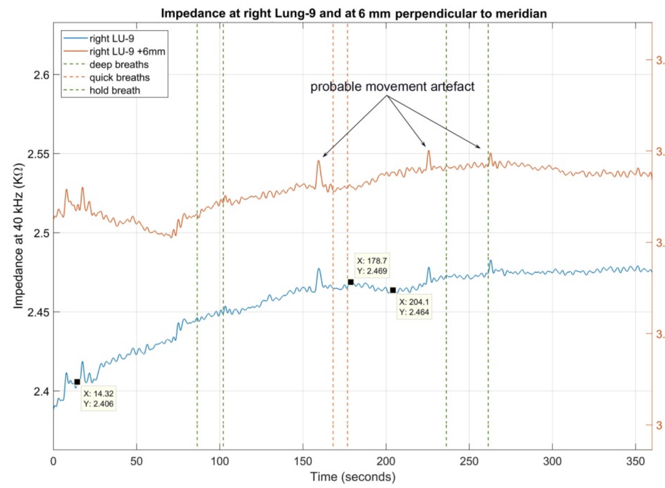

Fig. 3. Impedance at right LU-9 and at 6 mm perpendicular to the meridian.

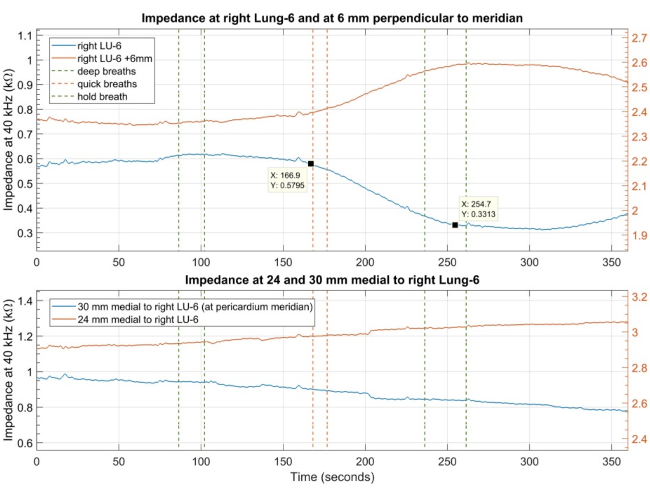

Fig. 2. Impedance at right LU-6 and at 6 mm perpendicular to the meridian (upper plot); and at 24 and 30 mm medial to right LU-6 (lower plot).

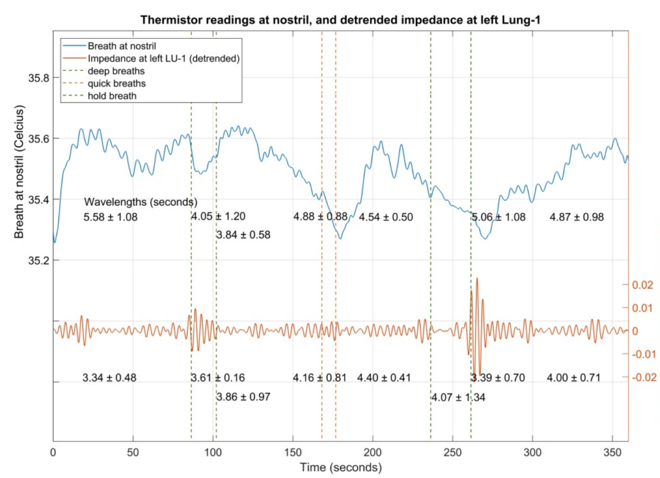

Fig. 4. The thermistor readings at the nostril, showing the patient's respiration cycle (upper plot); and the respiration waves recorded in the impedance at left LU-1, isolated using a bandpass filter (lower plot).

previously not doing this) may have momentarily emphasized this aspect of the lung's function (assuming that this base-rate wave is a part of the lung's function, rather than a product of the pacesetter in the brain stem) in the impedance at left LU-1. And after the breath was held for 25 seconds, the even larger emphasis of the pacesetter's base-rate wave may reflect the lungs' urgent need to resume breathing.

