

ПАЛЬПАЦИЯ ПРИ СЕРДЕЧНО-СОСУДИСТЫХ ЗАБОЛЕВАНИЯХ

© Строев Юрий Иванович, Чурилов Леонид Павлович

Санкт-Петербургский государственный университет. 199034, Санкт-Петербург, Университетская наб., д. 7–9.

Контактная информация: Леонид Павлович Чурилов — заведующий кафедрой патологии медицинского факультета, зам. руководителя лаборатории мозаики аутоиммунитета, доцент, к.м.н. Санкт-Петербургского государственного университета, действительный член Международной академии наук (Здоровье и экология).

РЕЗЮМЕ. Данная публикация посвящена вопросам пропедевтики внутренних болезней, в первую очередь — на материале сердечно-сосудистой, эндокринной и бронхолёгочной патологии. Пропедевтика толкуется авторами широко как введение во внутреннюю медицину, поэтому лекции содержат и терапевтический, и клинично-патофизиологический материалы. Лекция сопоставляет достижения и традиции отечественной терапевтической школы с принципами преподавания внутренней медицины, сложившимися в практике зарубежного медицинского образования. В четвертой части рассматривается методология контактного обследования и интерпретации его данных применительно к пальпации при сердечно-сосудистой патологии (библиография — 10 ист.).

КЛЮЧЕВЫЕ СЛОВА: аритмия; дефицит пульса; сердечно-сосудистые заболевания; физикальное обследование; пальпация; верхушечный толчок; пульс; брадикардия; тахикардия; частота пульса.

PALPATION IN CARDIOVASCULAR DISEASES

© Yuri I. Stroeв, Leonid P. Churilov

Saint Petersburg State University. 199034, Saint Petersburg, bld. 7–9, Universitetskaya embk.

Contact information: Leonid P. Churilov — M. D., Ph. D., Full Member of the International Academy of Sciences (Health and Ecology), Assoc. Prof., Chairman of Pathology Dept., Faculty of Medicine, Deputy-Head of the Laboratory of Mosaic of Autoimmunity, Saint-Petersburg State University, Phone: +7 812 326 0 326*5215. E-mail: elpach@mail.ru

ABSTRACT. This publication continues a series of authorial lectures devoted to questions of Propaedeutics of Internal Diseases, primarily based on the material of cardiovascular, endocrine and bronchopulmonary diseases. Propaedeutics is widely interpreted by authors as an Introduction to Internal Medicine; therefore, these lectures also contain clinical pathophysiologic material. The lectures compare the achievements and traditions of Russian classical therapeutic school with the principles of Internal Medicine that have evolved in the practice of foreign medical education. The forth lecture is dedicated to methodology of physical touching examination and its data interpretation related to palpation in cardiovascular pathology (bibliography — 10 references).

KEYWORDS: arrhythmia; cardiovascular diseases; physical examination; palpation; apex beat; pulse checking; bradycardia; tachycardia; pulse rate; pulse deficit.

Having visual examination completed, medical doctor starts with touching physical investigation, which includes palpation and percussion. The former is a subject of this lecture. Palpation is the process of using one's hands to check the body, especially while perceiving/diagnosing an illness. In Cardiology both structure and function of heart either blood vessels is evaluated by manual palpation [5].

METHODOLOGY OF APEX BEAT PALPATION

Palpation allows estimating more exactly the pathological changes of apex beat (AB), pulse and several special symptoms of cardiovascular disorders.

While palpating, doctor should stay from right side of a patient, who is lying in bed, but if a patient feels well, it is possible to palpate him/her standing.

Palpation of AB must reveal its area, strength, height and resistance. Put your right palm between the 3rd and 4th ribs of the patient, with the fingers directed to axillary area and wrist directed towards patient's sternum bone. After this feel the point of pushing with your nail phalanges. If AB is hardly recognizable, ask the patient to lean while standing or sitting, establishing more intimate adjoining of the heart to the thorax. Normally, AB is palpable in 5th space, 1–1, 5 cm to the medium from left medioclavicular line. Left ventricular hypertrophy or heart dilatation displaces AB noticeably to the left, sometimes, to axillary line [1].

