

REVIEW ARTICLE

Western Medicine Versus Eastern Medicine: Do Both Have a Common Root, Scientific Background, and Worldwide Recognition?

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ABSTRACT

This review is designed to initiate a discussion we believe is necessary for the biomedical community, because of some recent evidences for existing of a new body anatomical system, or the primo vascular system (PVS), which could be the missing link in the scientific explanation of the unknown mechanism of action of acupuncture. Some important questions for the medical society, (eg, “What is the main source of the mistrust of Western medicine toward traditional Oriental medicine and could it be overcome?” or “Is the PVS a real one and what is its distribution, formation, and function?” or “Are there scientific proofs for intimate relationships of the PVS with meridian system and whether the PVS would be the

physical basis of meridians?”) are deeply studied and appropriately answered. Various pieces of knowledge are now combined to achieve a better understanding and to provide an acceptable explanation about the functions of such new system and to explain the functional path used by traditional Eastern medicine to cure diseases. Some possibilities to use this PVS for development of some innovative therapies to treat some diseases are also discussed (eg, pharmacopuncture as a new innovative drug delivery method that combines acupuncture therapy with medication by injecting pharmacological substances into target acupoints). (*Altern Ther Health Med.* 2020;26(2):38-44).

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INTRODUCTION

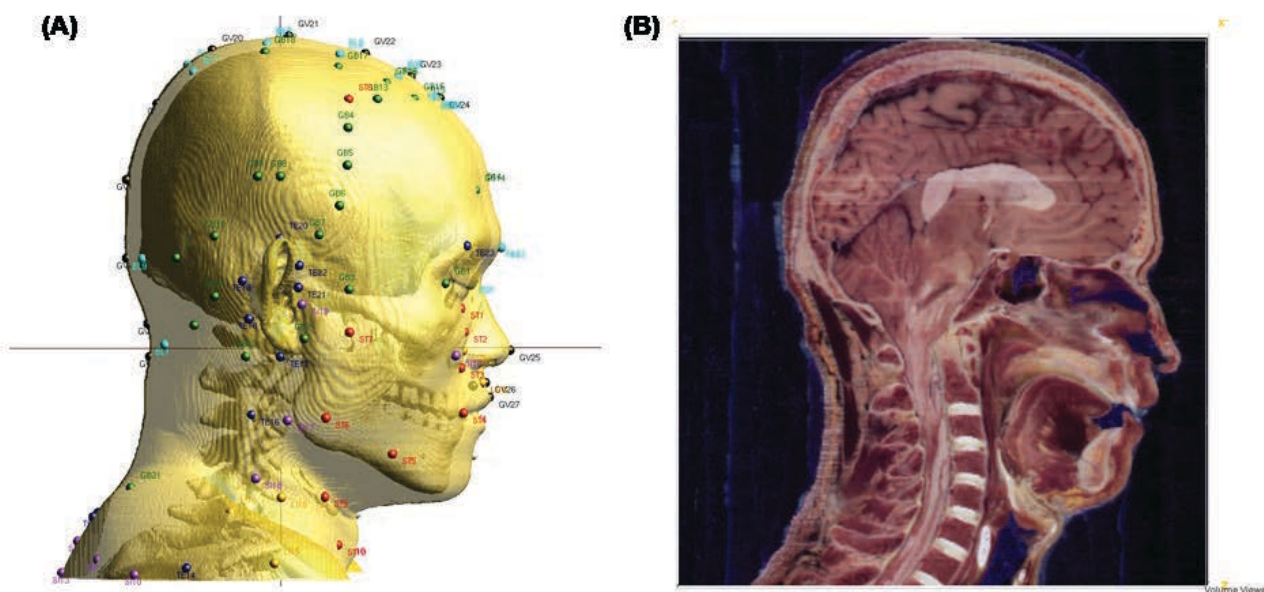
Before answering the title questions, we should go throughout some well-known definitions. According to the *NCI Dictionary of Cancer*, *Western medicine* is defined as

“a system in which medical doctors and other healthcare professionals (such as nurses, pharmacists, and therapists) treat symptoms and diseases using drugs, radiation, or surgery.” It is also called allopathic medicine, biomedicine, conventional medicine, and orthodox medicine.

