

The Neurosciences in the Byzantine era

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Summary

The Neurosciences possessed an important place in medical thought and education of the Byzantine era. Byzantine Neurology inherited the majority of the ancient Greek and Hellenistic medical and principles and doctrines, which were harmoniously amalgamated with Christian orthodox spirituality. The Medical practice in Byzantine period, based on a background of erudition, high medical ethics, brotherly love and charity, has been a work of compassion and mercy. Among the well known physicians of the Byzantine period who were distinguished for their special erudition in Neurology we mention Oribasius of Pergamos, Aetius of Amida, Alexander of Tralles, Paulus of Aegina, Theophilus Prorospatharios, Theophanes "Nonnos", Ioannis Zachariou, Nickolaos Myrepsos. The contribution of all of them in Medicine and especially on the treatment of the neurological and mental diseases exercised an enormous influence on the Arabic and Western Medicine and Pharmacology. In addition, the blossom of the Neurosciences in Byzantine era, had coincided with the establishment of Hospitals and numerous infirmaries in Constantinople and the other major cities of the Empire. The hospitals in Constantinople have had a genuine scientific profile, with their well organized medical, surgical, obstetrical and gynecological departments, including units as well as for neurological and mental diseases, intensive care units and well organized quotidian outpatient clinics. The hospitals disposed also their own Pharmacy, Library and Chapels. One of the most well known and highly esteemed Hospitals in Constantinople was the Xenon of Pantokrator, a teaching Hospital founded by the Emperor John B' Comnenos, in 1136. The Typikon of the Hospital of Pantokrator offers us a unique opportunity to realize and learn how medical care was per-

fectly organized and administered in Byzantium and especially how important and beneficial was the role of the orthodox Church. The hospitals and the neurological and mental units in the Byzantine Empire irradiated all over the world the principles of devotion and unselfishness of the doctors and the nursing personnel, who minister to the patients as to the most holy and precious persons, in the spirit of charity, compassion, mercy, brotherly love and self sacrifice.

Key Words: Byzantine Neurology, Hospitals in Constantinople, History of Neurology

Introduction

During the million years of the Byzantine Empire (1), the Hellenic mind amalgamated with the orthodox Christian faith, dominated in philosophy, natural and social sciences, theology, ethics, arts, history, literature, mathematics and Medicine.

Only the jurisprudence and the organization of the army were still based mostly on the Roman legacy.

The Neurosciences possessed an important place in medical thought and education of the Byzantine era since the brain, being the organ of intelligence, thought, feelings and the seat of the soul, has been considered as the center of the human psychosomatic entity and the principal adjuster of man's social behavior.

Byzantine Neurology inherited the majority of the ancient Greek and Hellenistic medical and principles and doctrines, which were harmonized with the Christian spirituality and the Platonic (2), Aristotelian, Neoplatonial and sceptical philosophical background.

The philosophical and spiritual background of the Byzantine Neurology

According to Aristotle the human intellect is divine and unaffected from illness and age. Man appears to be endowed with a common sense (sensus commu-

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nis), which corresponds to the unity of consciousness.. Aristotle considered all activities of the body as expressions and manifestations of the soul processes. He tried to explain that the soul is to the body what vision is to the eye (3). Aristotle defined wisdom as based on temperance and moderation, which may keep body and soul away from extremes (4).

According to Orthodox Christian spirituality the human being is a harmonious psychosomatic unity. The human body is endowed with a living soul. The soul is the basic principle of life. In to this soul is breathed the spirit. Body, soul and spirit have each one a special way of approaching and knowing, the body exclusively through the senses, the soul mostly through the intellectual reasoning and the spirit only through the conscience, a mystical way of perception, which transcends ordinary rational processes.

The interior psychosomatic harmony of the man is mostly changed by the passions, since they eliminate the inner peace and the purity of heart (5). Passions penetrate into both the soul and the body and infiltrate them overpowering man's consciousness and freedom. Passionate thoughts, feelings, desires and decisions are also the main obstacles to inner peaceful self -dialogue and counteract the serenity of mind.

The Medical practice associated with the Christian spirituality in Byzantine period became the practice of high medical ethics (6), brotherly love and charity, a work of compassion and mercy. The care of the patients was a sacred duty for the physicians and health practitioners, who were inspired by the example of Cosmas and Damian and many other holy doctors (7) who were solicitous not only for the physical or mental health, but also for the soul, the body comfort and the social well being of their patients in the name of Lord.