Arterial hypertension, especially essential one, displaces it to the left and down. AB may also be left shifted as a result of right ventricle enlargement in mitral and tricuspid heart diseases and cor pulmonale. In ascites, obesity, flatulence, pregnancy — AB as a rule is displaced up and to the left due to high phrenic position [3, 6].

In inanition and especially in cachexia, while visceral ptosis develops, AB is displaced down and to the right.

Commonly AB area has a diameter of 1–2 cm [7]. If it oversteps 2 cm it is called “flood AB”, if it is less than 1 cm in diameter — it is called “delineated (concentrated) AB”.

AB is expanded in pneumofibrosis, in left ventricular enlargement, in cachexia, in various kinds of myocardial pathology, and in heart valve diseases. Also it can look expanded in case if patient has broad intercostal spaces. In emphysema, obesity, and low phrenic position AB area is decreased.

AB may be high or low, which characteristic depends upon its strength and chest excursion [3].

In some conditions, related to sympathicotonia, AB is characterized as high or excited (physical exercise, worry, fever, thyrotoxicosis, arterial hypertension). AB is highest in patients with left ventricular hypertrophy (caused by arterial hypertension, aortic valvular heart disease, or hypertrophic cardiomyopathy) [5, 6].

The strength of AB is evaluated by palpation. It increases in left ventricular hypertrophy and decreases in pulmonary emphysema, obesity, chest edemas, and exsudative pericarditis.

Female patients with large mammal glands may display a weakened AB on palpation.

The compactness of cardiac muscle itself may be reflected in so-called resistance of AB, evaluated also by palpation. AB firmness is noticeably increased in any kind of left ventricular hypertrophy.

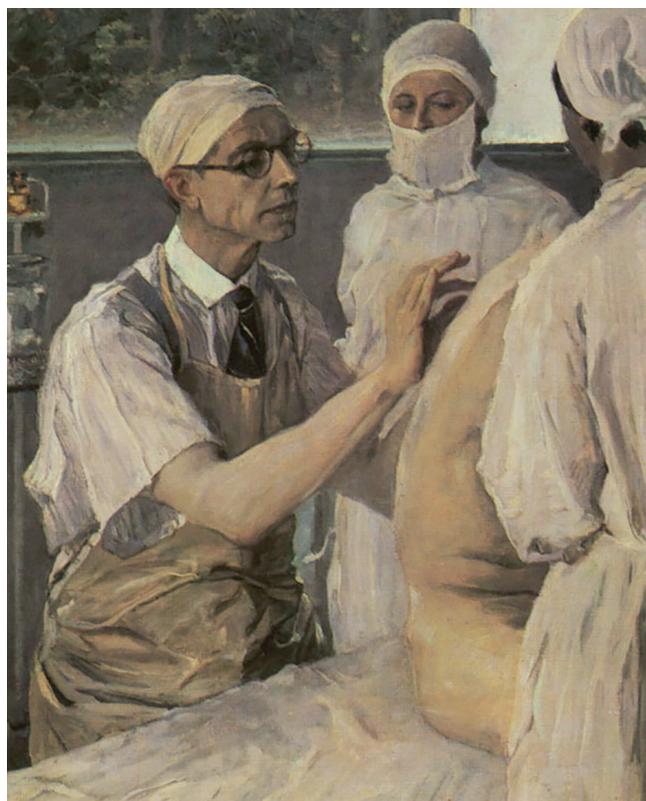
So, the AB in left ventricular hypertrophy is flood, high, resistant and strong. In extreme hypertrophy it is described as “dome-like” one.

METHODOLOGY OF PULSE CHECKING

Palpation gives the information concerning patient's pulse.

Pulse may be checked in any palpable artery, but due to convenience it is common to determine it on radial artery [1].

