

Hippocrates, on the Infection of the Lower Respiratory Tract among the General Population in Ancient Greece

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Abstract

Hippocrates and his followers, confronted with the infection of the lower respiratory tract, having understood that pulmonary diseases had a high rate of prevalence and mortality among the general population of the ancient Greek communities. He had used the "four humours theory" to explain its origin. Our study, reviewed Corpus Hippocraticum, in order to synthesize various fragments of different works, to compose the hallmarks in bronchiolitis, pleurisy, peripneumonia, pneumonia with their lethal complication empyema and to present the fatal lung infection, the pulmonary phthisis (tuberculosis). Vivid descriptions of the symptomatology were given, alongside with the efforts for treatment. Hippocrates was the first to use comparative hearing of both lungs, and the physician who have established thoracocentesis for the empyema's drainage, combined with parenteric nutrition and endotracheal intubation.

Keywords: Ancient Greece; Hippocrates; Infection of the lower respiratory tract; Bronchiolitis; pleurisy; Peripneumonia; Pneumonia; Thoracocentesis; Pulmonary phthisis

Introduction

Community-acquired lower respiratory tract infection was in ancient Greek general population a common cause of acute illness in both children and adults with high prevalence and mortality rates. Since an empirical approach was nearly always necessary in its management, physicians of the era should have been experienced to cope up with pulmonary diseases. Corpus Hippocraticum, a huge medical encyclopaedia, a masterpiece at that time (5th-4th century BC), included all the information available, coupled with the experience of both the Medico-philosophic Schools of Kos and Knidos (or Cnidus) [1].

Hippocrates thoroughly described environment's influence on human organism, and understood that the sun could be beneficial towards most diseases, including those of the respiratory tract. The "cough of Perinthos" epidemic, an influenza-like outbreak during the 5th century BC was also recorded, while several cases complicated with pneumonia were discussed. Thus, the first effort to epitomize the knowledge of the era concerning respiration and lungs was made by him and his pupils [2,3].

Hippocrates (ca. 460-370 BC) (Figure 1) and his followers, used their insuperable method of thorough observation, to analyze in depth the infection of the lower respiratory system to categorize its various manifestations as bronchiolitis, pleurisy, peripneumonia and pneumonia. Using the medical knowledge of their era, they had systematized their symptomatology and the methods to treat them. Furthermore, a form of pulmonary phthisis as an independent nosological entity was also described (Figure 2) [1,4].

It was the 5th century BC, when inside the Corpus Hippocraticum the first organized attempt, for the physiology of the human organism to be explained based upon the physician's mind was attempted. A plethora of pre-existent philosophical doctrines-theories, like Empedocles' (490-430 BC) elemental theory (Greek: στοιχειακή, earth, water, air, fire), Leucippus' (5th century BC, ca. 430 BC) atomic theory (atom: the first, smaller particle of life), and humours' theory (humoralism: black bile, Greek: μέλαινα χολή, yellow bile, Greek: κίτρινη χολή, phlegm, Greek: φλέγμα, and blood, Greek: αίμα), were commingled, evolved, and perfected in such a way to define every part of human's physiology and internal pathology.

Inside Corpus Hippocraticum the concept for the macrocosmos (universe, natural elements) to be depicted into microcosmos (live organisms), matured. Thus the "newly" combined humoral theory was employed. Each one of the four body humours contributed to human health when all were in a harmonious relationship inside human organism [5-14]. Hippocrates used the four humours theory to describe the pathogenesis of the diseases of the respiratory tract, and both types of bile and the phlegm were to be blamed [1,4].

To complete our study, a thorough review of the texts of the Corpus Hippocraticum in their original ancient Greek language was performed (Editions Littré, Paris and Kaktos, Athens and Militos, Athens).

Those three editions were selected as the best material available worldwide on the Hippocratic work, combined with a search inside the "Pubmed" medical data base (Hippocrates, respiratory tract, lungs, infections, were used as terms for the search). We have gathered a plethora of various fragments to compose the Hippocratic views on the infection of the lower respiratory tract.