The scientific background of the Byzantine Neurology

The scientific background of the Byzantine Neurology (8) was based on the enormous experience, derived from the ancient Greek and Hellenistic Neurology and the extensive literature of Greek authors from the fifth century BC to the third century AC, covering therefore eight centuries of continuous medical progress and education.

The famous solemn Hippocratic canon (9) and the

numerous extensive dissertations of Galen (10) were the main textbooks and compendia for the neuroscientists in Constantinople from the very beginning.

The studies of Herophilos on the blood circulation of the brain, the cerebrovascular diseases and their association with the blood pressure and heart arrhythmias, were eagerly adapted by neurologists, who also recognized the great diagnostic importance of the examination of the pulse and the auscultation of the heart in cardiological diseases and stroke.

The various important studies by Erasistratos of Chios on Neuroanatomy, who described the morphology of the gyri and the sulci of the surface of the brain and localized the centers of the higher mental faculties on the cortex of the brain hemispheres were also main principles and doctrines in Byzantine neurology.

Neurologists also accepted the Erasistratos' theory on the role that the cerebellum plays in the harmony and plasticity (ευσταξία) of movements and his concepts on psychosomatic medicine.

Soranus' from Ephesos dissertations on epilepsy, vertigo, apoplexy and tetanus were also well known in Constantinople.

Areteus from Cappadocia, who first described the decussating of the pyramidal tract (11) and gave also a detailed description of the major epileptic attack (grand mal) and the various types of aura (12) was one of the most deeply estimated authors among the neurologists in Byzantium.

Eminent physicians with high erudition and experience in Neurology in the Byzantine period

Among the well known physicians of the Byzantine period who were distinguished by their special erudition to Neurology were

Pantaleon of Nicomedia, one of the first Christian physicians, well specialized in ocular, neurological and mental diseases.

He became very glorious as practitioner and teacher of Medicine. He mostly practiced medicine among the sick poor people, without accepting fees, like Cosmas and Damien "the silverless, unmercenary Doctors"(13) . He gained the enmity of his pagan colleagues and finally he was led to martyrdom.

Oribasius of Pergamos (325-403 A.D), professor of Medicine in the School of Medicine in Alexandria. He was appointed as personal physician to Emperor Julian

the Apostate (361-363 A.D).

He wrote an encyclopedia of Medicine in seventy volumes, summarizing the corpus hippocraticus, the extensive dissertations by Galen and the manuscripts of the ancient and Hellenistic celebrant physicians. His work included chapters on Neurological diseases, such as on the function of memory and the phenomenology of dementia, on sleep disturbances, on migraine and the various types of headache, on meningitis and encephalitis, on stroke and on traumatic lesions of the spinal cord.

Aetius of Amida (sixth century A.C.) He was the first physician who described the paralysis of the palate in epidemic diphtheria.

Aetius wrote a textbook of Medicine in sixteen volumes, dealing mostly with the therapeutical protocols in the field of internal Medicine, including also treatments of neurological and mental diseases. His work was characterized as one of the most useful and practical contributions in the medical literature of Byzantine era (14)

Alexander of Tralles (525-605). He described the tension headache, the migraine and the various types of the epileptic seizures and several mental disorders. He traveled extensively in Greece, Italy, Spain and Gaul and he acquainted himself with most of the neurological diseases associated with starvation and exterior vulnerable factors.

He wrote dissertations, giving evidence of his personal experience and his speculations on the pathogenesis of neurological disease. He did not hesitate also to criticize Galen, in cases that his personal observations disagreed with Galen's doctrines.

In addition Alexander wrote a therapeutic compendium, with references to all possible treatments of the current medical problems, including brain and mental diseases. He emphasized also the beneficial role that baths play in the therapeutical treatment of neurological and mental disorders. He proceeded also in writing a Thesis on the pathogenesis and treatment of ocular diseases, which could be considered as the first scientific contribution to the field of Ophthalmology.

Paulus of Aegina (625-690), was one of the most famous doctors of Alexandria. He was appointed as consultant neurologist in the seven hospitals of the city of Alexandria, founded by the eminent and noble Patriarch John the Merciful (15).

He has been recognized as the first child neurolo-

gist, since he had acquainted a considerable experience of newborn's and infant's neurological problems, serving as neurologist in the obstetric wards of the maternity hospitals of Alexandria. He described a substantial number of congenital malformations of the nervous system and the spinal column.

