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► **To cite this version:**

Dina Bacalexi, Mehrnaz Katouzian-Safadi. Touching the patient: Galen's treatise On the pulse for beginners and its reception in the Medieval Latin, the Islamic Oriental and the Renaissance world. Scientiae 2019, Jun 2019, Belfast, United Kingdom. halshs-02356368

**HAL Id: halshs-02356368**

**<https://shs.hal.science/halshs-02356368>**

Submitted on 8 Nov 2019

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Touching the patient: Galen's treatise *On the pulse for beginners* and its reception in the Medieval Latin, the Islamic Oriental and the Renaissance world

The pulse is the sign *par excellence*, which brings to light what is happening inside the body. Galen's *On the pulse for beginners* (ca. 162-166 BC) is not a mere introductory treatise, but condenses nearly the whole Galenic pulse science. Thanks to its pedagogical character, it is a part of the Alexandrian medical curriculum (the 6<sup>th</sup>-cent. *Canon*), as well as of the Arabic *Summaria* (6<sup>th</sup>-7<sup>th</sup> cent.). This short treatise's reception from Late Antiquity until Renaissance shows its importance for medical education and practice.

Taking the pulse is touching the patient. Pulse terminology in our three working languages, Greek, Latin, and Arabic describes (or suggests) haptic sensations.

Terminological discussion is linked to the physician's role. Galen insists on the need for training, but discards methods based *exclusively* on experience, promoting a profound knowledge of each variant's name *and* the capacity to recognize it in practice.

The non verbal communication between two bodies has its advantages and limits: is it taken for granted or put into question in the reception of this particular treatise and of Galen's pulse theory in general? Unlike Herophilus' (ca. 330-250 B.C.) portable water-clock or clepsydra invented to take the pulse, in Galen the only "instrument" used is the physician's hand. Yet, given the wide range of Galenic variants, the tricky point is the actual capacity of a physician, particularly a beginner, to clearly distinguish all of them.

### 1. Chronology of a reception

Let us provide a chronological overview of the treatises taken into account in this study.

| date                       | Treatise  | Author   | Language                    |
|----------------------------|---|--|-----------------------------|
| 2 <sup>nd</sup> cent. A.D. | <i>Περὶ σφυγμῶν τοῖς εἰσαγομένοις</i> ( <i>The pulse for beginners</i> ) + the 6 other treatises on the pulse | <b>Galen</b>   | Greek                       |
| 6 <sup>th</sup> cent.      | <i>De pulsibus ad tirones</i> "ex uoce Agnello"   | <b>Agnellus</b> of Ravenna iatrosophist (the "master"); Simplicius (physician, the disciple who put it into writing) | Latin (lemmatic commentary) |
| 9 <sup>th</sup> cent.      | <i>Περὶ σφυγμῶν</i> ( <i>On the pulse</i> ), draws heavily on Galen's treatise for beginners                  | <b>Theophilus</b> Protospatharius  | Greek                       |
| 9 <sup>th</sup> cent.      | <i>Shukuk 'ala Ġalīnūs</i> ( <i>Doubts on Galen</i> )   | Abū Bakr al- <b>Rāzī</b> ( <b>Razes</b> )  | Arabic                      |
| 9 <sup>th</sup> cent.      | <i>al-Manṣūrī fī al-ṭibb</i> (abbreviated <i>Manṣūrī</i> , Mansuri hereafter)                                 | Abū Bakr al- <b>Rāzī</b>   | Arabic                      |
| 12 <sup>th</sup> cent.     | <i>Liber ad Almansorem</i>  | Abū Bakr al- <b>Rāzī</b>   | Latin                       |

