Short Review – Historical Article

Unveiling Ancient Wisdom: Understanding Cancer through the Eyes of Greek Physicians

Dimosthenis Papadimitrakis, Miltiadis Perdikakis, Dimitrios Filippou

[1] *Research and Education Institute in Biomedical Sciences (REIBS), Pireaus-Athens, Greece*

[2] *School of Medicine, National and Kapodistrian University of Athens, Athens, Greece*

Corresponding Address: Dimosthenis Papadimitrakis, National and Kapodistrian University of Athens School of Medicine, Athens, GRC, Email: dipapadimitrakis@gmail.com

Introduction. Cancer is a disease known since ancient times. Notable figures such as *Hippocrates, Galen, Archigenes, Leonides, Polydeuces*, and the later *Aetius Amidinos* and *Paul of Aegina* recognized its existence and studied its nature, causes, and properties. They applied various methods for its treatment, ranging from simple dietary interventions to surgical operations to resect tumors. This article aims to explore the historical insights and knowledge of ancient Greek physicians regarding cancer, along with their early attempts to comprehend and treat it, which often intersected with philosophy, mysticism, and rudimentary medical practices

Etymology and name origin. The origin of the word "cancer" is credited to Hippocratic doctors, who used the term "*καρκίνος*" (Greek word for crab) in an attempt to better describe tumors, as they were thought to grip healthy organs just as a crab does with its claws *"επί των τιτθών είδομεν πολλάκις ακριβώς όγκον όμοιον καρκίνω ζώω. Καθάπερ γάρ επ' τούδε του πάθους αι φλέβες αποτεταμέναι του παρά φύσιν όγκου το σχήμα καρκίνω παραπλήσιον εργάζονται"*. (1)

In the writings of many ancient Greek physicians, this disease is called by a variety of names. It is known as cancer (ulcerated and nonhealing), carcinoma (nonulcerated), carcinoid ulcer, carcinomatous tumor, carcinosis, and carcinomatous disposition. Some of the first names used to describe cancer in ancient Greek medical literature are "*σκίρρος*" (scirrhus), "*έλκος*", and "*θήριον έλκος*". The term used by Hippocrates to describe the mass was ***onkos*** (*όγκος*) a name that today is given to the entire specialty dealing with cancer i.e. oncology. Galen states: *''Καρκίνωμά εστιν όγκος κακοήθης και περίσκληρος, ανέλκωτος ή ηλκωμένος. Είρηται δε από του ζώου καρκίνου"* meaning that carcinoma is a malignant and persistent tumor, with or without ulcer, which comes from the animal crab. (2, 3)

Humoral theory. The theory of the four humours was formulated in 400 BC in the philosophical treatise "*On the Nature of Man"* of the Hippocratic School. It was based on the theory of the four elements of Empedocles. Galen used it to formulate his theory of disease and influenced physicians and scientists until the Middle Ages. The 4 humors of the human body are blood, black bile, yellow bile, and phlegm.

The four humors are also linked to four organs of the body, each responsible for producing one specific humor. When these four humors are in equilibrium within the body, the state is termed *'eucrasia'* (*ευκρασία*), indicating a condition of health or homeostasis. Conversely, *'dyscrasia'* (*δυσκρασία*) characterizes a state in which the balance of humors is disrupted, leading to a disturbance in homeostasis. Dyscrasia can manifest in various diseases, including cancer. (4)

Etiology. In ancient Greek medicine, cancer was believed to arise from an

imbalance of bodily humors, specifically an excess of black bile and melancholic juice. According to this theory, melancholic juice, derived from black bile and produced in the liver, was normally eliminated by the spleen. When either the liver overproduced or the spleen malfunctioned, the melancholic juice accumulated in the veins, circulating throughout the bloodstream. (5) This accumulation could result in the development of cancer locally in a specific part of the body or, if the melancholic juice spread diffusely, lead to conditions such as elephantiasis. The theory of humors posited that an excess of black bile disrupted homeostasis, contributing to the onset of various diseases, including cancer

However, certain dietary habits were also thought to be responsible for the development of cancer. Foods such as lentils, snails, donkey meat, and salted fish were considered to be carcinogenic whereas foods such as spelt porridge, milk, pumpkin, cabbage, vetches, and poultry were thought to not only have protective properties but also prevent the disease recurrence or progression. Therefore, specific dietary suggestions were made by physicians at the time to achieve the prevention of cancer. (6)