Oriental medicine, on the other hand, according to the same dictionary, is a “medical system that has been used for thousands of years to prevent, diagnose, and treat disease, which is based on the belief that Qi (the body’s vital energy) flows along meridians (channels) in the body and keeps a person’s spiritual, emotional, mental, and physical health in balance. Oriental medicine includes mainly acupuncture, diet and herbal therapy, but also meditation, physical exercise and massage.”

We should take into account that Western medicine often uses many plant-derived compounds in the process of elaboration of some pharmaceutical drugs and therefore cannot be fully separated from herbal therapy. The mechanisms of healing effects of herbs, physical exercises, and massages are also well known and studied enough, excluding acupuncture. Therefore, in this study, we will try to outline only a possible scientific explanation of the missing mechanism of action of acupuncture having in mind some new scientific findings during the last years.

Figure 1. A. An image displaying some acupuncture points used in traditional Eastern medicine. **B.** A cross-sectional view of human brain.



WHAT IS THE MAIN SOURCE OF THE MISTRUST OF WESTERN MEDICINE TOWARD TRADITIONAL ORIENTAL MEDICINE, AND COULD IT BE OVERCOME?

It is well known that Oriental medicine and especially acupuncture are based on the meridian system and also have more than 5000 years’ history of successful application in countries such as China, Japan, and Korea, but at the same time it is still not officially recognized as legitimate medicine by Western society. Most Oriental medical technics are based on different acupuncture stimuli of target acupoints placed along the meridian system (Figure 1). Unfortunately, throughout the whole history of Oriental medicine, a proper scientific explanation of intimate mechanism of action of the meridian system has not been given and it was not possible to visualize physically the pathways of the meridian system. The absence of clearly defined anatomical pathways of the meridian system in the human or animal body and the absence of possible explanations of mechanisms of action of this system seem to be the main disadvantages of Oriental medicine.

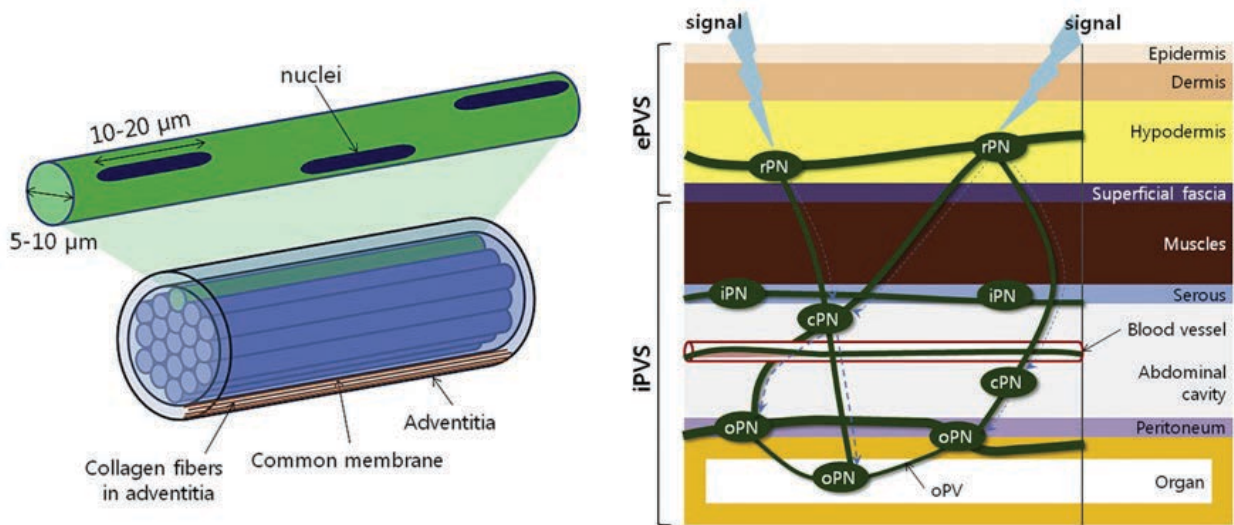
Finally, the main differences between these and/or other “medicines” are mainly based on their recognition by the scientific communities in some target countries, but not on their efficacy in the treatment of patients. That is why some physicians/researchers do not accept acupuncture, primarily because the meridian system lacks a physical/anatomical basis and acceptable scientific elucidation of mechanisms of action. Until now, various scientific theories have not been able to explain the functional path used by traditional Eastern medicine to cure diseases. According to Western medicine, no known anatomical foundation exists for the meridians and unknown mechanisms mediate the effects of acupuncture.