|               |   |   |                                    |
|---------------|---|---|------------------------------------|
|               |   | (Gerard of Cremona)   | (translation of <i>Manṣūrī</i> )   |
| 1529          | Γαληνοῦ περὶ σφυγμῶν εἰσαγομένοις/ <i>Galenī liber de pulsibus introductorius</i> (+ some other Galenic treatises including <i>On the urine</i> ) | Johann <b>Winter</b> (Johannes <b>Guinterius</b> Andernacus)          | Greek (edition)                    |
| 1531          | <i>Claudii Galeni Pergameni commentariolus de pulsibus ad medicinae candidatos</i>  | Johann <b>Winter</b> (Johannes <b>Guinterius</b> Andernacus)          | Latin (translation)                |
| 1532          | <i>Galenī opera de pulsibus</i> , (includes the treatise for beginners)   | Hermann <b>Cruser</b> (Hermannus <b>Cruserius</b> )                   | Latin (translation)                |
| 1544 and 1549 | <i>Claudii Galeni Pergameni introductio in pulsus ad teuthram</i> (followed by <i>De pulsuum usu</i> translated by Thomas Linacer)                | Martin <b>Grégoire</b> (Martinus <b>Gregorius</b> )                   | Latin (translation)                |
| 1575          | <i>In Galeni libellum de pulsibus ad tyrones commentarius</i> (followed by “3 urine treatises drawing on Hippocrates and Galen”)                  | Leone <b>Rogano</b> (Leo <b>Roganus</b> )                             | Latin (translation and commentary) |
| 1645          | <i>De pulsibus libellus</i> (draws upon Galen)  | Francisco <b>Valles de Covarrubias</b> (Franciscus <b>Vallesius</b> ) | Latin                              |

## 2. Words for pulse and its variants

The current modern pulse terminology focuses on beat counting, not on naming variants. Counting matches the quest for an “undisputed truth”, based on positive evidence: for example 60 to 100 beats per minute (bpm) for a healthy adult. Our reading of ancient, Medieval and Renaissance texts shifts the focus to a more complex world, where particular names are given to a wide range of pulse variants the physician is supposed to feel and interpret.

Terminology includes translation, in particular into Latin. In the Renaissance Latin editions, not all the Greek Galenic terms were translated: some of them were printed in Greek or simply transliterated. In the dedicatory epistle to François 1<sup>er</sup> (1532 edition), Cruserius regards the lack of adequate Latin terminology for pulse as a lack of interest, because physicians’ preference goes to an apparently easier diagnostic criterion, namely urine. His aim to “rehabilitate” pulse includes enrichment of the Latin language.

Let us start from the very word “pulse”. Roganus thinks that before reading his commentaries on Galen’s *Pulse for beginners*, one must be able to answer the question

“what is pulse?” He refers to Galen’s definition, which is not in the aforementioned treatise (*De diff pulsuum* book 4, ch. 3 K. 8, 725): “a movement of the heart and the arteries that can be perceived by the senses” (αἰσθητή), and to what Galen (*De diff pulsuum* book 1, K. 8 497) says about Hippocrates, “the first physician known to us that put into writing the word pulse and was aware of the pulse science, although he neither studied it in detail, nor gave the name ‘pulse’ to every movement of the artery”.

A TLG search for the term “pulse” (σφυγμός) in the Hippocratic corpus yields 38 results, including the adjective “pulse-like” (σφυγμώδης). Pulsing is considered a pathological phenomenon, mostly associated with fever or inflammation<sup>1</sup>. There are some references to the temples that pulse (*Epidemiae* 5, c. 1, 60; 7, c. 1, 3, 5, 23, 32) but not to methods of taking or measuring the pulse. In the Hippocratic corpus, the pulse is not a fundamental characteristic of life, as it is in Galen.

The Arabic term for pulse is *nabd*: to produce a moan on a string; the verb *nabaḍa* means to hit; the etymology of this term suggests sound and movement. Theophilus, following Galen (K. 8, 486), presents the artery as a “string” (χορδή).

The Galenic pulse terminology for beginners starts with a reminder: “when you touch the artery, you notice that it is extended in every dimension. Every physical body has three dimensions, length, width and breadth”. Given that the normal state is the “well-proportioned” (σύμμετρος), Galen enumerates the variants due to deficiency or excess of one or more dimensions. He provides a table containing 27 variants in his *De differentiis pulsuum* (K. 8, 532-533). Theophilus and Roganus reproduce this table, as well as other tables of pulse variants according to motion, to a series of impacts, to the interval between two impacts etc. Roganus provides an extensive table of the variants due to “a singular irregularity” (*singularis inaequalitas*), explains that “one page is too small to contain all of them”, and prompts his reader to deduce the missing differences whose names are not included in the table.

The Galenic vocabulary includes common Greek terms (dimensions, size, speed etc.), but also, and most importantly, metaphorical ones. While some Western 18<sup>th</sup>-cent. scholars rejected “poetic” vocabulary considering that such terms do not fit “rational” science,<sup>2</sup> the Medieval and Renaissance commentators never express any doubts about their accuracy. We will focus on this metaphorical use of language.