He was also one of the first neuroscientists who distinguished the afferent from the efferent tracks in the spinal cord and the brain stem. He also described the meningitis with most of its neurological and psychiatric complications, as well as encephalopathy due to infectious factors, stating that the patients have a livid color, shallow respiration, poor pulse and usually fatal outcome.

Paulus of Aegina, was the first physician who noticed that the depression (Μελαγχολία) may cause a dementia like syndrome, which is mostly reversible.

Paulus' main contribution in the Byzantine medical literature was his Compendium (Epitome, Επιτομή). This work was a brief encyclopaedia of Medicine including also diseases of the nervous system. The sixth chapter of the Compendium was a concise treatise of Surgery including also chapters of neurosurgical techniques. It was very much estimated by his colleagues and it has been used as textbook by the surgeons and medical students for centuries.

St.Eustathius of Thessaloniki, who described the photophobic epilepsy and the epilepsy, which is associated with laughter (γελαστική επιληψία).

Theophilus Prorospatharios (9th century). He was known as protospatharios, chief physician, monk and philosopher (16). who was one of the most eminent Neuroanatomists of his times.

He wrote a dissertation entitled "On the structure of the Human body".which has exercised a profound influence on the medical education, erudition and qualification of the physicians during the Byzantine period. He also wrote dissertations "on pulses", "on urine", "on secretions" and a commentary on the Aphorisms by Hippocrates (17). He was deeply inspired by the Christian values, emphasizing the ideas of the sanctity of the human life and the holiness of the body.

Theophanes "Nonnos" (10th century). Theophanes was one of the most eminent physicians and authors of the period of Macedonian renaissance (18) in Constantinople.

He wrote a Handbook of Medicine called Synopsis (Σύνοψις) including three hundred chapters on internal

medicine and neurology, one chapter on gynecology and one on Pharmacology.

Ioannis Zachariou, Actuarius (19), who was one of the most eminent neurologists and psychiatrists. He was the personal doctor of the emperor Andronicos III (20) He has been appointed as head of the department of Internal Medicine and Neurology at the Hospital of Pantocrator and the Hospital of Mangana in the 14th century.

His theories on the human soul are included in his book, entitled "On the function and the passions of the soul"

Nickolaos Myrepsos, Actuarius. He was one of the most eminent physicians and was appointed as personal doctor of the emperor John III Vatatzis (21)

He wrote a textbook of Pharmacology (Dynameron or material medica), which included 2600 drugs and pharmaceutical substances. His contribution on the treatment of the neurological and mental diseases exercised an enormous influence on the Arabic Medicine and Pharmacology.



Constantinople, the capital of the Byzantine Empire. Map by Giacomo Francesco Camocio

Hospitals of Constantinople with neurological units

In Byzantine era, the blossom of the Neurosciences coincided with the establishment of Hospitals and numerous infirmaries in Constantinople and the other major cities of the Empire (22).

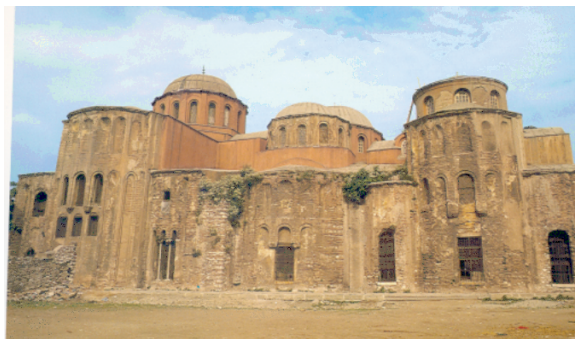
The hospitals in Constantinople have had a genuine scientific profile, with their well organized medical, surgical, obstetrical and gynecological departments, as well as units for neurological and mental diseases, intensive care units, out patient clinics, Pharmacy,

Library and Chapels.

The majority of the hospitals was equipped also with everything needed for physical therapy, music therapy and work therapy. Some of the Hospitals were Academic Hospitals affiliated with the University of Constantinople, the Magnaura (23).

Among the numerous hospitals of Constantinople the most well known and reputable ones were (a) the xenon (24) of Pantocrator, (b) the xenon of Samsom, (c) the xenon of Evoulos, (d) the xenon of Irene in Perama, (e) the xenon of Cosma and Damien or Cosmidion, (f) the xenon of Christodotos, (g) the xenon of Narsis (h) the xenon of the Forty Martyrs and (g) the xenon of Marcianos .

We would describe herein the hospital of Pantocrator as a typical model of the organization and function of the hospitals in Constantinople in the eleventh century.