WHETHER THE NEWLY DISCOVERED PRIMO VASCULAR SYSTEM CAN BE THE MISSING LINK IN THE SCIENTIFIC EXPLANATION AND/OR WORLDWIDE RECOGNITION OF ORIENTAL MEDICINE

Having in mind that the routes and the mechanisms of actions of all body systems such as the nervous, vascular, lymphatic or hormonal systems, are well known, there is obvious necessity to find out the anatomical basis and/or the physiological pathways, which can throw more light on the mechanisms of action and healing effects of Oriental medicine treatments (eg, acupuncture). During the last several years, by using different experimental approaches, the number of scientific papers that report the discovery of various anatomical and physiological evidences for existence of an anatomical basis for the meridian system has increased. Morphological science is greatly challenged to offer a new biomedical theory that proves the possible existence of new systems in the human/animal body such as the primo vascular system (PVS), which can explain the healing and/or instantaneous effect of acupuncture. The PVS is a system that is recently proposed for such an explanation and integrates the main features of cardiovascular, nervous, immune, and hormonal systems. It also provides a physical substrate for the acupuncture points and meridians (AMs). The theory of acupuncture is based on specific energy that flows throughout meridian channels that are stimulated by metal needles inserted at target acupoints.

In the 1960s, Professor Bong-Han Kim proposed for the first time such a new anatomical system composed from Bong-Han ducts (BHDs), later named PVS and respectively primo vessels (PVs), that corresponds to the ancient acupuncture meridians and acupoints.¹ A liquid called “the primo fluid” containing various components circulates

Figure 2. A. Illustration of 1 isolated subvessel (top) and a bundle of subvessels of the primo vessel. **B.** Topographical distribution of the primo vascular system.



in this PVS. This primo fluid flows in one direction, attending the blood flow and depends on the heart beats. A membrane surrounds the whole PVs and there are also subvessels inside the vessels of the PVS, which are composed of specific endothelial cells with rod-shaped nuclei with size 10 to 20 μm, smooth muscle cells and adventitia. Kim developed his idea for the PVS by adding interior and exterior PVs and primo nodes (PNs). The diameters of the lumens of such PVs (representing a bundle of subvessels) are 100 to 150 μm, but these of subvessels are only 5 to 10 μm, which is nearly the size of some capillaries of the blood and/or lymph systems (Figure 2). However, this hypothesis/finding has not attracted appropriate attention and has been neglected by the scientific community. Independently of that, the anatomical structures corresponding to AMs have been studied by many researchers but no one has reported any positive confirmation of Kim's works; neither has anyone been able to disprove Kim's results. The conventional histological analysis could not distinguish the PVS from the surrounding connective tissues. Now, it is already of great importance, this mistrust of Western medicine to Eastern traditional medicine to be overcome, and various pieces of knowledge to be combined to achieve a better understanding and to provide an acceptable explanation about the functions of such a new system.

IS THE PVS A REAL ONE AND WHAT IS ITS DISTRIBUTION, FORMATION, AND FUNCTION?