Pulse resembling to an animal:

- Anting (μυρμηκίζων *formicans*): “extremely faint, frequent and small” (Galen). Agnellus: this pulse is named after the subtle and rapid movement of the ant.
- gazelling (δορκαδίζων *capricans*): “unevenness within each part consists in a distinct interruption, as for the gazelling pulse” (Galen). Theophilus describes in detail the bound of the gazelle.
- Worming (σκωληκίζων *vermicularis/vermicans*), considered a variant of the “wavelike” pulse: “like a worm crawling through the artery, surging in the manner of a wave, so that the entire artery does not undergo diastole at the same time” (Galen). Agnellus: it resembles the worm’s progression combining a bump and then an extension

<sup>1</sup> Shigehisa Kuriyama, *The expressiveness of the body and the divergence between Greek and Chinese medicine*, NY 1999, 28: “the Hippocratic body has no *natural* beat”. We underline the word *natural*.

<sup>2</sup> Kuriyama 1999 69-70 and 75-81.

- Curtailed (μύουρος *myurus* or *myouros*), a falling-away pulse. Agnellus: this pulse resembles a mouse's tail.

Natural phenomena:

- wave-like (κυματώδης *undosus/fluctuosus*). Roganus : this pulse imitates the movement of the wave or the flexible rod (green branch)
- tremor-like (κλονώδης *tremulus/turbulentus*) according to Theophilus, this pulse resembles the movement of the branches of a tree (κλῶνος in Greek).

Peculiarity:

- double-beating (δίκροτος *dicrotus*). Roganus stresses a parallel with the movement of a branch one pulls down and then releases: the intensity of its movement progressively diminishes, until it returns to its previous place. Theophilus alludes to the pulse's "itinerant movement", successively hitting the index, the middle, the ring finger and finally the little one.

Razes, in the *Doubts*, mentions his discussion with a "prominent physician from Bagdad" who said that if one keeps deep inside himself the image of something, he may think that he indeed had felt what he actually imagines.

The image one keeps in mind after he has really seen a gazelle, a worm, an ant, a mouse, a wave, or a green branch may be transformed into haptic sensation created by "imagination". Yet this question can also entail another one, concerning the relationship between haptic and visual perception mentioned by Roganus: "pulse can be perceived by senses, not only touch, but also view".

Galen's terms for pulse variants are too many to be memorized: terminology entails questions about the most efficient method to decipher the body language.

### 3. Methods of touching, places to touch

The majority of the commentators and translators pay particular attention to the best place to touch, the number of fingers and their position, even the part of the finger receiving the haptic sensation. We would like to point out that these detailed instructions and explanations are not included in the treatise *For beginners*.

Although he does not give technical instructions, Cruserius, in the dedicatory epistle of his 1532 Latin edition, deplores that the majority of physicians lack practice in taking the pulse: they consider touching the patient's wrist a mere routine (*consuetudo*).

Roganus thinks that knowledge about ways of touching (*tangendi modus*) is indeed possible to be transmitted *via* a book, this is the reason why, like Vallesius, he devotes a chapter of his book to this topic, and thinks that the way of placing the physician's hand on the artery depends on the form of the patient's arm. In the *Ad tirones*, Galen, without mentioning the number of fingers and how to place them, highly recommends the wrist as the place where the pulsing arteries are "the easier to find, the better-formed and the more useful in practice". Agnellus emphasizes the advantage of placing *four* fingers on the *wrist* rather than on the temples, because of female reluctance to uncover and let one touch the temples. Theophilus criticizes those "ignorant people" who put patients into painful and unbearable situations, for example trying to touch their side.

Roganus refers to *De dignoscendis pulsibus* (K. 8, 889) because he wants to highlight that the "optimal constitution of the body" is the measurement standard for the pulse variants. Galen, in the aforementioned treatise, thinks that "the trustworthy criterion is

not the number of fingers, but the optimal constitution of the body. If one does not know this constitution, pulse diagnosis based on fingers is not accurate”.