The Monastery of Pantocrator

The Monastery of Pantocrator

One of the most well known and highly esteemed Hospitals in Constantinople was the Hospital of Pantocrator (Ξενών Παντοκράτορος), founded by the Emperor John B' Comnenos (25) in 1136.

The Hospital of Pantocrator was located in the northeast side of a hill near the port of the Golden Horn (26), the sea which is inserted deeply into Constantinople (27).

From the very beginning it was planned to be a General Academic Hospital, which employed more than 50 doctors and a large number of nursing personnel, administrators, pharmacists, technicians and dietary staffs.

The doctors who were candidate to be employed in

the hospital were the best of the empire, since, it was considered as the highest honor to be chosen to serve in the Hospital of Pantocrator.

Medical students attended the activities of the wards, under the supervision of their professors and the expert, well educated and specialized physicians. A respected academic physician worked as full time professor at the hospital in order to teach continuously medical students as well as the younger residents and interns. This physician was the highest paid physician on staff.

A medical library was also provided for the students, the doctors and the nursing personnel. The library was one of the biggest medical libraries of Byzantine period. It included the Corpus Hippocraticus, all the works and dissertations by Galen, Erasistratus' and Herophilos' manuscripts, Soranos' dissertations and all the Medical Compendia, Textbooks, Handbooks and dissertations by Byzantine authors.

The students followed a round training in Medicine and Surgery, as well as in Paediatrics, Ophthalmology, Obstetrics and Gynecology, Neurology and Psychiatry. The hospital included departments of Neurology and Psychiatry, very well organized, with laboratories of Neuroanatomy and Neurophysiology.

The general director of the Hospital was the Lord Actuarius (28), who was, as a rule, the personal physician of the Emperor. The organization and the function of the Hospital of Pantocrator have been models for the Hospitals of the Arabic World (29).

The Hospital included five wards or departments (30).

In the first ward, the patients who have had to be admitted suffered mostly from diseases, which needed surgical intervention, such as tumours, haematomas, traumas and bone fractures.

In the second ward, which included eight beds, the patients who usually admitted suffered from diseases of internal medicine and ophthalmology.

The third ward, which included twelve beds, was the maternity department, with sections of obstetrics and gynaecology.

The fourth and the fifth wards were well organized as departments of Neurology and Psychiatry.

The Hospital had also a well organized intensive care unit, which consisted of six beds, intended for serious cases. This unit was the first well organized and equipped intensive care unit in the world.

The Hospital has had also a Pharmacy, which employed three pharmacists, who could prepare the prescribed remedies and could supply the wards with the pharmaceutical substances and drugs for the proper treatment of the patients.

The physicians were to make ward rounds once a day in the winter and twice a day from May through September. The activities of the hospital included also out patient clinics, which could cover all the special fields of Medicine.

According to the regulations of the Hospital (typikon) (31) in charge of each one of the wards were two physicians called protominite (πρωτομηνίται), specialized in internal medicine. In addition the surgical department has had two surgeons in charge, who performed the operations. The ward of Obstetrics and Gynecology has had three doctors in charge, two men and one lady (doctoress-ιάτραινα) and it employed female nursing personnel only.

The departments of Neurology and Psychiatry have had two physicians in charge well qualified in neurological and mental diseases. Each one of the experts collaborated with three ordinary (υπουργοί έμβραθμοί) and two extraordinary assistants (υπουργοί περισοσί).

The physicians were also assisted by a large number of trainees, medical students and nursing personnel.

During the ward rounds all the cases were physically examined, psychologically analyzed and discussed extensively by the experts and the assistant physicians. The final decision for the application of the appropriate therapeutic protocol for each one of the cases was made by the expert, who was in charge of the department (32).

The therapeutic protocols for the neurological and mental diseases included frequent baths (33), ointments, vegetarian diet for the psychiatric patients and a diet of 3300 calories for the neurological cases, large number of pharmaceutical substances, music therapy, work and physical therapy, psychotherapy and spiritual support.

The patients attended the liturgy in the Chapels of the Hospital and participated in the Sacrament of Holy Communion. Two chapels were provided for (one for men and another for women). Each chapel would have a full time priest and lector. Divine Liturgy was celebrated in each chapel four times a week; Wednesdays, Fridays, Saturdays and Sundays. One priest was

always to be available to hear confession.