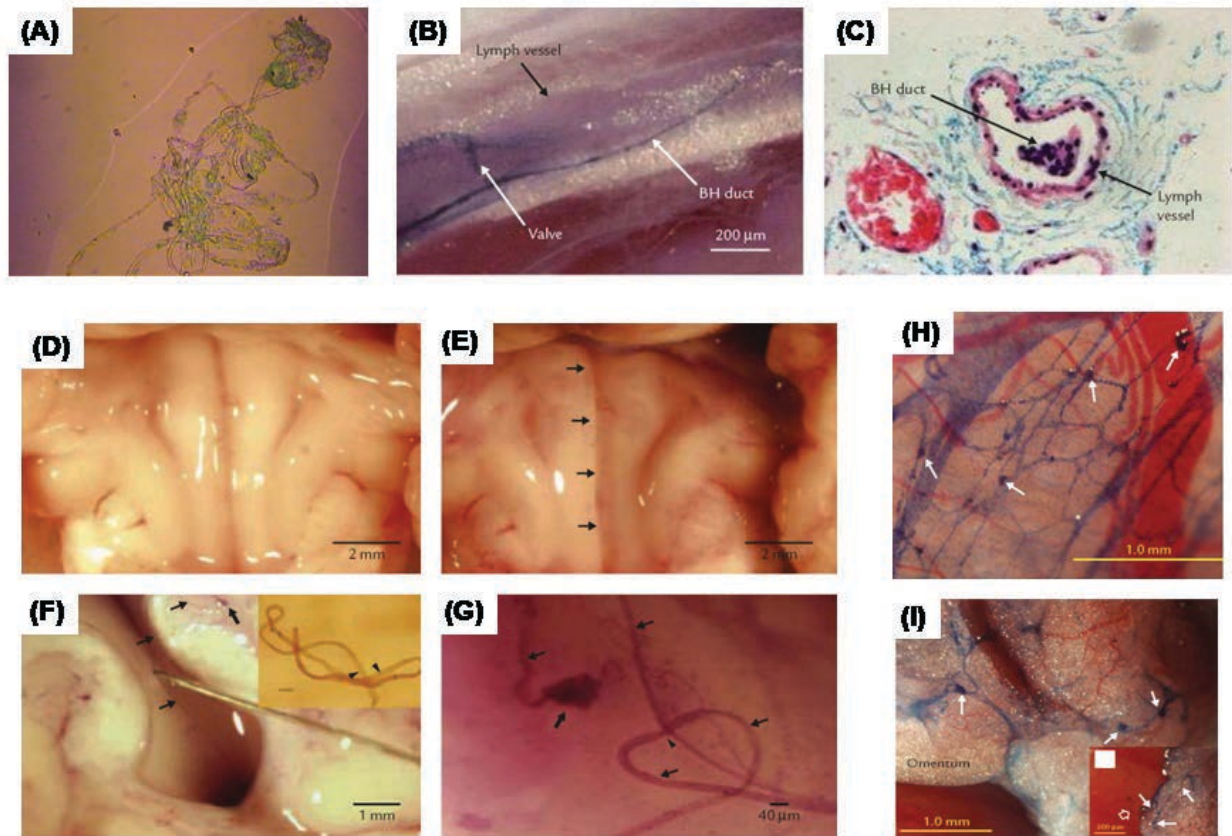
During the last 15 years, the research team in Seoul National University (SNU) has exerted great efforts to confirm and prove this hypothesis and developed some methods to detect and identify this PVS publishing more than 60 articles and receiving more than 200 citations concerning this subject.² Now, with the recent discovery of the staining technique with several dyes such as fluorescent nanoparticles and Hema color, it is already possible to see the "hard-to-observe primo vessels" in the neurovascular (NV)

bundles in the hypodermis of laboratory animals (eg, rats) and, therefore, the existence and/or distribution of PVS is finally proved, similarly to all other anatomical systems.^{3,4,5}

