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HISTORY OF MEDICINE

Ioannis Chrysospathis, Theodoros Garofalidis and Georgios Hartofilakidis: The Pioneers of Orthopaedics in Greece

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Abstract

The aim of the present paper was to highlight the work of Chrysospathis, Garofalidis and Chartofylakidis, who dedicated themselves to the emergence of orthopaedics as an independent branch of medical science in modern Greece. The ancient Greek physicians Hippocrates, Galen and Paulus of Aegina laid the foundations for the emergence of orthopaedics and ancient Greek civilisation undoubtedly played a significant role in the evolution of this medical art throughout the following centuries. In modern Greece, Ioannis Chrysospathis fought for orthopaedics to be a separate medical branch rather than a practice within the context of general surgery. Theodoros Garofalidis also contributed to the evolution of orthopaedics in Greece, while Georgios Hartofilakidis brought pioneer knowledge to the Greek area, contributed to the creation of specialised orthopaedic departments and internationally contributed to the study of hip diseases and the art of total hip arthroplasty.

Key words: Orthopaedist; Surgery; Orthopaedic Department; University of Athens; History of Medicine.

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The evolution of orthopaedics in Greece

Greek mythology provides the first accounts of the origins of medical science in ancient Greece. According to the mythology, Apollo, the offspring of Zeus and Leto, was the god of science and medicine. He taught humans about a plethora of medicines made from different herbs, in addition to various therapies, such as thermal or herbal baths. He was also believed to have demonstrated the method of making a diagnosis based on observation and a focus on symptoms. Cheiron, a centaur, was taught the art of medicine by Apollo and was said to have been the first to perform the practice of surgery on wounds and fractures. He later passed on the knowledge he gained to Asclepius.[1]

Asclepius, the offspring of Apollo and Coronis, was recognised as a great healer with extraordinary therapeutical skills and he was worshipped as a demi-god at the Asklepieia, healing temples located throughout Greece (ca 5th-4th century BC). Asclepiads, the healer priests of the Asklepieia, had a profound knowledge of the earth and the properties of herbs and poisons and they used this knowledge in accordance with their religious perception in surgical procedures. Inscriptions