In conclusion

In the organization of the Hospitals in Byzantine era, the medical education and the proper treatment of the patients, we would recognize the essentials of contemporary modern hospitals. The methodic and systematic analysis of the clinical phenomena, symptoms and physical signs of the clinical cases, in association with the experimental research, the profound erudition, the gentle competition, the search for new therapeutic horizons and the theoretical elevations and perspectives of the physicians in the Byzantine Era in the Xenon of Pantocrator and the other hospitals of Constantinople, could be considered as been comparable with the phi-

losophy, the administration and the high scientific standards and principles of the modern Academic Medicine.

In the Byzantine Empire, the Greek Neurosciences were spread, from the large academic center of Constantinople, to the Arabic and Latin welds and were incorporated into the European and Arabic medicine (34) preparing the evolution of the Modern Neurosciences.

In addition the hospitals and the neurological and mental units in the Byzantine Empire irradiated all over the world the principles of devotion and unselfishness of the doctors and the nursing personnel, who minister to the patients as to the most holy and precious persons, in the spirit of charity, compassion, mercy, brotherly love and self sacrifice.

(1) Byzantium was one of the many Greek colonies in the Bosphorus founded by the king Byzas of Megara in 658 B.C. In 478 B.C Byzantium became an important member of Delian League, led by Athenians and in 334 became part of the Empire of Alexander the Great. In 324 A.C the emperor Constantine, who was the first Roman ruler who supported Christian religion and adopted it in the sunset of his life, became the head of the Roman Empire. He decided to make Byzantium the capital of the vast Empire, which was officially inaugurated on 11 of May, 330, endowed by him with the name Constantinople (the city of Constantinus). Constantinople being, one of the most thriving and beautiful cities in the world, became the political and cultural center of the Western and Eastern World. The political organization was mostly Roman, the religion was Orthodox Christian and the language, the culture, the education, the philosophical atmosphere and the general outlook were Greek. In the reign of the Emperor Justinian I (527-565) the population of Constantinople estimated to have been more than 500,000 inhabitants. The Byzantine Empire, which was gradually transformed to a Greek kingdom, lasted for 1.130 years. In 1453 the Ottoman Sultan Mehmed II (Fatih) laid siege of Constantinople. In a final assault on May 29 in spite of an intensive, brave and heroic resistance of the inhabitants, the city fell. The last king, Constantine XI Dragatsis Palaeologos, showing a unique bravery and self-sacrifice fall dead in battle.

(2) Plato believed that the human being is a synthesis of the immortal and eternal soul with the mortal and temporal body. The body is activated by the soul. Therefore the virtues and the passions of the soul are manifested mainly in the human behavior. Plato appropriated the idea that philosophy is quasi-medicine and that reasonable thinking and dialogue, which lead to catharsis (κάθαρσις) are the most effective methods of treatment for the illness of the soul. The self-understanding, the self-analysis and self-control (ἐλεγχος) could heal eventually any traumatic experience of the psyche.

(3) Aristotle, *De anima* 413 b 26.

(4) Aristotle, *Nic, Ethics* 1104 a 12

(5) Matt.V,8

(6) Baloyannis SJ: Bioethics from the Orthodox viewpoint. In S.J. Baloyannis (Editor) Proceedings of 7th International Congress on the Improvement of the Quality of life on Dementia, Parkinson's disease, Epilepsy, MS, Muscular Disorders and Neuroethics. Thessaloniki 29th January-1st February 2009 Pub. Medimond (Bologna) 2009.pp.1-3.

(7) Holy Physicians are not exclusively limited to byzantine era. The life of St. Luke, Metropolitan of Simferopol, eminent surgeon, academic teacher and author in the middle of twentieth century is a splendid testimony of the long tradition of Christian physicians, who suffered any torment for their faith and for the love and care of their patients. See Maruschak, Vasilii, *The Blessed Surgeon: The Life of St. Luke of Simferopol*, Divine Ascent Press, 2002.

(8) Bloch Iwan : *Byzantinische Medizin*", *Handbuch der Geschichte der Medizin*, Max Neuburger und Julius Pagel, Vol. 2 Jena: G. Fischer, 1902, 1:492—588.