PVS is present in most, if not all, organs of the mammal, forming an extensive network throughout the body. The PVS has been detected in the heart chambers,⁶ the caudal vena cava, the hepatic vein, the hepatoportal vein, the femoral vein, the aorta, the large lymph vessel along the caudal vena cava⁷⁻¹¹ outside or inside blood- and lymphatic vessels freely flowing in the blood/lymph,^{8,10} on the arachnoid mater, cerebellum,¹² perinervium, and epinervium of the sciatic nerve,^{12,13} on the surfaces of the liver, stomach, small and large intestines, bladder, spleen, kidneys and omentum, abdominal cavity,¹⁴⁻¹⁸ hypodermal layer of the skin, superficial fascia,¹⁹ fat tissue,²⁰ and cancer fascia.²¹ The PVs were also found to enter the internal organ tissues, the third ventricle, fourth ventricle, cerebral aqueduct, and were seen along the central canal of the spinal cord²² (Figure 3).

The hallmarks of the PVs are 10- to 20-μm rod-shaped endothelial nuclei.^{23,24} "The primo fluid" inside the PVs was found to contain various component (eg, free aminoacids, free mononucleotides, basophilic granules,²⁵ proteins,²⁶ small steam-like cells of 3 to 5 μm,²⁰ primo-microcells,²⁷⁻²⁹ hormones,³⁰⁻³ cells containing DNA granules that cannot be found in any other body liquids,³³ and to flow at a speed of 0.3 mm/s. The PVs are surrounded by a membrane with a high concentration of hyaluronic acid.⁸ Finally, it was found that the PVS is associated with the vessels and the nerves and is also abundant in the loose connective tissue, the fat tissue, the skin's hypodermal layer, the serous membranes and superficial fascia, and, therefore, it is distributed as a web among all body systems, including the tissues of organs. PVS is small (micron size), optically translucent, hardly distinguished and enshrouded with loose connective tissues that may be the principal reason it was not discovered earlier. The subsystems of PVS in hypodermis appeared to be the anatomical structures of AMs.

Figure 3. **(A)** Phase-contrast microscopic image of a BHD (primo vessel) from an artery of a rat. Total length is approximately 4 cm. **(B,C)** BHD inside a rabbit lymphatic vessel stained with Janus Green B. **(D-G)** BHD in brain ventricles of rabbits. Stereomicroscopic images at bottom of the fourth ventricle beneath the cerebellum of same rabbit before, **(D)**, and after, **(E)**, hematoxylin application. No BHD visible in panel A but, after hematoxylin staining and washing, BHD (arrows) emerged near sulcus, panel B. **(F)** Stereomicroscopic image of BHD (arrow) in an aqueduct and third ventricle of rabbit brain after hematoxylin and washing, lifted using a needle to show it was a floating tissue in cerebrospinal fluid. Inset: wound state of threadlike structure specimen, showing its elastic nature; overlapped regions show its optical transparency; 2 nodes present (arrowheads); scale bar, 60 μ m, in the inlet. **(G)** Stereomicroscopic image of BHD (arrow) with corpuscle (thick arrow) and node (arrowhead); 1 end of BHD cut at front part of third ventricle. **(H,I)** Weblike network of BHDs revealed by using trypan blue. **(H)** Web of BHDs on visceral peritoneum around stomach near rat spleen; several small BHCs at crossing points (arrows); blood capillaries not stained. **(I)** Network of BHDs on omentum below stomach and over small intestine; 3 small corpuscles at crossing points of BHDs (arrows). Inset: another part of same omentum as **(H)**; floating BHD (open arrow) connected to BHDs (arrows) in omentum, showing BHDs on omentum as part of larger network of freely movable BHDs on internal organ surfaces.



Abbreviation: BHD, Bong-Han duct.

