



The Concept of Pulse

Mahdi Alizadeh Vaghasloo^{1*}, Ayeh Naghizadeh¹, Mansoor Keshavarz²

¹Department of Traditional Persian Medicine, School of Traditional Medicine, Tehran University of Medical Sciences, Tehran, Iran.

²Department of Physiology, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

Received: 18 May 2017

Accepted: 23 May 2017

Abstract

Apart from being a sign in diagnosis, the pulse is a unique conceptual issue in Traditional Persian Medicine (TPM) that deserves to be discussed in detail. A positional and local motion originating from the source of vital spirit, and consisting of two movements and two rests, the pulse increases the vital spirit and produces the psychic spirit. Analyzing the pulse provides a framework to evaluate conditions of the heart and its vital force, conditions of the matter in the vascular wall and both inside and outside the vascular lumen, and the status of tissue demand for ventilation. There are many factors, both physiologic and pathologic that can bring about specific changes in various parameters of the pulse. Therefore, the comprehensive pulse diagnosis of TPM inquires and is founded on assessing ten features of the pulse, namely parameters of pulse expansion dimensions, pulse strength, pulse speed, pulse frequency, vessel fullness, vessel consistency, overlying skin and tissue quality, pulse uniformity, regularity vs. irregularity of pulse diversity, and pulse weight or music. Overall, the pulse is a demonstration of blood perfusion in tissues, which in turn determines the temperament of organs. This concept has led the authors to the "Doctrine of Priority of Blood Production and Distribution over the Formation of Temperaments and Dystemperaments". Derived and assessed by the study of pulse in TPM, this doctrine may be used to forecast different temperaments and dystemperaments within an individual by evaluation of the blood and its distributional status via the pulse. This doctrine may solve the paradoxical findings of non-homogenous dystemperaments in single individuals, and reduce misdiagnosis and treatment.

Keywords: Pulse, Traditional Persian Medicine (TPM), Avicenna, Blood Production and Distribution Doctrine, Temperament, Nabz

Citation: Alizadeh Vaghasloo M, Naghizadeh A, Keshavarz M. **The Concept of Pulse.** Trad Integr Med 2017; 2(2): 54-60.

*Corresponding Author: Mahdi Alizadeh Vaghasloo

Department of Traditional Persian Medicine, School of Traditional Medicine, Tehran University of Medical Sciences, Tehran, Iran.

Email: m-alizadehv@sina.tums.ac.ir

TEL: +98 88990837-105

Introduction

Apart from being a sign in diagnosis, the pulse is a unique conceptual issue in Traditional Persian Medicine (TPM) that deserves to be discussed in detail. The pages written in its favor, forms more than a quarter of the pages written on semiology. This article is derived from a qualitative method research performed on TPM manuscripts ranging from 2nd to 20th A.D. centuries [1]. The conclusive definition and overall description of pulse compiled from the above mentioned literature is as follows:

“*The pulse “Nabz” نبض* is a positional and local motion, originating from the source of vital spirit, the heart and arteries. It is composed of both expansion and contraction to maintain innate heat in its temperate state; expansion, contributes to ventilation of the vital spirit via the breeze of cool air, while contraction helps expel wastes and hot burnt smoke vapors “*Ab-kherah-e-dokhanieh*” ابخره دخانیه condensed in the spirit. The pulse also serves to increase the vital spirit “*Rouh-e-heivani*” روح حیوانی and produce the psychic spirit “*Rouh-e-naf-sani*” روح نفسانی”.

Significance of the Pulse

The pulse is one of the most reliable indications of body status in terms of health and disease, and the best sign by which the heart can be evaluated. Moreover, the vital concept of “blood production and distribution”, cannot be fully assessed without appraising the pulse. Essential features of TPM pulse diagnosis may be summarized as follows:

- It is the **most discussed sign** in the literature, and the most important one.
- It is one of the **fastest and most sensitive signs** of the body that makes some of its parameters a real-time indicator of the body and even mental status.
- It is **one of the most ruled-based and**

mathematical signs of the body, which can be easily analyzed by suitable digital devices and categorized by trained and qualified examiners. This makes it one of the simplest and most accessible signs that can be examined even in abroad villages without need to any complicated device.