On the contrary, according to Agnellus and Theophilus, the number of fingers, four, is indeed a trustworthy criterion, because each dimension of the artery produces a different sensation on each finger or part of finger. Roganus thinks that sensation on fingers vary according to the pulse’s strength: only 2 fingers feel the weak pulse, while 4 fingers feel the “large” one. According to Vallesius, one finger may feel the beginning of the diastole before the others; the systole may seem longer to one finger than to the others. The unevenness of the pulse depends on how different fingers feel the speed, the size (*magnitudo*), the frequency, the vehemence or hardness. When a finger does not feel the movement, Roganus says, this means that it is imperceptible, though real.

How to regulate touching?

Roganus’ recommendation: neither compress, nor touch smoothly. The former impedes the movement of the feeble pulse, the latter that of the vehement pulse. In order not to “darken” the pulse movement, one must assess the situation and take the best decision.

Vallesius’ caveat: in case of “light” movement, one must not press heavily thinking that increase in pressure will improve perception, because this will hinder the movement. “Press until you feel something”, then release.

Razes teaches the daily practice of medicine in his *Mansuri*. This treatise circulated widely in Europe in its entirety or in chapters or even in leaflets written in vernacular. Andreas Vesalius issued a commented edition of it. *Manṣūrī* was a fundamental book for the organization of medieval medicine in the Arabic/Islamic world and in Europe.

The pulse is included in two anatomical and one diagnostic chapter:

1-1) Arteries *fī al-Šarāyīn* (Ar P 56- 57) are in different places of the body surface, where the pulse may be present: the palm of the hand (Mansuri, P 56, L 21), behind the ears, the temples (Mansuri P 57, L 8-9), the groin, between the index and middle finger, in the back of the feet (near the tendon or sinew) (Mansuri P 57, L 19,20). But the physicians “are in search of” the pulse on the wrist. It is interesting that Razes says “in search of”, and not observe, feel or touch, as if the pulse were associated with the verb “to search” (*nabḍ/tağasusuhu*), implying that it may not be so easy to find.

1-2) Heart *fī al-qalb* (P 64-65): the pulse appears on the left because the top of the heart is oriented to the left and an artery has its source there.

1-3) Pulse *fī al-nabḍ* (P 513- 520): it is necessary to examine the pulse when the person is healthy, and remember it. Razes gave a concise list of nine usual pulse variants, according to the haptic sensation under the physician’s finger. Then he described the regularity of the sensation and gave another classification. If this sensation is combined with a heat sensation, there are eleven other classifications.

#### 4. Sense perception, sensitivity and reality

In the *Mansuri*, Razes recognizes the difficulty to feel and learn a particular pulse sensation, which goes from “the outside towards the inside” part of the body. In the penultimate chapter of his *Doubts*, dealing with Galen’s pulse science, he tackles the question of sense and sensitivity. This book is intended for high-level physicians, philosophers and thinkers. Razes expresses his deep gratitude and respect towards Galen and science in general; this entitles him to criticize his respectable master.

Razes feels “very confused” after his reading of Galen’s pulse description: this description is only based on Galen’s personal feeling, so his division and definition are necessarily abstract. Even though he believes in the accuracy of touch as a means for diagnosis, he doubts the actual possibility of feeling such a great variety described by Galen. Razes uses the term “exaggeration” to describe Galen’s account on pulse variants. Yet he does not discard Galen’s art: he only criticizes his certitude. Is it possible to transmit skills and sensations, such as touch subtlety, through a book?

Razes tackles the question of “imagination” as a part of a process (he mentions the terms *tassawur* and *tahayyul, tawahhum*). The beginning of this process is an in-depth study on the desire for specific sensation (through touch). Then the person reaches a stage of imagination. This process may end up in illusion and hallucination. Razes himself, and another physician, experienced this in different situations, where imagination was indeed transformed into concrete haptic sensation. Razes mentioned a “good physician” unable to have such a touch subtlety. Therefore, the training and learning Galen suggested is not accessible to physicians because it requires an art that nobody can learn, “unless he is not a human being, but a god”.

Neither Agnellus or Theophilus, nor the humanists, pose such questions. Their purpose is to explain Galen’s assertion that it *is, indeed, possible*, if one uses the appropriate method and follows the appropriate rules, to transpose haptic to rational perception and medical diagnosis, challenging though this task may be.

Agnellus undelines the role of the most learned (*doctissimus*) physician in distinguishing the pulse. Theophilus, being fairly confident about touch accuracy, values experience and training: “reason yields no supplementary evidence”. But when he alludes to the physician’s capacity for deduction, insightfulness and erudition, he implicitly recognizes that pulse science is not a mere matter of sense and sensitivity.