However, in some arterial diseases radial artery pulse is not palpable. There may be also some individual anomalies of radial artery position. Hence, bilateral simultaneous pulse palpation



Pic. 1. Mikhail V. Nesterov (1862–1942). A portrait of surgeon S.S. Yudin.1933. (Oil on canvas, 99 x 80 cm). Palpation of vertebral cord prior to epidural anesthesia

on both radial (brachial, carotid or low extremities') arteries is necessary. Otherwise, doctor may miss certain important disease, manifested in omission of pulse on the side of injure (or upstream the place of thromboembolism of the artery examined). The examples of such asymmetric pulse disorders are: Takayasu's¹ disease [2, 10], aortic coarctation, peripheral atherosclerosis, compression of the artery with tumor or enlarged lymph node, thoracic aortal aneurysm, pneumothorax, excess of fluid in pleural cavity, sugar diabetes with asymmetric involvement of the arterias of lower extremities in diabetic angiopathy — etc [3]. Sometimes pulse is weaken in left radial artery in patients with mitral stenosis due to megalatrium (extreme degree of left atrial enlargement), because the atrium compresses left subclavicular artery.

At the same time, due to nervus recurrens compression, aphonia may occur (which is known as Ortner symptom²).

Along with estimation of even or, vise versa, unsteady character of pulse, the following pulse characteristics should be described: Frequency, rhythm, pulse curve shape, hardness [1].

¹ Takayasu, Mikito — a Japanese ophthalmologist, born September 4, 1860 — died November 20, 1938, in Beppu, Japan. He described a particular type of arteriitis in 1908. (According [2, 10] — here and in all eponymic historical data below).

² Ortner von Rodenstätt, Norbert — an Austrian internist, born August 10, 1865, Linz, Austro-Hungarian Empire; died March 1, 1935, Salzburg, Austria. He described Ortner's symptom I in 1897.

To check pulse *frequency* it is important to account it during the whole interval of one minute. It is obligatory in unsteady pulse or arrhythmiae. Only in steady rhythmic pulse and absence of any suspicions for arrhythmia, it is possible to account pulse beats per 30 seconds and double the result [7].

Normal pulse frequency in adults in resting state is 70–76 beats per minute (bpm).

In children it is higher and depends closely on age: The younger the child — the higher the pulse rate.

The equation 4:1 between the pulse and respiration rates is known as normal pulse index. It is of big importance. In pneumonia it may be altered, specifically in paediatric cases. Physical strain, excitement, overeating, and hot weather — all increase pulse rate.

PULSE RATE CHANGES

Tachycardia is pulse rate accelerated upper than 90 bpm.

Pulse rate may be accelerated due to various pathologic reasons: Pain of different origin (stenocardia, infarction, pulmonary artery thromboembolism, rupture or exfoliation of aortic wall); severe distress (distress-associated pattern of cardiac dysfunction earlier was traditionally called "cardioneurosis"). It may occur also in palsy of vagal nerve or excitation of stimulatory sympathetic (Pavlov's)³ cardiac nerve; in paroxysmal tachycardia, in hyperthyroidism, in heart failure, under belladonna and sympathomimetic drugs overdose, and sometimes — in digitalis poisoning [1, 3, 4, 6, 8, 9].

Pathologic bradycardia with pulse rate less than 60 bpm may be caused by cardiac conductivity disorders (heart blocks). It may be observed in sinoatrial node weakness, sinoauricular block, atrio-ventricular block of different aetiology (related to myocarditis, cardiosclerosis, myocardial infarction with the involvement of septum and posterior wall, under digitalis overdose, in some autoimmune cardiopathies etc) [1, 3, 6, 8, 9].

Complete atrio-ventricular (transversal) heart block produces cerebral circulation disorder due to rare pulse and poor minute heart volume: Morgagni–Adams–Stokes' syndrome⁴ [2, 4, 6, 8].

Disorder of cerebral circulation or stroke, derived from arterial hypertension, may produce either bradycardia or tachycardia, as well as pulse rate always is altered in brain tumors, aneurysms or other sizable processes within the cranial cavity, provoking cerebrospinal liquor hypertension.

Pulse is called regular, or steady if the intervals between the pulse waves are stable, otherwise it is characterized as irregular (arrhythmic) one.

³ Pavlov, Ivan Petrovich — a Russian physiologist, born 26 September, 1849 in Ryazan', Russian Empire, died 27 February, 1936 in Leningrad, USSR. Pavlov's enhancing cardiac nerve was described by him in doctoral thesis of 1883.