Via following the vessels and the nerves, the PVS probably uses these structures as a type of “highway” and as a way to influence body systems and organs. In fact, supplying, draining, and innervating tissues and organs are duplicated by the PVS. This duplication may be a way of controlling the functions of these tissues/systems. The PVS probably also controls the cardiovascular system (which provides substances and hormones to the organs) and the nervous system (which provides impulses to the organs) and regulates and/or coordinates the biological processes that are the basis for life.

The PVS was supposed to have bioelectrical activity, excitatory conductivity, and mechanical motility. The

bioelectrical signals of the endothelial cells of the PVs are similar to the signals of the smooth muscle cells.¹² This electrical activity could be changed in relation to various stimuli into the PVs. Acupunctural needles and other acupunctural techniques may provoke mechanical or electrical stimuli and may activate the PVS. Primo fluid can circulate from superficial PNs to deep PNs and then to the organ’s PNs and to the tissue cells. Stimulation of the PVs could induce changes in the function of the organs (eg, the number of heart beats and the power of the heart, intestinal movement or the fatigue curve of skeletal muscles). Cutting PVs could provoke prominent changes such as karyolysis or

apoptosis in the cells, and it could reduced excitability of nerves and muscle movement.

The movement of the “the primo fluid” that flows through the PVS was subsequently proved by various technics used by SNU research team (eg, some radioactive tracers or Trypan blue),¹⁵ Janus Green B7, or Alcian blue^{8,19} technics to identify the fluid circulation or to visualize the PVS. During the last decade, a series of conventional and modern methods and technologies have been also used for this purpose (eg, Confocal laser scanning microscopy¹⁶; various types of electron microscopy, such as scanning electron microscopy [SEM], cryo-SEM, focused-ion-beam SEM, and high voltage transmission electron microscopy [TEM]^{14,17,18}; X-ray microtomography⁸; atomic force microscopy²⁷; fluorescent nanoparticle^{9-11,34}; immunohistochemistry^{35,36}; proteomic analysis²⁶; the ELISA technique for hormone analysis^{30,31}; electrophysiological methods¹²; and magnetic resonance image [MRI] and computed tomography [CT]).²² Various animal species such as cows,¹³ pigs,³⁷ and dogs,³⁸ in addition to laboratory animals (eg, mice, rats, rabbits), were also used for investigating this PVS (Figure 3).

The development of meridians (ie, the PVS) takes place prior to the development of other organs such as blood vessels and the nervous system. For example, the PVS in the vitelline membrane in eggs was investigated within 16 to 24 hours of incubation, and it was found that the putative PVS was clearly developed earlier than the formation of the extraembryonic vessels, let alone the establishment of the heart and intramembranous vessels.³⁹ This finding supports the idea that the embryonic PVS is like a matrix for the development of vessels and that the PVS has an early embryologic connection with the heart.

The PVS could be considered as the missing physical substrate for the AMs and could be involved in the development and/or functioning of living organisms. The primordial PVS is probably like a matrix for the vascular and the nervous systems, which could be formed around the PVS. The PVS is duplicated by the vascular and the nervous systems during the early stage of body development, which can probably explain why the PVS combines the features of the vascular, nervous, and hormonal systems. After developing of all embryonic body systems the primordial PVS subsequently could remain connected with these systems, simultaneously controlling them, because it appeared to be the oldest morphological functional system. Therefore, the physical/anatomical substrate for the meridian system could be considered as the missing point, which could combine the knowledge of the ancient Oriental (Chinese) medicine and that of the modern science into 1 successful unit.

The PVS may be also used as a drug delivery path for repairing and/or regeneration of tissues^{2,3,5} and, therefore, under normal physiological conditions, the PVS appears to maintain the function of regenerative homeostasis of animals. In this regard, it is well known that acupuncture has long been used to treat neurologic conditions, with the point ST-36 being used for treating stroke and Alzheimer’s disease in some Eastern countries.⁴⁰

Scientific investigations on the mechanism of acupuncture have mostly focused on the relation to the nervous system either in molecular mechanisms such as neurotransmitters and imaging in brain with fMRI. The therapeutic efficacy is also related to the nervous system, because pain is the most widely admitted symptom to be effectively treated with acupuncture. Now, the nervous PVS in the peripheral nerves starting from the acupoints up to the spine and brain adds completely new perspectives on the explanation of mechanism of action of acupuncture on pain and other neurological disorders. This would add significantly to the conventional view points of Western medicine based mainly on nervous system.