- It is **one of the most sophisticated signs**, since almost any intervention and change in lifestyle may affect and change it; thus, many information may need to be collected from the history and examination to differentiate between similar pulses.
- It is **one of the most comparable signs**, the TPM descriptions of which may be approved to a large extent by modern hemodynamic and rheological and physiological evidence.

Components of the Pulse

Each pulse wave form is composed of two movements and two rests: an expanding movement, and a peripheral (external) rest, followed by a contracting movement and finally a central (internal) rest (Fig. 1). Most practitioners can feel the last part of the expanding movement, and also the peripheral rest in most examinees. The contracting movement is not sensed in most cases, unless the examiner is a real expert or the pulse is either strong “*Ghavi*” قوی, huge “*Azim*” عظیم, rigid “*Solb*” صلب or slow “*Bati*” بطيء.

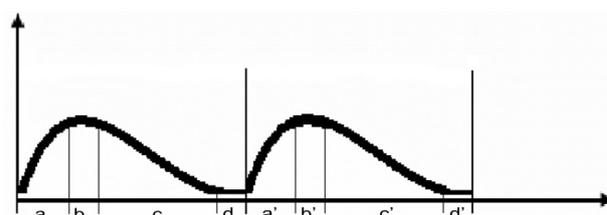


Figure 1. Components of the pulse. (a) expanding movement; (b) peripheral rest; (c) contracting movement; (d) central rest.

Regulations of Pulse Diagnosis

One can check any palpable artery for pulse in any manner by any method and obtain a spatial mental picture of the pulse contour, and then relate that picture with the clinical diagnosis of the patients to build a self-diagnosis system in his mind, but may not reach the description and diagnosis system in TPM literature unless fulfilling the required regulations. This is because various conditions change the perceived sensation from the pulse, and thus pulse diagnosis may not be easily translated from one school of medicine to the other, for example from Chinese to Ayurvedic or to Persian or modern western style very easily due to their different styles and conditions of examination.

Regulations may generally be classified into conditions of the artery, conditions of the persons involved, and conditions of the environment of examination. TPM literature describe many conditions for the best type of artery to be examined, all of which are met by the radial artery. The conditions of the examiner and the examinee are also discussed in detail. The environment must also have suitable temperature and calmness for good relaxation and concentration of both. According to TPM, placement of fingers in terms of number, direction, position, angle of placement, and level of pressure in which the pulse is examined are all important because they may alter the interaction of the pulse with the examiner's fingers and thus change his or her perception. For example, TPM, opposed to Chinese, Ayurvedic and Western style of pulse diagnosis, requires placing "four" fingers proximal to the styloid process, with the small finger toward the distal end of the limb. (Figure 2)

Retentive Causes of Pulse

As philosophers, TPM scholars like Avicenna have discussed four essential causes for pulse formation. The agent cause "*sabab-e fa'eli*"

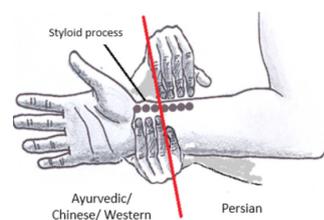


Figure 2. Comparison between location, direction and number of fingers used for pulse diagnosis in different schools of traditional medicine.