⁴ Morgagni, Giovanni Batista — an Italian anatomist and pathologist, born February 25, 1682, Forlì, Papal States; died December 5, 1771, Padua, Venetian Republic; Adams, Robert — an Irish surgeon, born 1791, Dublin, British Empire; died January 13 or 16, 1875, Dublin, British Empire; Stokes, William — an Irish physician, born October 1, 1804, Dublin, British Empire; died January 10, 1878, Howth, near Dublin, British Empire.

In arrhythmia pulse should be checked simultaneously both on peripheral artery and over the heart (by means of heart auscultation). It may occur that the number of heartbeats calculated will be greater than amount of pulse beats. This phenomenon is known as *pulse deficit*, it may occur only and exclusively in absolute arrhythmia (ciliary arrhythmia, with its irregular pulse), other arrhythmiae are not accompanied with this phenomenon [2]. The deficit of pulse is absent in extrasystoles. Hence, it is regarded as the pathognomonic symptom of arrhythmia absoluta [1, 9].

Respiratory arrhythmia is accompanied by increased pulse rate on inspiration and decreased — on expiratory phase of breathing. Pulsus paradoxus, also paradoxical pulse or paradoxical pulse, is an abnormally large decrease in stroke volume, systolic blood pressure and pulse wave amplitude during inspiration (in exsudative or adhesive pericarditis) [1, 3].

PULSE CHARACTERISTICS

Hard (firm) pulse, or in Latin: Pulsus durus — is characteristic for arterial hypertension and arteriosclerosis. Soft one (in Latin: Pulsus mollus) is effortlessly compressible and typical for decreased vascular tonus (in collapse, shock, arterial hypotension) [1, 3].

Almost non-palpable pulse can be named in Latin: Pulsus filiformis — thread pulse; if the pulse waves have rapid elevation and quick fall, we speak about Pulsus celer (Corrigan's pulse⁵) [6], and high amplitude pulse is called in Latin: Pulsus altus [1, 7, 9].

This kind of pulse is typical for aortic insufficiency as well as thyrotoxicosis. On the contrary, slow pulse (in Latin: Pulsus tardus) with small filling (in Latin: Pulsus parvus), or small pulse — all are characteristic for aortic stenosis and advanced arteriosclerosis.

Gliding movement of fingers along the palpable vessel may reveal the peculiarities of vascular wall structure. Perceptive inductions of the whole artery may be in atherosclerosis, especially in Monckeberg's⁶ sclerosis with calcinosis. Nodular separated indurations are typical for nodous periarteritis [2]. In severe arterial hypertension pulse can hardly be compressed.

Capillary pulse is a rhythmic changes of nail bed color — pallor in diastole and redness in systole. This phenomenon is observable in aortic insufficiency (Quincke's⁷ symptom). The details of history and methodology of palpation can be found elsewhere [1–10].

The next phase of physical examination and topic of our next lecture is percussion.

⁵ Corrigan, Sir Dominic John — an Irish physician, born December 1, 1802, Dublin, British Empire; died February 1, 1880, Dublin, British Empire.

⁶ Mönckeberg, Johann Georg — a German pathologist, born August 5, 1877, Hamburg, German Empire; died March 22, 1925, Bonn, Germany.

⁷ Quincke, Heinrich Irenaeus — a German internist, born August 26, 1842, Frankfurt an der Oder, Kingdom of Prussia; died May 19, 1922, Frankfurt am Main, Germany.

ACKNOWLEDGEMENT

Authors are grateful to their American students for whom this project was primarily intended, especially to Dr. S.G. Huneycutt M.D., F.A.A.F.P., D.C. and to untimely deceased Dr. William G. Scoggins M.D., B.A., D.C. (1948–2010) for their valuable help in preparation of these lectures and to renown Norwegian medical bibliographer and historian Dr. Ole Daniel Enersen for his titanic efforts supporting the comprehensive “Who named it?” database [10]. No conflict of interest to declare. The authors equally contributed to the text.