Discussion

In biomedicine, the patient in this study would be considered to have a healthy lung function. However, in Chinese medicine he was diagnosed as having poor "kidney" function (note that when the "kidneys" are mentioned in Chinese medicine, this includes the functions of 3 organs collectively: the kidneys, adrenal glands and gonads). In Chinese medicine it is recognised that good "kidney" function is required to enable the lungs to breathe in properly (though this association is unknown in contemporary physiology). Hence the patient's lung function, as regards breathing in, would have been weaker than in patients with normal "kidney" function.

Further, at the start of the recording, the patient appeared tired and lethargic. His respiration cycle was 5.58 ± 1.08 seconds, which is slower than normal, and slower than normal for this patient; and his pulse rate was also slower than normal, at 53 bpm (this was measured by analysing the pulse waves at right LU-9; see dataset [8]). The patient had not yet eaten that morning, which may also have contributed to his general lack of energy.

Other variables are the season and the time of day. In Chinese medicine it is recognised that the strength of the lung function (as with all the organs) varies around a 24-hour cycle, and is at its minimum strength between 3-5 PM. Since the recording was made around 12:40 PM, the strength of the patient's lung function was approaching its weakest level of the day.

All these factors may have reduced the stamina of his lung function and produced effects of a greater magnitude than might be obtained in other patients. However, using this more sensitive patient for the study only served to more readily highlight the principle being investigated. And the purpose of this study was merely to demonstrate that the principle exists (not to define its range of magnitude amongst a variety of patients and also account for all the possible variables).

In Fig. 1, the sharp drop in impedance at left LU-1 after the patient took 4 deep breaths, may be interpreted to indicate a weakening of lung function, which would suggest that the patient's lungs found it hard to perform this deep breathing which then caused the lung function to gradually weaken over the following 53 seconds. When the patient breathed rapidly, this only caused a slight decline in the impedance at left LU-1; and holding the breath for 25 seconds, appeared to have no effect on the impedance.

The impedance at the right LU-6 acupoint did not show the same response to the deep breathing, but showed a notable response when the patient breathed rapidly for 8.6 seconds.

In previous studies [2,9] it was found that the left and right instance of the same acupoint usually display notably different impedance characteristics, where the left acupoint may reflect *yin* aspects of the organ (i.e., the condition of the fabric [2]), and the right acupoint may reflect *yang* aspects (i.e., the functioning). This interpretation would account for the results, where the impedance at left LU-1 reflected the strain on the lung's fabric of taking successive deep breaths; and the impedance at right LU-6 reflected the reduction in function strength (or stamina) when taking repeated rapid breaths.

In response to the rapid breathing, the impedance at right LU-9 only showed a slight reduction. Elsewhere [11], the author has provided a detailed account of why and how different acupoints along the same meridian reflect different aspects of the related organ. This phenomenon may account for the difference in the degree of the response at the right LU-6 and LU-9 acupoints to the same functional state in the lungs (taking repeated rapid breaths). However, this area requires further study to be able to accurately define these relationships.

The base rate of the respiration pacesetter was reflected in the impedance at all the test acupoints, including the control locations. The fact that this was also reflected at non-lung-related acupoints is consistent with the author's recent investigations of all the pacesetters (the duodenal, the stomach's slow wave, the respiration and heartbeat) as reflected in the impedance at meridians and acupoints. Previous studies have found that the duodenal pacesetter (or possibly its base rate) and also the stomach's slow wave are reflected at stomach-related acupoints [2], and also that the base rate of the respiration pacesetter is reflected at lung-related acupoints [10]. But after further investigation, it transpired that all these pacesetters are reflected at all locations, but with varying amplitudes depending on the strength of the related organ's function at the time of recording. Therefore, when the digestion was processing a recent meal, the duodenal pacesetter and also the stomach's slow wave were reflected with a higher amplitude than the base rate of the respiration pacesetter, which explained why (when the digestion was active) the impedance at stomach-related acupoints showed mainly duodenal waves, rather than respiration waves. In the current study, the recording began at 12:37 PM, and the patient had not eaten that morning, therefore his digestion was not active, which explains why respiration waves were present in the impedance at the stomach meridian (Fig. 1, lower plot; but also see the extra plots and spreadsheets in the dataset [8]). If the patient had recently eaten, it is expected that duodenal pacesetter waves would have been predominant in this plot. Further detailed investigations into this phenomenon are currently ongoing.