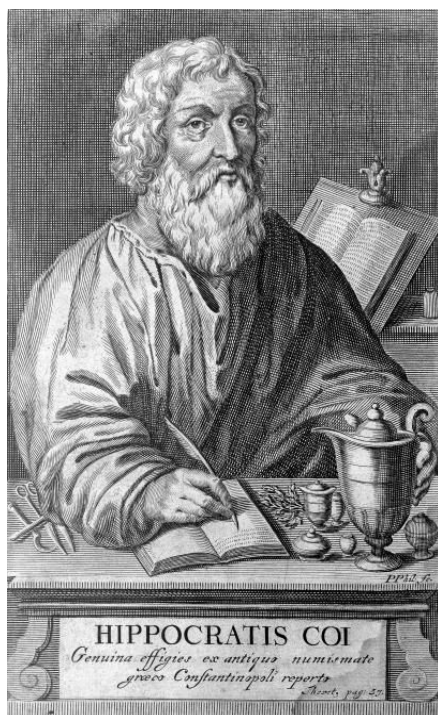


Figure 1: Portrait of Greek physician Hippocrates from an 18th century edition of Hippocratic aphorisms: Hippocratis Aphorismi, König, Strasbourg, 1756.

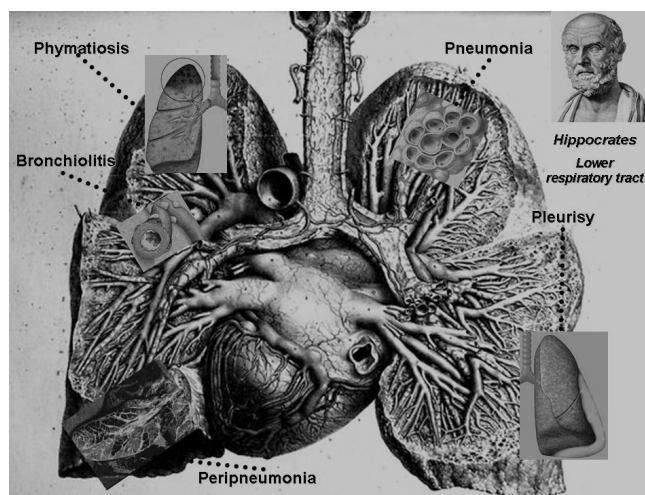


Figure 2: Pathology of the lower respiratory tract inside Corpus Hippocraticum. Lung anatomy, Anatomie de l'homme, Bourgery and Jacob, Guérin Editions, Paris 1862.

Hippocrates lived in an era, when microbes and viruses were unknown, yet infectious diseases were prominent throughout the Hippocratic works. The Hippocratic approach was based on the general view that a disease was nothing more than fluids (humours) dysregulation, and/or excess. That meant that most descriptions of the

clinical cases were vague, but on the other hand the general principles surprisingly are still in valid.

Categorizing the infection of the lower respiratory tract

Hippocrates described a type of angina that had as its main symptom the intense breathlessness combined with choking and presenting a rapid progression. The patient could die at the same day, or during the third day after its appearance, "the sore throat angina, when not exhibit any event neither to the neck, not to the throat, but cause severe choking and wheezing, cause death the same day or the third day" [15]. Most probably, the above mentioned report described bronchiolitis, where the prominent symptom was the intense respiratory distress presenting progressive deterioration since the first days [16]. Surprisingly, apart from the inhalations, or the per os treatment, Hippocrates proposed suppositories too. A mixture of thapsia garganica, barley flour, eggs, *sesamum orientale*, salt and honey was proposed as the proper remedy (Figure 3).



Figure 3: *Thapsia garganica* (right side), *Sesamum orientale* (left side). Otto Wilhelm Thome, Flora von Deutschland, 1885.

As an expectorant was used the famous ancient Greek mead (Greek: υδρομέλι) and as a palliative drug the oxymelos (Greek: οξύμελος), composed of five parts of honey, one part of vinegar, while a series of purgative baths were also recommended [17,18].