(9) Hippocrates of Coos (460-370 B.C), who for his methodic and systematic study of the various diseases and pathologic conditions of the human body is considered "The father of Medicine", contributed greatly to the field of Neurosciences. Hippocrates wrote that epilepsy is a neurological disorder, which in addition to the convulsions causes a marked alteration of the personality, the feelings and the behavior of the patients. Hippocrates described various types of seizures such as generalized, unilateral and focal and emphasized the diagnostic importance of the aura, which precedes the epileptic phenomena. In cases of unilateral seizures, due to head trauma, the lesion of the brain is always in the contralateral brain hemisphere. Hippocrates also has offered the basis for localization of functions in the cerebral cortex and the subcortical centers. He taught that any traumatic lesion, hemorrhage, apoplexy (αποπληξίη) or tumor in the anterior part of the brain hemispheres causes paralysis or hemiplegia of the opposite side of the body. Apoplexy according to Hippocrates is preceded very often by numbness and sensory disturbances in the face or in one half of the body. Hippocrates

also pointed out that cases of the right side hemiplegia are associated, with loss of speech (motor aphasia), since the center of speech is located in the left hemisphere, and it is affected by the apoplexy. He described the clinical manifestations of severe sub-arachnoid hemorrhage. Hippocrates believed that the spirit (πνεύμα), which is located in the brain, vitalizes the human body either by its association with the blood, which penetrates the brain, or by the brain's connection to the pituitary gland (υπόφυσις), as well as via the peripheral nerves. Hippocrates was the first neuroscientist who described that the two brain hemispheres are separated by the falx of the dura matter and connected by the corpus callosum (μεσολόβιον). He claimed that the ability of verbal communication is a distinctive function, which is located in the anterior part of the left hemisphere. Hippocrates described mania as an acute psychiatric disorder, characterized mostly by exaltation of the mood, loss of self control and aggressiveness. Hippocrates was the first physician who described dementia associated with hypothyroidism.

(10)Galen of Pergamus (130 AC) was one of the highest authorities in Medicine in Hellenistic and Roman era with extensive impact on the Medieval and Modern Medicine. He wrote more than 400 dissertations on every field of Medicine. His works were deeply influenced by Hippocrates and Aristotle. On the brain and the spinal cord Galen thought that both of them perceive and analyze sensory stimuli and at the same time they propagate motor impulses to every part of the body. He found that transverse hemisection at higher levels of the spinal cord induces paralysis in the ipsilateral limbs of the body and sensory disturbances concerning the perception of pain and temperature in the contralateral ones. He claimed that if the face is simultaneously affected with the limbs, the lesion must be located in the brain. He has emphasized also that if the face is affected at the same side with the body and some of the cranial nerves are also involved, the cause of the paralysis is definitely located in the brain. He thought that the spinal cord is the prolongation of the brain substance in the spinal canal and it performs the commandments of the brain cortex. Galen also recognized that the phrenic nerve, arising from the 3rd myelotome of the spinal cord, innervates the diaphragm and it is therefore involved in breathing. One of the main contributions of Galen in anatomy and physiology of the cranial nerves was the definition of the important role that the recurrent branch of the vagus nerve plays for the formation and composition of the voice and speech. After several anatomical studies, he found that the recurrent branch of the vagus nerve innervates the muscles of the vocal cords and therefore unilateral lesion of that nerve causes dysphonia, though bilateral lesion causes complete aphonia. Galen described the innervations of all the muscles, which are involved in the production of voice and speech. Galen also mentioned that the spinal nerves are originated from the spinal cord by two separate roots, the anterior and the posterior one. One of them is involved in sensation and the other in motion. On epileptic seizures Galen stated that the tonic-clonic convulsions or spasms (σπασμός) are phenomena of intensive irritation of the brain or of obstruction of the ventricles and the pores and channels of the brain. The aura (αύρα) as a premonitory sensation of an epileptic attack is mostly projected into the viscera as an unusual gastric complaint. Galen made a sharp distinction between the convulsions of organic origin and the hysterical ones. On headache, Galen gave a description of lasting value.