Types of tumors. In general, many types of cancer were known to the ancient Greek physicians. Among these are skin, oropharynx, larynx, breast, and cervical cancer. According to texts by *Hippocrates, Galen, Aetius, Polydeuces, Archigenes*, and other physicians, cancers can be classified into certain categories. In particular, they can be divided into "*ακρόπαθους*", i.e. superficial, and "*κρυπτούς*", i.e. deep, "*ανέλκωτους*" and "*ελκωμένους*" depending on the absence or presence of an ulcer, and "*προ της ήβης*", i.e. hereditary, and "*μετά της ήβης*", i.e. acquired. (7, 8)

Characteristics of the tumor. Despite the lack of modern technological means, the acumen of the ancient Greek physicians allowed them to identify some of the most important properties of cancer. Among these, they recognized that cancer cells can infiltrate neighboring healthy tissues, leading to the spread of the disease. They called this property "*νομή*" or "*επινέμησις*" as it is presented in the following two extracts from texts by *Aetius*: *"διαβιβρώσκων αεί και διά βάθους υποκάμπτων, στήναι αμηχανεί",* and *Orivasios: "όσα δε καρκινώδη τρόπον συνίστανται, χαλεπώτερα και τα εκφυόμενα της βαλάνου χαλεπώτερα των της πόσθης, και τα εν τη έδρα τα βαθύτερα των προχειρότερων. Ώφθη δε πότε επινεμόμενα εκ της έδρας προς το αιδοίον της γυναικός".*

It is noteworthy that ancient Greek physicians recognized cancer's ability to metastasize either via lymphatics or via blood vessels, which they referred to as *'sympathy*.' They observed that, apart from the primary tumor focus, secondary foci (metastases) could develop in distant organs, often resembling the organ of origin (distant metastases). Additionally, they noted that lymph nodes, referred to as *'bullae*', surrounding cancer-affected organs, would frequently become hardened and malignant (lymphogenic metastases). One of the most commonly identified relationships was between breast cancer and axillary lymph nodes. These observations find confirmation in passages from *Soranos: "'πάσχουσα μέντοι η μήτρα προς συμπάθειαν στόμαχον άγειν και μήνιγγας έστι δε τις αυτή και προς τους μαστούς φυσική συμπάθεια", Leonides: "ώστε κατά συμπάθειαν εν ταις μασχάλαις βουβώνας επανίστασθαι κακοήθεις"* and *Hippocrates: "Γυναικί όταν υστέραι σκληραί γίνωνται και εις τα αιδοία εξίσχωσι και οι βουβώνες σκληροί γίνονται και κάδμα εν*

τοισοιν αιδοίοισιν ενή, καρκινούσθαι άρχεται".

The recurrence ("*ανάμνησις*") of cancer was also well-known to ancient Greek physicians. It was particularly common for cancer to recur after surgery. This is the reason why doctors of the time sought surgical resections with healthy margins (Ro), taking care not to leave the slightest bit of cancerous tissue behind. *Leonides: "παραιτούμενα επί τούτων τα δριμύτερα των φαράκων και τα λυπαίνοντα, εις ανάμνησιν γαρ ταύτα άγει το πάθος" and Paul of Aegina:"χειρουργούμενος χείρων διατίθεται"* spoke of the risk of cancer recurrence in their writings.

Symptoms. Ancient Greek doctors accurately described the main symptoms of cancer. They identified bitterness of the mouth, anorexia, indigestion, ulcers, lymphadenopathy (metastases), pain (local or reflective), and bleeding (especially in cases of uterine and bowel cancer). Often a hard visible and/or palpable mass was observed rapidly coalescing with the surrounding tissues (infiltration). Furthermore, it was perceived that the symptomatology was specific for every organ affected by cancer. Cachexia was considered a sign of advanced or even incurable disease as revealed by passages of Hippocrates, Galen, and other doctors. (8)

Diagnosis. Diagnosing cancer posed significant challenges and was a task reserved for seasoned physicians. The accuracy of the diagnosis held utmost importance, as it dictated the choice between pharmaceutical and surgical treatments. The differential diagnosis encompassed various conditions, including benign tumors, persistent and untreatable ulcers, gangrene, herpes, edema, and inflammatory foci.