In the current study, the fact that the base rate of the respiration pacesetter was reflected in the impedance at left LU-1 (Fig. 4, lower plot), demonstrated that dynamic information relating to this base-rate wave is reflected in real time at the lung-related acupoints (i.e., the changes in frequency, and also the notably increased amplitude during the heavy breathing and after the patient's breath was held for 25 seconds). And the general trends in the impedance plots at all the test acupoints also reflected dynamic states within the lungs in real time. This was most notable in the upper plots of Figs 1 and 2, which states were not reflected in the impedance at the nearby control points (the lower plots).

Since the impedance at an acupoint can only change when there is a physical change in the local tissue (including the body fluids), these results confirmed that the local tissue at these lung-related acupoints reflected real-time states in the lung function, such as the general function strength, and also varying states related to the base-rate wave of the respiration pacesetter (which may be a function of the lungs, rather than of the electrical respiration pacesetter which is located in the brainstem). These results were consistent with the intelligent tissue hypothesis.

The data reported in this current paper was collected from only 1 patient (though the results were consistent with other published studies [1,2,8,10]). At this early stage in this research project, it is only the intention to identify general principles. There are many facets to this mechanism that acupuncture utilizes (and most are beyond the current knowledge of contemporary physiology) and there are also many variables. Once all these factors are fully understood, it would then enable the sensible study of their variation between different patients.

Conflicts of Interest

The author received no financial contribution towards the design or conduct of this research, nor towards the preparation of this article.

References

[1] Kovich F. The Daily Variance in Impedance at Acupuncture Points. J Acupunct Res 2018;35:176-181.
[2] Kovich F. The stomach's communication with its related acupoints, and the "intelligent tissue" hypothesis. J Acupunct Res 2019;36:21-27.
[3] Serisawa K. An Approach on Meridians and Acupuncture Points in Modern Medicine. J Compre Rehabil 1978;11:789.
[4] Sullivan SG, Eggleston DW, Martinoff JT, Kroening RJ. Evoked electrical conductivity on the lung acupuncture points in healthy individuals and confirmed lung cancer patients. Am J Acupunct 1985;13:261-266.
[5] Rosenblatt S. The Electrodermal Characteristics of Acupuncture points. Am J Acupunct 1981;10:131-137.
[6] Saku K, Mukaino Y, Ying H, Arakawa K. Characteristics of reactive electropermeable points on the auricles of coronary heart disease patients. Clin Cardiol 1993;16:415-419.
[7] Kovich F. Secrets of the Hidden Vessels, 3rd ed. Bristol (UK): CuriousPages Publishing; 2018. 363 p.
[8] Kovich F [Internet]. The lungs' real-time states are reflected in the tissue at its related acupuncture points. Mendeley Data, v1 2018. Available from: http://dx.doi.org/10.17632/5r24nhmtch.1.
[9] Kovich F. The impedance profile of acupuncture points. J Acupunct Res 2018;35:104-107.
[10] Kovich F [Internet]. The lungs' communication with their related acupuncture points. Mendeley Data, v1 2018. Available from: http://dx.doi.org/10.17632/767nyxr284.1.
[11] Kovich F. Secrets of the Hidden Vessels, 3rd ed. Bristol (UK): CuriousPages Publishing; 2018. p.335-351