The end-positions of NV bundles may be matching to the locations at the points corresponding to the acupoints K-14, K-15, K-16, and others along Kidney meridians and ST-25 and others along the stomach meridian of a rat and others. This discovery made the acupoints anatomically defined. Furthermore, the PVs in the NV bundles are of 10- μ m order thickness and run along with the nerve fascicles, which make feasible to stimulate differentially the PVs or the nerve fascicles with fine metallic, electric or laser needles. This, in turn, makes it possible to devise micrometer-scale precision acupuncture as a design for studies and subsequently could resolve the impreciseness and subjectivity of acupoints locating and could make it independent from the skills of acupuncturists. In addition, close connections between the nerve and the acupuncture system can be distinguished by comparing stimulations of the adjacent PVs and nerve fascicles. Via combining this precision stimulation with the objective evaluation the objective-precision-acupuncture becomes feasible. Scientific investigation on the propagation of signals of electroacupuncture and laser acupuncture becomes also possible, because the PV along the NV bundle can be traced with suitable staining dyes and fluorescent nanoparticles.

Based on the revelation of anatomical structures, we consider 3 modes of investigations on the structural and functional nature of the PVS: (1) optical imaging of the PNs and PVs in the skin layers by using the diffusive optical tomography and the optical coherence tomography, (2) laser stimulation on the PVS with endoscopic instruments and the brain monitoring system, and (3) the pharmacopuncture for drug delivery through the PVS. The research on optical imaging is well suited for the PVS, because the structure is in the range of micrometer scale and transparent optical property. Consequently, this research can offer a significant opportunity to define some additional morphological properties of the PVS even to submillimeter scale.

The PVS is a system of liquid flowing ducts as proved by many experiments with staining dyes or fluorescent nanoparticles. Consequently, acupuncture can be combined with injection system to provide some medicine into the AM or the PVS system. Therefore, the pharmacopuncture could be considered as new innovative therapy and drug delivery method that combines acupuncture therapy with medication by injecting pharmacological substances into target acupoints.

Some of the important PVS properties/characteristics are (1) the PVS (particularly inside PNs) stores a new type of stem cells (embryonic-like stem cells), which subsequently can differentiate to neuronal cells and to participate in the repairing of the damaged brain tissue; and (2) in the PVS there are many immune cells, especially the mast cells which are key effectors of innate immunity and allergic reactions. The more abundance of mast cells at acupoints was reported earlier by Chinese researchers independently of the PVS.³ The PVs contain chromaffin cells, which produces adrenalin and noradrenalin. These neurotransmitter hormones are well known with the sympathetic nerve activities. This is still another indication that the PVS and the nervous systems are somehow closely related.

ARE THERE SCIENTIFIC PROOFS FOR INTIMATE RELATIONSHIPS OF PVS WITH MERIDIAN SYSTEM AND WHETHER PVS WOULD BE THE PHYSICAL BASIS OF MERIDIANS?