He described the unilateral headache as hemicrania (ημικρανία) or heterocrania (ετεροκρανία), which is originated either by superficial stimuli of the skull or by functional disturbances of the deep structures of the head, such as the brain and the meninges. He also stated that the tension headache is mostly associated with the anxiety and it is of psychogenic origin. The loss of consciousness, described as syncope or lipothymia (λιποθυμία), was attributed by Galen to a partial failure of integrative action of the brain, the heart and the lungs. Galen described lethargus (λήθαργος) as an unusual condition, which is characterized by clouding of the consciousness of the mind and acute temporal deterioration of the mental functions such as memory, learning and cognition. Galen described coma as the most serious condition of loss of consciousness. He distinguished also coma into two types (a) deep unconsciousness with the eyes closed and (b) deep unconsciousness with the eyes open, called it sleepless coma (άγρυπνον κώμα). Galen described also some unusual clinical conditions such as catalepsy (κατάληψις), katochi (κατοχή) kataphora (καταφορά) or katochos (κάτοχος). He described catalepsy as a semicomatous condition, associated with titanic or hysterical rigidity, muscular stiffness and very often with a febrile delirium. Galen described the clinical phenomena of Parkinson's disease or Paralysis Agitans, such as tremor, rigidity, bradykinesia, the occasional mental deterioration of the patient and the inexpressive face with overconfident expression of the eyes, which are open and unblinking. Galen distinguished delirium, the mental derangement, into two types (a) in delirium without fever, called by Galen paraphrosyne (παραφροσύνη) and (b) in delirium with fever called by Galen phrenitis (φρενίτις). The main diagnostic criteria of paraphrosyne are the hallucinations and the erroneous reasoning of paranoid type as well as the behavioral disturbances. Phrenitis is always associated with febrile conditions and it is attributed the irritation of the brain by fever or by toxic humors. In serious cases phrenitis appears in the advanced stages as a fatal complication of the primary disease. Galen described the deterioration of mental activities as morosis or moria (μύρωσις, μωρία). Morosis is a mild form of dementia. Dementia or anoiā (άνοια) according to Galen is characterized by serious impairment of memory and loss of judgment. He claimed that dementia occurred in senility due to noxious humors of the body or to abnormal cooling of the brain. Presenile dementia is mostly associated with head trauma, severe phrenitis, high fever or debilitating and noxious effect of various drugs, (11)Areteus Cappadocius: The extant works. Ed and transl. by Francis Adams, The Sydenham Society, London 1846, pp.63, 306 (12)Illberg G: Das neurologisch-psychiatrische Wissen und Können des Aretäus von Kappadokien. Ztschr. f. d. ges. Neurol. 1923;86: 227 (13)Hronos G, The Holy Unmercenary Doctors: The Saints Anargyroi, Physician and Healers of the Orthodox Church, Light and Life Publishing, 1999. (14)Photios, Bibliotheca, René Henry, 8 Vol Paris: "Les Belles Lettres", 1959—77, 3 :152. (15)John the Merciful, John the Almsgiver, John the Almoner, John Eleymon, or John V of Alexandria was patriarch of Alexandria in the early 7th century, He came from Amathus in Cyprus . He became known as the benefactor of Alexandria, establishing many hospitals and homes for the poor. He was characterized by incredible generosity and philanthropy. He

distributed all his personal wealth and belongings to poor and afflicted. After Egypt had been conquered by the Persians he took refuge in his birthplace of Cyprus, where he died between 616 and 620, and his body was moved to Constantinople, then in 1249 to Venice. The main source for his biography is a Life written by Leontius of Neapolis in Cyprus. John is commemorated in the Orthodox Church on November 12. See also *Three Byzantine Saints: Contemporary Biographies of St. Daniel the Stylite, St. Theodore of Sykeon and St. John the Almsgiver*, trans. Elizabeth Dawes, and introductions and notes by Norman H. Baynes, (London: 1948)

(16)Hunger Herbert, *Die hochsprachliche profane Literatur der Byzantiner*, 2 Vol. *Handbuch der Altertumswissenschaft*, Munich: Beck, 1978,2: 299.

(17)The aphorisms were a series 34 Science Quotes by Hippocrates, from which the patient's affliction could be deduced and proper treatment would be prescribed. Their broad application made them exceptionally valuable to all physicians for centuries. See *Hippocrates. Aphorismi Hippocratus (Hippocrates' Aphorisms)*. Amsterdam: Hendrik Wetstein, 1685. The first aphorism is "Life is short, and Art long; the crisis fleeting; experience perilous and decision difficult. The physician must not only be prepared to do what is right himself, but also to make the patient, the attendants, and externals cooperate." (trans. Francis Adams: *The Genuine Works of Hippocrates*, (1886), Vol. 2, 344-5).

(18)The period of Emperors of Macedonian dynasty was one of the most glorious and prosperous one of the Byzantine history. The sciences and the arts flourished greatly, so it is called "Macedonian Renaissance". See Browning Robert: *The Byzantine Empire*, London: Weidenfeld and Nicolson, 1980.

(19)Actuarius was the title of honor of the personal physician of the Byzantine Emperor, who was at the same time the head of the ministry of health.

(20)Andronikos III Palaiologos (Ανδρόνικος Γ΄ Παλαιολόγος) (1297 – 1341) was Byzantine emperor from 1328 to 1341, Andronikos III was the son of Michael IX Palaiologos and Rita of Armenia.