سبب فاعلی being the heart or it's vital force, the material cause "*sabab-e maddi*" *سبب مادی* being the blood, the vessels and the extravascular tissue, the formal cause "*sabab-e soori*" *سبب صوری*, being movement, and the final cause "*sabab-e ghayi*" *سبب غایی*, which is the ventilation of tissues and their innate hot [substance], "*Haar-e gharizi*" [2] *حارغریزی*. This all means that the heart or the vital force moves the blood, vessels and extravascular tissues to ventilate the Haar and body tissues. Since all pulse have movement in common, Avicenna summarized the four into three "retentive" causes "*asbab-e masekeh*" *اسباب ماسکه*, which form the foundations on which the pulse is built upon and maintained [3]. It could therefore be realized that every single pulse guides to at least three conditions and status; first, the conditions of the heart and its vital force, second, the conditions of the matter in the vascular wall and both inside and outside the vascular lumen, and third, the status of tissues and *Haar*'s demand for ventilation. The two latter are respectively related to wetness and warmness, which are the two main qualities forming the temperament. Hence, generally speaking, every pulse provides information on the energy and temperament status of the body [4].

Modifying causes of the Pulse

Many factors, may affect the pulse via altering the retentive causes. Sexuality, age, temper-

ament, body type and shape, seasons and climate are amongst the factors that apply to every person and correlate to a specific characteristic change in the pulse.

Other than satiety/hunger status and the quantity of consumed food and drinks, their quality in terms of temperament, may also alter certain features of the pulse.

Regarding sleep and wakefulness, various considerations may be taken into account. Features of the pulse fluctuate during stages of sleep, including the beginning and end phase. Likewise, situations such as moderate versus prolonged sleep, sleeping in a fasting or postprandial state, and spontaneous waking as opposed to being waked up, whether calmly or abruptly can each yield a certain kind of pulse.

Obviously, movement and sedentariness affect the pulse. TPM literature have described specific pulse alterations depending on the timing and severity of exercise.

The influence of bathing on the pulse depends on factors like water temperature, and length of stay.

In addition to the mentioned factors, the pulse is affected by sexual intercourse, pregnancy, breast feeding, and emotions such as anger, pleasure, happiness, sadness, grief and fear.

Extreme conditions of the physiologic states described above, in addition to diseases, may exhaust or impose a burden on the vital power, thereby weakening the pulse or altering its characteristics suddenly or gradually. TPM manuscripts provide an in-depth discussion on pulse changes in specific and also general disease conditions including stagnations, infection, inflammation, pains and diseases. In relation to inflammation and swelling, specific pulse features have been determined depending on the type of the organ involved, the amount, stage, type and other characteristics of the inflammation.

The Ten Parameters of Pulse

TPM scholars analyzed and described each pulse by means of ten parameters. The parameters help better reporting and teaching of complex pulses and even help translation and correlation of each pulse from one school of medicine to the other. This is due to the fact that they are much more fundamental and thus comparable than the complex pulse names in each school. For example, a “*Xuan-Xi*” Chinese pulse is narrow in diameter and hard in consistency which resembles the “*Thin*” رقيق TPM pulse which has the same quality as these two parameters. The ten parameters of TPM pulse diagnosis are as follows:

1. Pulse Expansion Dimensions مسافت انبساط رگ

The first parameter considers the extent of pulse expansion in the three dimensions of length, width, and height. Each dimension is examined separately and assessed as excess, moderate or deficient. Therefore, the pulse may be described as long “*Tavi*” طويل, moderate “*Mo'tadel*” معتدل در طول, or short “*Ghasir*” قصير in terms of length; wide “*Areez*” عريض, moderate, or narrow “*Zigh*” ضيق in terms of width; and high-set “*Shahegh*” شاهق, moderate, or low-set “*Monkhafez*” منخفض in terms of height. Each dimension is related to a diagnostic state; for instance, length is related to the strength of the heart, while width is associated with the wetness or flexibility status of the vessels, bearing the most correlation with the extent of body wetness.

A “compound pulse” نبض مرکب is a pulse described by more than one description or parameter. A huge “*Azim*” عظیم pulse, an example of a compound pulse in which all three dimensions are at their extreme, is a long, wide and high-set pulse. On the contrary, a tiny “*Saghir*” صغیر pulse, is short, narrow and low-set.