ЛИТЕРАТУРА

1. Черноуцкий М. В. Диагностика внутренних болезней. Л.: Медгиз; 1953: 182–190.
2. Чурилов Л. П., Строев Ю. И., Колобов А. В., Колобова О. Л., Константинова А. М., Утехин В. И. Толковый словарь избранных медицинских терминов. Эпонимы и образные выражения. СПб.: ЭлБи-СПб.; 2010: 336.
3. Внутренние болезни по Тинсли Р. Харрисону. Изд. 14-е. Пер. с англ. Т. 4. М.; 2005: 1511–1518.
4. Хегглин Р. Дифференциальная диагностика внутренних болезней. Пер. с нем. М.: Триада-Х; 2015: 800.
5. Йонаш В. Клиническая кардиология (пер. с чешск.). Прага: Государственное издательство медицинской литературы; 1966: 821.
6. Мадьяр И. Дифференциальная диагностика внутренних органов. Пер. с венг. Т. I–II. Будапешт: Изд-во Академии наук Венгрии; 1987: 1155.
7. Милькаманович В. К. Методическое обследование, симптомы и симптомокомплексы в клинике внутренних болезней: Руководство для студентов и врачей. Минск: Полифакт-Альфа; 1994: 672.
8. Отто В., Хамбш К., Тройтлер Г. Медицинская поликлиническая диагностика. Пер. с нем. М.: Медицина; 1979: 479.
9. Василенко В.Х., Гребенев А.Л., Голочевская В.С., Плетнева Н.Г., Шептулин А.А. Пропедевтика внутренних болезней: Учебник. 5-е издание, переработанное и дополненное. М.: Медицина; 2001: 592.
10. URL: <https://www.whonamedit.com> (accessed 27 July 2018)/ Интернет-ресурс, <https://www.whonamedit.com> (дата доступа: 27 июля 2018 г.).

REFERENCES

1. Chernorutsky M.V. Dianostika vnutrennih boleznej [Diagnosis in Internal Medicine]. Leningrad: Medgiz Publishers, 1953: 182–190. (in Russian).
2. Churilov L. P., Stroev Y. I., Kolobov A. V., Kolobova O. L., Konstantinova A. M., Utekhin V. J. Explanatory Dictionary of Selected medical Terms: Eponyms and Figurative Expressions [Tolkoviy slovar' izbrannykh meditsinskih terminov. Epomimy i obraznye vyrazheniya]. Saint Petersburg: ELBI-SPb; 2010: 336. (in Russian).
3. Harrison's Principles of Internal Medicine. 14th edinion (translated from English). M: Praktika–McGraw–Hill Publishers (jointly). 2005; 4: 1511–1518. (in Russian).
4. Hegglin R. Differencial'naja diagnostika vnutrennih boleznej. Per. s nem. [Differential Diagnosis in Internal Medicine (translated from German)]. M: Triada-H Publishers; 2015: 800. (in Russian).
5. Jonáš V. Klinická kardiologie (translated from Czech). Praha: Zdravotnické nakladatelství publisher; 1950: 748. (in Russian).
6. Magyar I. Differencial'naja diagnostika vnutrennih organov. Per. s veng. Tom I–II. [Differential Diagnostics of Internal Organs (translated from Hungarian)]. Budapest: Academiai Kiado Publishers. 1987; I-II: 1155. (in Russian).
7. Mil'kamanovich V.K. Metodicheskoe obsledovanie, simptomy i simptomokompleksy v klinikei vnutrennih boleznej: Rukovodstvo dlja studentov i vrachej [Methodical Examination, symptoms and symptom complexes in clinics of internal diseases. Guide for students and physicians]. Minsk: Polifakt-Al'fa; 1994: 672. (in Russian).
8. Otto W., Hamsch K., Treutler H. Medicinskaja poliklinicheskaja diagnostika. Per. s nem. [Outpatient medical diagnostics (translated from German)]. M.: Meditsina Publishers; 1979: 479. (in Russian).
9. Vasilenko V.H., Grebenev A.L., Golochevskaja V.S., Pletneva N.G., Sheptulin A.A. Propedevtika vnutrennih boleznej: Uchebnik. 5-e izdanie, pererabotannoe i dopolnennoe [Propedeutics of Internal Diseases. 5th Ed., amended]. M.: Meditsina Publishers; 2001: 592. (in Russian).
10. URL: <https://www.whonamedit.com> (accessed 27 July 2018)/ Интернет-ресурс, <https://www.whonamedit.com> (дата доступа: 27 июля 2018 г.).