According to the Hippocratic opinion, pleurisy was the pathological condition during which "the lung leans towards the pleura" (Greek: πλευρά, English: pleura=ribs). At the hearing, a peculiar sound was produced, "a sound that resembles the tune made when sanding new skin pieces". Its clinical manifestation presented fever, pleural pain, orthopnoea, while a characteristic presentation of friction rub could have been also audible. The egested mucus had a dark colour [19]. Alcoholism was also to be blamed, as wine could cause the deposition oh huge quantities of bile and phlegm into the thoracic cavity, an excess that functioned as a local sticky melange to glue the lungs onto the ribs [20]. For the expectoration, Hippocrates, used seeds and fruits of cone pipe mixed with Attica honey. As for the pain, he had used cathartics and expectorants (in order to remove humours that were in excess), made by aromatic plants and herbage, such as Galbanum, *Artemisia abrotanum*, and piper (Figure 4) [19].



Figure 4: Galbanum (right side), *Artemisia abrotanum* (left side). Otto Wilhelm Thome, Flora von Deutschland, 1885.

Disease's duration was estimated in a time period of seven to ten days, while in the case of no recedence, an empyema could be formed to complicate further the outcome [21].

Peripneumonia according to Hippocrates was caused when "affluent pus runs from the head to the lung", or as a complication of pleurisy. Peripneumonia was apparent if "the fever was acute, with pains presenting on either side, or in both, and if cough was present, and the sputa expectorated had blond or vivid colour, or was likewise thin, frothy, and florid". Thus, its clinical manifestation presented high fever, frequent breathing, pain localized over the chest wall, referred to the shoulder, or to the clavicle, and delirium. Disease's duration varied from fourteen to eighteen days. The prognosis was bad, and empyema could have been appeared as a common complication. The suggested methods of treatment were the same with those of pleurisy [22].

Hippocrates named the most serious infection of the lungs pneumonia (Greek: πνευμονία), a condition caused when the lung draws to its side blood, or salted mucus, without egesting them. Consequently these liquids could have been condensed and coagulated, able to create edemas and empyemas. The nosological entity's seriousness was described, "when pneumonia is at its height, the case is beyond remedy if he is not purged, and it is bad if he has dyspnoea, and urine that is thin and acrid, and if sweats come out about the neck and head, for such sweats are bad, as proceeding from the suffocation with rales, and the violence of the disease is obtaining the upper hand". Its clinical manifestation was presented with intense and dry cough, shaking chills and high fever, chest and back pain, dyspnoea, and orthopnoea. The patient could remain in the same condition for approximately two weeks, and then the pus could be spited out and the expectoration of the humours could appear [23,24]. As far as the treatment was concerned, initially bathing with hot water was strongly indicated, combined with the drinking of hot herbal preparations, mainly cereals. In some cases, when the patient was too weak to eat, Hippocrates had used medicines, such as a blend of honey, milk and vinegar through an oral gastric tube (Greek fragment: η λαβόμενος της γλώσσης, εγχέειν ησυχή διά σύριγγος) [23].

In general, Hippocrates used for the non-invasive treatment of all the types of infection of the lower respiratory tract a plethora of a) expectorants herbs, such as oregano, Scilla Maritima, Cyclamen Persicum, Cuminum Cyminum, Raphanus Sativus, and Piper Nigrum,

b) herbs for inhalation and/or fumigation, and gargles such as oregano, celery, dill and Rhus Coriaria, c) laxative herbs, such as Helleborus officinalis, Mercurialis Annuua, Brassica Oleracea, Amaranthus blitum, Beta Vulgaris, Allium Sativum, Coriandrum Sativum, Mentha Pulegium, and Adiantum Capillus, and d) antipyretic herbs, such as celery, olive leaves, Rhamnus and Salvia Officinalis [1].

Hippocrates was the first physician to apply the hearing of both sides of the thorax, to compare the oscillation, if any, a comparative method suggested to all physicians (Greek fragment: Έπειτα ακροάζεσαι ποια από τις δύο πλευρές κλυδάξει περισσότερο) [21,25].

Operating empyemas

The most fatal complication of the general infection of the lower respiratory tract, presenting the worst prognosis, was the empyema. Hippocrates suggested bed rest and inhalations, combined with the gradual drainage via a metallic catheter through the ribs after a surgical incision, thoracotomy (Greek: θωρακοτομία), or thoracocentesis (Greek: θωρακοκέντηση), a method that is being used still nowadays (Greek fragment: Ταμνειν δε μεταξύ των πλευρών στηθοειδέι μαχαιρίδι το πρωτον δέρμα... έπειτα εγχέειν οίνον και έλαιον χλαιίνων αυλίσκω... εντιθέναι μοτόν κασιπτερίνον κοίλον» (Figure 5) [17,19].