2. Pulse Strength قوت نبض

This parameter is probably the most important parameter studied in TPM, which provides an estimate of the vital force originating from the heart and is somehow the origin of all other forces of the body. It is based on the quality of the beating impact of the pulse against the examiner's finger. It is divided into strong "Ghavi" قوی, moderate, and weak "Za'eef" ضعیف based on the force it exerts on fingers. A strong pulse is a prerequisite of many of TPM treatments in order to prevent faint or weakness during procedures. [5,6]

3. Pulse Speed سرعت نبض

The parameter of speed, reflects time durations of contraction and expansion, and is categorized into fast "Sari" سریع, moderate, and slow "Batei" بطيء. It is compatible with today's concept of pulse wave velocity.

4. Pulse Frequency تواتر نبض

The frequency of pulse takes into account the relaxation (rest) phases between two pulse waves. This parameter, may be considered as an equivalent to pulse rate, and is described as frequent "Motevater" متواتر, moderate and infrequent pulse "Motefavet" متفاوت. Extremes of the frequent and infrequent pulse may lead to conditions known today as tachycardia and bradycardia.

5. Vessel Fullness امتلاء رگ

Depending on the degree of vascular fullness which is felt in between the pulses at the rest period, the pulse or better say the vessel, is named full "Momtali" ممتلی, or empty "Khali" خالی. The full pulse may also be categorized depending on what the examiner senses, a non-consistent gaseous fullness or a more consistent viscous humor filled fullness. This parameter is very much related to subclinical assessment of hemorheology.

6. Vessel Consistency قوام رگ

The consistency parameter describes the extent of vascular stiffness as rigid "Solb" صلب, moderate, or flexible "Lin" لین. Considering the many diverse etiologies of rigidity including vascular fullness, vasoconstriction, dryness and etc., one may realize that there is a diverse etiological aspect for primary hypertension, the most common known type of hypertension, albeit with unclarified etiology and no evident reason for the diverse response to a similar treatment. This is an example of where TPM may intervene to sort the patients with its own criteria and show the diversity of their temperaments and hence the diversity of treatments.

7. Overlying Skin and Tissue Quality کیفیت ملمس رگ

In TPM, not only the pulse wave and the vessel, but the surrounding tissues and overlying skin are examined in terms of their palpable qualities like warmness vs. coldness and wetness vs. dryness, and tissue consistency. Sufficient moisture and wetness are essential elements in maintaining optimal consistency and permeability of a tissue, which in turn facilitate physiologic flow of material in biological systems. Differences in this component may be a source of variability in food and drug distribution and bioavailability among various individuals. The deposition of undigested food or waste products in the interstitium may interfere in the above mentioned flow causing defects in body functions. This condition, named the "Bad-anbasht syndrome" نشانگان بدانباشت in the previous articles [7] may also be detected, categorized and correlated to clinical scenarios by examining the consistency and the amount of tissue above the pulse. The authors believe that a general estimate of other tissues and the whole interstitial space may be achieved by examining certain outside regions of the body especially bilateral regions over the wrist pulse. Although the pulse is a real time assessment of heart and body situation similar to

blood glucose level in the evaluation of diabetes, some parameters like the consistency of the overlying tissue show a past long-term situation of the pulse and perfusion which is comparable to the measurement of HbA1c.

8. Pulse Uniformity *استواء نبض*

The components of pulse can be examined in terms of uniformity or diversity. This is described as a spectrum ranging from absolute diversity to absolute uniformity. At least two pulse wave pictures sent to the examiner's brain are compared in each assessment to observe uniformity vs. diversity. These are the pictures of two successive pulses reaching a single sensor, here the finger tip of an examiner or perhaps the two pictures of one single pulse passing underneath two consecutive sensors, specifically two subsequent fingers placed on a vessel. An even more detailed comparison has been mentioned by dividing each finger into 3 sub-fingers and comparing the pulse felt underneath each part. The diverse pulse may also be categorized depending on the continuity or discontinuity of the change. Uniformity is assessed in terms of various above mentioned parameters including strength, length, speed, frequency, fullness, consistency and quality of the overlying tissues.