To be classified as cancer, a mass had to exhibit specific characteristics—it needed to be firm and painless. Additionally, it should maintain a normal body temperature and not display heat, which could indicate inflammation. The final consideration leading to an unfavorable cancer diagnosis arose when conventional treatments proved ineffective in addressing the mass. (8)

Therapy. According to *Galen*, the treatment of cancer has two parts: *"αλλά και το θεραπεύειν διττον εστίν. Εν μεν το πάντα πράττειν ως υγιές αποφήναι το πεπονθός μέρος, έτερον δε το προνοείσθαι την αρμόττουσαν τω πάθει πρόνοιαν, όπερ έστι παρηγορείν τε και πραυνειν αυτό και μαλισθ' όταν η μεθ' ελκώσεως"*. In other words, the ancients sought either to treat the tumor completely by curing the patient or to soothe/relieve the patient's symptoms in the case of an incurable disease. In the first case, they used medicinal preparations of plants, herbs, and minerals in combination with a proper diet and nutrition. If these did not achieve their therapeutic goal and the cancer was considered operable, then surgery was performed to remove it. However, the sheer number of herbs and medicines used suggests that ancient physicians already knew how small the chances were for a cancer patient to survive the disease. (9)

According to Ancient Greek Medicine, the human body typically endeavors to expel excess melancholic humor that has gathered in the veins by directing blood flow towards the stomach, intestines, and skin surface. Ancient Greek physicians viewed processes such as menstrual bleeding and hemorrhoids as mechanisms for eliminating this excess melancholic humor, which they believed played a role in preventing the onset of cancer. Consequently, in addition to administering pharmaceutical preparations, doctors sought to facilitate the removal of excess melancholic humor from the patient's body to restore good health. (10)

They primarily pursued this goal through dietary interventions, advocating for the

consumption of foods such as milk, honey, and amaranth greens. Simultaneously, they employed a technique known as 'phlebotomy,' which involved bloodletting operations aimed at purging the body of melancholic humor by imitating the processes of menstruation and hemorrhoidal bleeding. Additionally, they employed purging methods, such as inducing vomiting and diarrhea, to cleanse the stomach and intestines of accumulated excess melancholic humor. (11)

Indicatively, some of the substances used by physicians in ancient Greece to treat cancer are the following: *Asclipias* (ivy) for cancer of the uterus and breast, *Acalypha, Aristolochia, Draconia, Elatirion (fig), Epithymium, Helleborus, Erica* fruit for oral carcinomas, *Cadmium, Lithargy* for breast and uterine carcinomas, Lead, *Strychnous* porridge, and *Chalcitis*. Particular mention needs to be made of *draconia "ταύτης ο καρπός ισχυρότερος ου φύλλων μόνον αλλά και της ρίζης εστί ώστε και καρκίνους και πολύποδας εκτήκειν πεπίστευται",* the "*καρκίνιους ποταμούς*", which was used by the majority of ancient Greek physicians, and "χαλκίτις" which was considered a very powerful medicine that burned cancer like fire. Of the above, others were derived from plants such as *draconia* and *erica* fruit, and others were derived from metals such as lead and litharge. These medicines were usually used together with other preparations such as honey and milk which had recognized nutritional and medicinal value. (8)

Surgery. When the various therapeutic methods failed, physicians resorted to surgical methods. The surgical treatment used was the so-called 'cut and burn' operation ("*δια τομής και καύσεως*"). However, this operation was not considered to be indicated and permissible in every case. On the contrary, it was reserved exclusively for so-called "*ακρόπαθους*" (or superficial) cancers and was prohibited for "*κρυπτούς*" (or deep) cancers. The experience of doctors at the time had shown that patients who underwent surgery for deep cancers died faster than those who did not have surgery. In fact, Galen reports that surgery for deep cancers led to their exacerbation, ultimately resulting in the patient dying unable to cope with post-operative stress. However, even for superficial cancers, surgical treatment was not universally accepted. Galen mentions that many notable doctors of the time would only proceed with surgery if the cancer was advanced. Paul of Aegina, one of the greatest physicians of the time, performed multiple surgeries on terminal tumors, both evolved and inoperable because he believed that this would be optimal for the patient. It is also noteworthy that doctors of the time recognized the importance of complete and radical resection of the neoplasm for the effectiveness of treatment. This can be seen from the following passages from *Galenos'* writings: "*Περικόψας δε πάντα ακριβώς το πεπονθός, ως μηδεμίαν απολείπεσθαι ρίζαν",*"and "*άμα δ' εν τοις τοιούτοις συστώσι μορίοις α μετά των ριζών εκτεμείν και καύσαι δυνατόν εστίν".* (12, 13, 14)

Regarding the methods used for cancer surgery in ancient Greece, Leo*nides' technique of mastectomy* has survived. According to this technique, the surgeon would divide the healthy part of the breast from the affected part and then use fire to cauterize the wound until the bleeding stopped. He would then repeat the same tactic of cutting and burning in order to effectively remove the lesion, achieving the 'perfect cut' where the remaining part of the breast would be free of any cancerous focus. (15, 16)