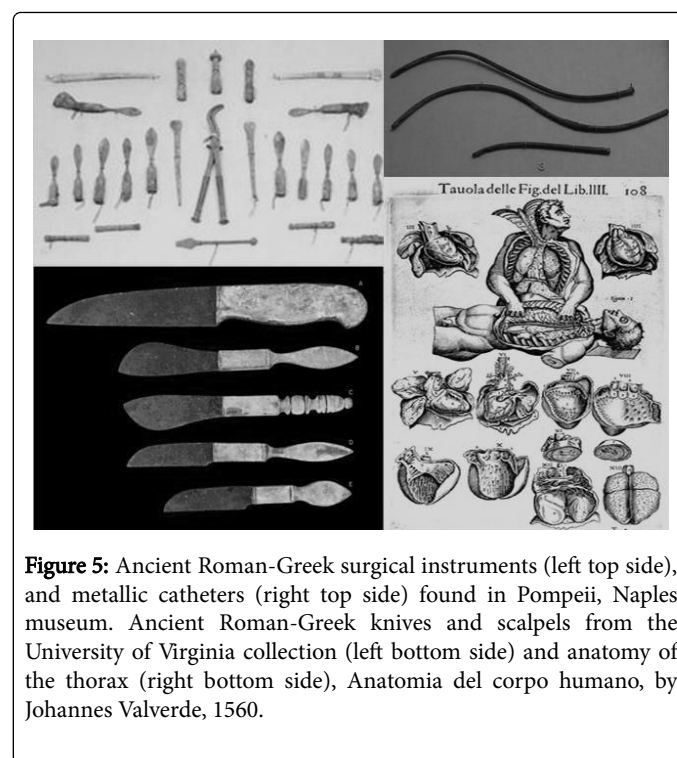


Figure 5: Ancient Roman-Greek surgical instruments (left top side), and metallic catheters (right top side) found in Pompeii, Naples museum. Ancient Roman-Greek knives and scalpels from the University of Virginia collection (left bottom side) and anatomy of the thorax (right bottom side), Anatomia del corpo humano, by Johannes Valverde, 1560.

For his surgical operation, Hippocrates had used the well-known Thessaly's endemic plant mandrake (Greek: μανδραγόρας) (Figure 6) as a general anaesthetic (it contains scopolamine), combined with morus alba (Greek: σπός μούρων) and hederia (Greek: σπός κισσού), known sedatives of the era [21,22,24,26]. The description of the surgical procedure astonishes, "a sharp surgical knife is to be inserted between the ribs, in a depth equal to a thumb nail's length, towards the empyema's area. With the help of the knife, a linen cloth is inserted, sewed locally (used as a spile, to both attract the pus and block the air).

The linen "door" is to be opened daily for the pus to be drained, for at least 10 days with the help of a catheter. When the empyema area

is clean, and the fluid is similar to water, antiseptics are to be infused (a mixture of olive oil and wine), and left there for 12 hours.

The symphysis of the surgical wound must be allowed to happen progressively, although cauterization is indicated in cases with transfected tissues" [19,27]. For the patient to undertake the surgical intervention needed in the cases of dyspnoea, Hippocratic medicine introduced the endotracheal intubation, by using a thin stannum (tin) tube through the larynx, "for the lung to attract pneuma" (Greek: πνεύμα, English: pneuma ≈ air = the vital force of the soul) [19,28].