9. Regularity vs. Irregularity of Pulse Diversity

انتظام نبض

An irregular pulse, regardless of the parameter examined, is further divided into regularly irregular and irregularly irregular types. Although this may resemble the classification of arrhythmias in main-stream medicine, but one should note that arrhythmias are mostly assessed by the study of the successive electrical activity of the heart via the electrocardiogram but what is discussed by TPM is the more clinical peripheral hemodynamic aspect of the heart similar to plethysmography or pulse oximetry. The advantage of this view is that besides com-

parison of successive pulses under one finger, a bonus comparison may be made by assessment of two fingers/sub-fingers observing a single pulse passing beneath. The latter comparison provides the examiner with more information especially on hemorheology and hemodynamic status of the examinee. Thus it may be claimed that TPM pulse diagnosis method opens a window towards subclinical hemorheology and hemodynamics.

Some types of irregular pulses are named after certain characteristics they possess. These so-called compound pulses include the rat-tail pulse "*Zanab al-Fari*" ذنب الفاري, hammer pulse "*Motraghi*" مطرقی, spindle pulse "*Mesali*" مسلی, dichotic pulse "*Zu Ghor'atein*" ذوقرعتین, gazelle pulse "*Ghazali*" غزالی, waving pulse "*Moji*" موجی, saw-like pulse "*Menshari*" منشاری, ant-like pulse "*Namli*" نملی, worm-like pulse "*Doodi*" دودی, drop pulse "*Zul Fetreh*" ذوالفتره, ectopic pulse "*Vaghe'fi al-Vasat*" واقع فی الوسط, shivering pulse "*Morta'esh*" مرتعش, twisting pulse "*Moltavi*" ملتوی, vibrating pulse "*Motevater*" متوتر, constricting pulse "*Moteshanej*" متشنج, etc.

10. Pulse Weight or Music *وزن نبض*

This parameter includes the proportions between two corresponding components of two succeeding pulse waves or the proportion between two different components within a pulse wave, such as the expansion time ratio in two waves or expansion/contraction ratio in one single wave. These weight proportions, fixed in all human beings, comprise the music and harmony of the pulse. A pulse in terms of weight, is classified into two types of balanced and unbalanced. The latter is further divided into three subtypes of mild, moderate and severe unbalanced pulse. The more unbalanced is a pulse, the stronger is the cause and severity of disease and the more likely is the weakness of the heart.

Implications of Pulse in Temperament Diagnosis

Temperaments are key concepts in traditional schools of medicine. According to qualitative research and investigations in TPM literature, we have reached the conclusion that the formation of diverse temperaments is highly related to the amount of blood perfusion of the organs. In other words, when an organ is perfused well by the warm- and wet-tempered blood it gets its natural warm and wet temperament and when it is not receiving good blood, it will lack in its warmth and wetness or both. Obviously, cold and dry tempered organs like cartilage and bone receive much less blood regularly. This conclusion has brought up the writers of this article to the ***“Doctrine of Priority of Blood Production and Distribution over the Formation of Temperaments and Dystemperaments”***. Derived and assessed by the study of pulse in TPM, this doctrine may be used as a shortcut to forecast different temperaments and dystemperaments of different organs without too much questioning and examination and mostly by evaluation of the blood and its distributional status via the pulse. This doctrine may solve the paradoxical findings of non-homogenous dystemperaments in single individuals, and reduce misdiagnosis and treatment. The original evidence and applications of this hypothesis will be discussed in future articles.

Conflicts of Interest

Authors have no conflict of interests.

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