Immediately after the operation, the primary concern of the physician is the care of the wound and the recovery of the patient from the stressful stimulus of surgery. The wound was covered/tied with

dressings/patches which were moistened with water. Milk and honey were used to soothe and heal the burn wounds. The sick person was placed in a warm room as it was thought that cold weather could lead to a relapse of the disease. On the 2nd or 3rd postoperative day, the doctor would wash the wound with plenty of water, and cover it with a small amount of honey, vine leaves, or other plants before re-bandaging it. This is repeated until the scabs fall off. No drugs were used as it was thought that they would lead to the recurrence of the cancer. Instead, the only drugs the patient received were human or donkey milk. After the surgery, the patient had to follow a specific diet and exercise program to feel better. This included rehydration, abstaining from alcohol and cold drinks, and avoiding foods that cause indigestion. (7, 17)

Conclusion. It is surprising that in those ancient times, physicians had identified the role of stressful stimuli in the development of cancer. It is also noteworthy that, as can be deduced from Galen's writings, this brilliant physician believed that cancer does not appear overnight but is the result of the long-term effect of melancholic juice. He therefore recommended avoiding all habits that increase the body's bad juices.

It was also believed that diet also plays a decisive role in the onset of cancer, something that modern science only began to accept in the mid-20th century AD. 18 centuries ago, however, Galen prevented people from eating foods that caused an increase in melancholic juice and suggested people suffering from cancer were also cautious with their diet.

Hippocrates knew that cancer is a disease that progresses in stages (hence the current staging). They bequeathed to modern physicians a rich terminology about cancer. They made suggestions on the prognosis of the disease by observing the course of their patients and carried out the first clinical trials. At the same time, the Ancient Greek physicians pioneered in proposing surgical treatment of cancer by radical and complete resection of the tumor.

References

1. GALEN, A Method of Medicine to Glaucon, Book B, ch. iv, G.C.Kuehn, vol. XI, p. 140-141.
2. Hajdu, Steven I. “Pathfinders in oncology from ancient times to the end of the Middle Ages.” Cancer vol. 122,11 (2016): 1638-46. doi:10.1002/cncr.29955
3. Salaverry, Oswaldo. “La etimología del cáncer y su curioso curso histórico” [Cancer etymology and its historical curious course]. Revista peruana de medicina experimental y salud publica vol. 30,1 (2013): 137-41. doi:10.1590/s1726-46342013000100026
4. Hippocrates. The Genuine Works of Hippocrates: Translated From the Greek With a Preliminary Discourse and Annotations by Francis Adams. 2 vols. London, United Kingdom: Sydenham Society; 1849.
5. Wolff J. Die Lehre von der Krebskrankheit von den ältesten Zeiten bis zur Gegenwart. Jena: Gustav Fischer, 1907.
6. Karpozilos A, Pavlidis N. The treatment of cancer in Greek antiquity. Eur J Cancer 2004;40:2033–40.
7. Moulin D. A short history of breast cancer. Boston: Martinus Nijhoff Publ; 1983
8. Kouzis A. Cancer among ancient Greek physicians. Athens, Konstantinidis 1902 [in Greek].
9. Retsas, Spyros. "On the antiquity of cancer; from Hippocrates to Galen." Palaeo-oncology: the antiquity of cancer. Farrand Press, London, 1986. 41-53.

10. Park R. An epitome of the history of carcinoma. Bull Johns Hopkins Hosp. 1903: 14: 288–294.
11. Hajdu SI. A note from history: landmarks in history of cancer, part 1. Cancer. 2011; 117: 1097-1102.
12. Adams F. The seven books of Paulus Aegineta. Vol. 2. London: Sydenham Society; 1844. p. 332.
13. Graney, M.J., Graney, C.M. Colorectal surgery from antiquity to the modern era. Dis Colon Rectum 23, 432–441 (1980). https://doi.org/10.1007/BF02586797
14. Karamanou M, Diamantis A, Androutsos G. The first cases of cancer in antiquity. J BUON 2008;13:601-608.
15. Ekmektzoglou, Konstantinos A et al. "Breast cancer: from the earliest times through to the end of the 20th century." European journal of obstetrics, gynecology, and reproductive biology vol. 145,1 (2009): 3-8. doi:10.1016/j.ejogrb.2009.03.017
16. Papavramidou, Niki et al. "Ancient Greek and Greco-Roman methods in modern surgical treatment of cancer." Annals of surgical oncology vol. 17,3 (2010): 665-7. doi:10.1245/s10434-009-0886-6
17. Weiss L. Early concepts of cancer. Cancer Metastasis Rev 2000;19:205-217.