Roganus says that trusting touch completely can fail pulse diagnosis: one must combine training (*exercitatio*) of touch, method of placing the hand (*forma applicandae manus*), and intellectual activity (*meditatio*), which will compensate for the deficiency of the two others. He insists on the key role of training, in order to acquire a good knowledge, especially of the morbid signs, through pulse. To what extent is knowledge considered “good”?

In fact, Galen (K. 8, 478) urges beginners to train “both their intellectual faculties and sense of touching”, in order to recognize pulse “in practice, not only in theory”. Furthermore, Galen points out that “the starting point of this practical training is learning through speech”<sup>3</sup>.

Beginners must train themselves to “feel” the systole rather than the diastole, because the former may be imperceptible. This recommendation is put forward in Guinterius’ (1531) Latin translation. Despite Roganus’ assertion that “nowadays nobody refutes the fact that it is indeed possible to touch the systole”, Vallesius admits that even the most trained touch can be deceived by the similitude between the beginning of the diastole and the end of the systole. Guinterius’ Latin translation of the Galenic pulse of the “bulimic” (Roganus translates *canina fames*, K. 8 488-489) thanks to the image of “sand

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<sup>3</sup> P. N. Singer (*Galen: Selected works*, translated with and introd. and commentaries, Oxford 1997) translates “the learning of the intellectual precepts”. Yet the Latin translation in K. (*sermone expressa doctrina*) is more precise, because it mentions speech (i.e. teaching) as the means of learning.

gliding (/flowing)” towards the ground is supposed to help beginners to figure out the systole.

Why must beginners first learn the most challenging aspect of the pulse diagnosis? Galen, recognizing this difficulty, prompts physicians to pursue training, even though it can be difficult and time-consuming. He appears as a role model in *De dignoscendis pulsibus* (K. 8, 770-771): his perseverance was finally rewarded because he was “able to touch the systole” and this was “like light suddenly emerging from the darkness”. Galen explains that medical education is lifelong.

Yet such statements do not help answering the question “are we able to feel what we touch?”, or “how trained/sensitive can our touch be?”.

Expressing doubts about the actual capacity to touch a wide range of variants does not call into question the utility of a diagnosis based on the pulse. Galen teaches beginners that “there is hardly any cause that does not include pulse change” (K. 8 462). He refers not only to pathology, but also to everyday life, seasons and age. Razes does the same.

Roganus provides one of the rare case studies showing the importance of learning and experience: you must diagnose the pulse of your new patient, Socrates, suffering from fever or another disease. Socrates is a man, his temperature is hot, he lives in a hot region, and he is young. If you consider, in a *wider* framework, the pulse of men whose temperature is hot, who live in hot regions, and are young, then you can make an accurate diagnosis of the pulse of this *particular* patient.

The pulse is also a prognostic tool, providing information about the evolution of the patient’s state. It helps to assess the gravity of the situation. A pulse variant that corresponds to a disease whose other signs are well known is less alarming (even if it is lethal) than a variant that corresponds to nothing, Vallesius says.

### Conclusion

Pulse can be regarded as fascinating “medical imagery” of ancient times, a non-invasive technique of communication thanks to direct contact between two tiny surfaces of two bodies. This generated a vast medical knowledge: diagnosis and prognosis of many a disease, as well as assessment of the patient’s “environment” and way of life. This knowledge has different facets in different intellectual milieus, each of them providing a different reading of Galen: Razes is overly critical; the late antique, byzantine and humanistic tradition focuses on technical, doctrinal, or philological investigation.

The reliability of the haptic sensation is not a mere question of “traditional” versus “technological” medicine: doubts about what one can indeed diagnose placing fingers on the wrist arose long before the emergence of modern technology.

Our aim was neither to provide answers about sensors located at the fingertips or the skin, nor to put ancient, Medieval and humanistic texts to the test of neuroscience or cognitive approaches. We hope that we have fueled a debate that goes beyond the mere issue of “sense and sensitivity”, encompassing transmission of knowledge and necessity of a multi-focal approach to medicine as a *human* science.

Shigehisa Kuriyama, in his book *The expressiveness of the body*, studies the divergence between Greek and Chinese medicine. The Galenic pulse taking and its reception remind us that traditions may also converge, giving pulse a pivotal role in medical practice.

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