(21)John III Doukas Vatatzes, (Ιωάννης Γ΄ Δούκας Βατάτζης) (1192 – 1254) was emperor of Nicaea 1221–1254. He became the son-in-law and successor of Theodore I in 1212. A capable ruler and soldier, he expanded his state in Bithynia, Thrace and Macedonia.

(22)Most of the Hospitals in Byzantine Empire were affiliated with monasteries with the monks providing the necessary medical and nursing care. St. Basil of Caesarea, who had been trained in medicine in Athens established a City of Charity (Ptocheion) for the care of sick and poor people of the region. The monks and doctors in those institutions associated philanthropy (benefaction for their fellow man) with sacramental and prayerful life (theoria). St. John Chrysostom as soon as became Patriarch of Constantinople in 390, commenced establishing many philanthropic institutions, including hospitals. Constantelos, Demetrios J., *Byzantine Philanthropy and Social Welfare*, Rutgers University Press 1968

(23)Magnaura sometimes known as the University of the palace hall of Magnaura (Πανδιδακτήριον της Μαγναύρας) was the University of Constantinople founded in 425[1] under the name of Pandidakterion (Πανδιδακτήριον). It was the first university in the world although the University of Bologna was the first to use the term Universitas (corporation). The original institution was

founded in by the emperor Theodosius II. The university included 31 chairs for schools of medicine, philosophy arithmetic, geometry, astronomy, music, rhetoric and law. The university existed until the Fall of Constantinople in 1453.

(24)Xenon or xenodocium is the official name of the hospital in the Byzantine era. Sometimes the term Nosokomeion was also in use. Initially hospital meant a place where foreigners or visitors, being in poverty, were received. In the Greek antiquity the patients were admitted in the Aesculapium, which was the establishment for the sick people. There the physicians called Aesculapians used to administer a considerable number of remedies for the treatment of neurological and mental diseases. In the early Christian times hospitals, which were real establishments for the patients, started to be organized on a scientific basis in Constantinople and elsewhere in the fourth century. The most well known hospitals of that period were (a) the xenon of St. Zoticus, near the church of St. Sophia founded during the reign of Constantine and (b) the famous foundation of St. Basil in Caesarea in Cappadocia, called "Basilius"

(25)John II Comnenus (1118-1143) was the son of the Emperor Alexius I Comnenus and Irene Ducas. He sought to strengthen the Byzantine Empire and spend most of his time with his troops fighting against the Petcheneg, the Hungarians, the Normans and the Atabegs.

(26)Möller-Wiener Wolfgang: *Bildlexikon zur Topographie Istanbul*, Tübingen: E. Wasmuth, 1977.

(27)The main church of the monastery of Pantocrator still stands in Constantinople today and is known as the Zeired-kilisse-tzami The hospital building is no longer standing.

(28)In the 11th century the title Actuarius was applied to prominent physicians, possibly those attached to the imperial court, particularly to personal physician to Byzantine Emperor.

(29)Gutas Dmitri, *Greek Thought, Arab Culture: The Graeco-Arabic Translation Movement in Baghdad and Early 'Abbasid Society (2nd-4th/8th-10th Centuries)*. London and New York: Routledge, 2000.

(30)The Typikon of the hospital specified one patient per bed in all the wards. Provisions were made for mattresses, sheets, pillows, and extra covers in the winter. Six beds provided for bed ridden patients- were equipped with perforated mattresses. The Typikon also provided for two latrines (a men's and a women's). Patients were to be bathed twice a week. Three large stones were provided, properly located for the cold winter months.

(31)Paul Gautier : *Le typikon du Christ Sauveur Pantocrator*, REB, 1974, 32: 1—145.

(32)The Typikon says that "The physicians after singing a psalm they will examine the sick carefully and scrutinize each person's illness in accurate detail, healing each person with appropriate remedies, making suitable arrangements for all, and expressing great devotion and careful and real concern for all as they will render an account of these actions to the Pantokrator.... All the physicians should turn their gaze on him, the Pantokrator, and not neglect their careful examination of the sick, knowing what a great reward this work has when it is properly carried out" (Typikon page 34, paragraphs 39, 42).

(33)PanTypikon 91.1051-1093.

(34)Baloyannis SJ: *Avicenna: The mysticism of the Greek medicine in the Arabian World*. *Encephalos* 1997; 34:11-29.

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