Considering that the acupuncture points are physically connected to the internal organs via the PVS, contrast agents for magnetic resonance imaging, radioisotopes, and other materials have been used previously as tracers for the meridians.⁴¹ These attempts to visualize the network of the PVS, (ie, entire meridian system, which could be considered as the basic framework for acupuncture treatment), were not quite successful until now. Fortunately, this puzzle is being recently resolved by the discovery of the staining dye, Hema color, and the special staining technique for visualizing PVs situated in the subcutaneous layer of rats allowing to distinguish PVs among the surrounding loose connective tissues. The PVs corresponding to the conception vessel were found by the Korean research team, which developed this technique and visualized the hitherto unobserved PVs with blue colored threadlike structure on the nerves of NV bundles. An injection of some acupuncture points along the 2 bladder meridian lines immediately after the death of animals was undertaken using a liquid polymer, which harden quickly (after only several minutes). A modified corrosion casting methodology was also applied to make the surrounding body tissues more transparent and to visualize easily indurate plastic pathways as routs of meridian system.^{5,42} Nonacupuncture points were also chosen as the control points. It was also tested whether this liquid polymer will distribute throughout the vascular or lymphatic vessels near to acupuncture points or it will have different ways of distribution. It was seen that the liquid polymer promptly found own routs, different from nervous, vascular and lymphatic routes, distributing itself to the whole body, including deeply inside organs as heart, liver, spleen, kidney, adrenal gland, pancreas, lung, and spinal-cord covers. Long tracks along the spine from the neck up to the upper part of the tail (known as bladder meridians) were seen.⁴² The speed of polymer's distribution from the skin up to the tissue of various organs was outstanding, independently of the circumstance that the animals were dead and their functional

systems were not working. That supposes the existence of special conditions and structures (such as the previously mentioned PVS), which can support such a polymer distribution from the skin up to the organs' parenchyma for a short time, even several minutes after death. Moreover, the routes of polymer distribution follow not only the meridians but also the PVS distribution. The findings could be indirect evidence that the PVS and meridians have unbreakable bonds.⁴² The tracing of liquid plastic was mainly through supporting tissues as adipose tissue, in addition to the tissue between muscles and the covers of body cavities and organs. Surprisingly, the polymer was also found inside various organs reaching them without any visible tracers from the organ surface up to the inside tissue. Such small colored particles of indurate plastic were seen in all investigated organs. However, when only 1 acupuncture point was injected or several nonacupuncture points were injected, plastic reached neither the deep structures of the skin nor the supporting tissues surrounding the organs and cavities. The impossibility to activate meridian system and to accomplish health effect when using only 1 acupuncture point stimulation or several nonacupuncture point stimulations was confirmed by this particular experiment as the polymer distribution was not found in the both last cases.^{4,42}

Having in mind the circumstance that the PVS is situated mostly into the aforementioned supporting tissues and also can reach each organ and every single cell, we suggest that the routes of the used liquid polymer, which was injected in the target acupuncture points of the skin, follow not only the meridians but also the PVS distribution and, therefore, the PVS could be the anatomical basis for meridians. These findings can also prove that the PVS and meridians have unbreakable relations and, therefore, the PVS could deliver some signals and/or drugs to the parenchyma of the organs.

A similar tracing and migration of various kinds of polymers, such as Mercox, which can penetrate the wall of the PVS even in already dead animals, could be also performed under in vivo conditions using CT and/or some other technics such as Alcian blue dye and fluorescent nanoparticles in some future well designed experiments. Such a method seems to be a promising and useful when applied for visualization of the routes of the meridian system (eg, PVS). The shapes, sizes, and locations of the PVs and the PNs are the hallmarks used to identify the PVS. Another reason to present the structures filled with polymer as a PVS is that no other structures in the skin have equal or even similar morphological characteristics. The PNs cannot be lymph nodes, because of their elongate shape, size, and location, nor vascular or lymphatic vessels.^{4,5,42}

Therefore, it seems, the PVS could be the missing link in the scientific explanation and recognition of Oriental medicine, having in mind its common evidence-based root with the Western medicine. Furthermore, it could possibly provide the missing explanation of the mechanisms of the flowing of body's vital energy Qi along meridians, which is considered as the basic milestone of Oriental medicine.

Moreover, there is a possibility to use this PVS for development of some innovative therapies to treat some rare incurable diseases such as amyolateral sclerosis (we have promising results in some preliminaries studies).

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AUTHOR DISCLOSURE STATEMENT

The authors declare no conflict of interests.

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