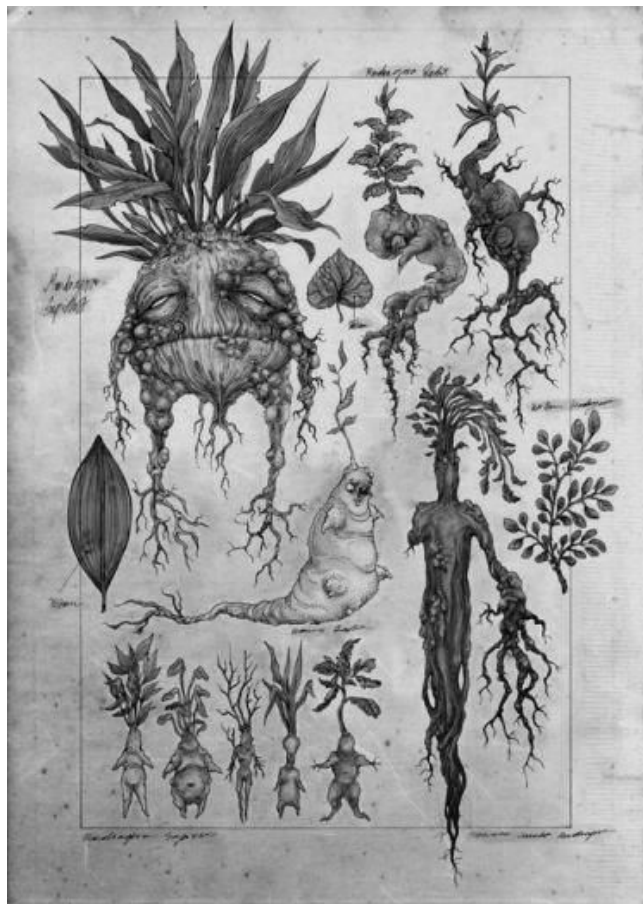


Figure 6: A botanical illustration inspired art about mandrakes, Codex Seraphinianus, 1981.

Pulmonary phymatosis (tuberculosis)

Inside Corpus Hippocraticum a lethal infection of the lungs was mentioned, named pulmonary phthisis (Greek: φθισις), the terminal illness known as phymatosis (Greek: φυματιωση, phyma=unnatural tumour, a cyst full of fluids) [1,29]. According to the Hippocratic views, there were three types of tuberculosis, a) The first derived from the phlegm. Thus, when the cranial cavity was overwhelmed of the rotten phlegm, the veins were consequently overfilled with it. Then a stream was forming towards the lungs. b) The second form was due to the strain of the human body, while c) the third form was caused due to spinal's cord repletiness with blood and bile, or when the hollow veins were filled with a dilute phlegm and bile [30].

Syptomatology was thoroughly described and is still in value "first, the fever persists, mild during the day, rising during the night, abundant sweats, strong need to cough, while the sputum is insignificant, eyes bury themselves in their niches, blushing cheeks, hand nails with a curve (Hippocratic fingers), burning fingers, especially on the edge.

Patients could be lost when the fever continues or when, the impression is given that it disappears, and reappears with the same intensity. The thirst continues, the appetite is lost (towards cachexia), there is diarrhoea, sputum is greenish, or tan, or full of mucus and foams, the coexistence of all these symptoms leads eventually to death" [31].

The condition could have been ameliorated during the summer and worsened during autumn. Pain all over the supportive skeletal system, haemoptysis (Greek: αιμόπτυση) of foamy blood due to a vessel rupture, and smelly saliva completed the vivid symptoms [15]. Commonly the patients died within a year having lived a horrible end stage life, or in some cases could survive for up to nine years. To palliate the patients, Hippocrates proposed therapeutic promenade, cereals, and cathartic mixtures of Helleborus niger, Cuscuta epithymis, Euphorbia peoles, and Daphne gnidium (Figure 7) [31].



Figure 7: Helleborus niger and Cuscuta epithymis (top side), Euphorbia peoles, and Daphne gnidium (bottom side). Otto Wilhelm Thome, Flora von Deutschland, 1885.

Fumigations and specific diet were to be applied too [20].

Conclusion

Hippocratic presentation's clarity for the clinical course and symptomatology of the various types of the pulmonary infection, remain still unparalleled by modern thinking. Hippocrates was aware of the infection of the lower respiratory tract, while he was the first to

apply bilateral comparative hearing of the thorax to reveal the oscillation, if any, the first physician who combined an oral gastric tube for parenteric nutrition, a tracheal intubation for the severe dyspnoea and a thoracotomy for the empyema thoracis with a drainage system and intrathoracic infusion of antiseptics, a complex approach that is being used even today thanks to his innovative application.

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