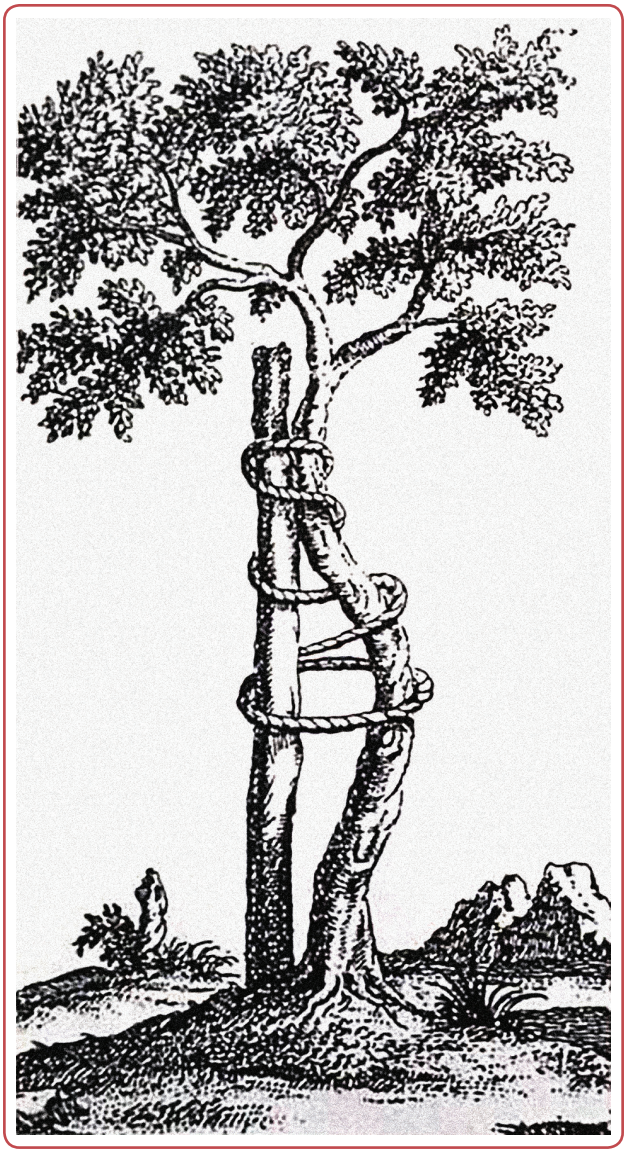

Figure 1: The "Crooked tree" by Nicolas Andry de Bois-Regard
Source: Private collection.

about wound care, reduction of dislocations and immobilisation of fractures have been found in various Asklepieia, demonstrating the development of surgical as well as orthopaedic practice in ancient Greece.[2]

It should also be highlighted that bone fractures, reconstruction and dislocation were well-known medical subjects among physicians even in Homer's era (8th century BC). In the epic poem, "The Iliad", Homer included more than one hundred battle injuries, including bone and joint trauma. All this knowledge was collected and categorised (c 460-370 BC) inside *Corpus Hippocraticum*, which contains various chapters on orthopaedics, such as "About fractures and dislocations" [in Greek: *Περὶ ἀγμῶν* (*Peri Agmon*)], "On joints" [in Greek: *Περὶ ἄρθρων* (*Peri Arthron*)] and "On the bone restoration" (in Greek: *Μοχλικός* (*Mochlikos*)].[1, 2]

Galen (AD 129-200) from Pergamon, Asia Minor is considered the successor of Hippocrates. He studied in Alexandria and his work on kyphosis, lordosis, scoliosis, vertebral tuberculosis and spinal injuries was inspired by the Hippocratic account. His service as a gladiatorial surgeon during the Roman period allowed him to study the anatomy of the human body by examining the gladiators' wounds; however, his anatomical and physiological theories were mainly based on animal dissection because dissection of human bodies was forbidden. Unavoidably, he made errors in his attempts to extrapolate his conclusions from animal experiments to humans. Nevertheless, he had an indisputable impact on the study of spinal anatomy: he specified twenty-nine pairs of spinal nerves, he described the cervical and brachial plexus and he knew a lot of details about neural anastomoses (*epimixies*).[2, 3]

In the Byzantine times, Paulus of Aegina (ca AD 625-690) was a distinguished surgeon who made great contributions to the orthopaedic art. He wrote the *Epitomae Medicae Libri Septem* (Medical Compendium in Seven Books), a guidebook for surgery and medicine that was used until the 17th century. In his work, he extended the accumulated knowledge about the locomotor system. Furthermore, he identified bone fractures in full detail, giving emphasis to congenital bone dislocations and he recommended the use of antiseptics, painkillers and anti-inflammatories.[1-3]

During the Ottoman occupancy (c 1453-19th century), the Hellenic medical tradition was limited. This tradition was revived with the establishment of the Greek state (1830), particularly when the Practical School of Medicine and Surgery was founded (1835) and the Othonian University was established (1837). The University was later known as the National and Kapodistrian University of Athens (1932). In 1856, the Athens University Clinic, Astykliniki, was established to provide clinical training for students and medical care for paupers. In Astykliniki, people with orthopaedic problems, such as gangrene, periostitis, rickets, bone fractures and joint diseases, were treated in the context of general surgery.[2]

Notably, until the end of the 19th century, orthopaedic surgery was not defined as a separate medical field in Greece. However, owing to continuing study and practice by certain general surgeons who treated people with orthopaedic problems, orthopaedics began to develop as a distinct specialty in medicine. In 1917, an orthopaedic de-

partment was instituted in Astykliniki, with Ioannis Chrysospathis and Athanasios Contargyris appointed as directors.[2]

Ioannis Chrysospathis (1873-1938)

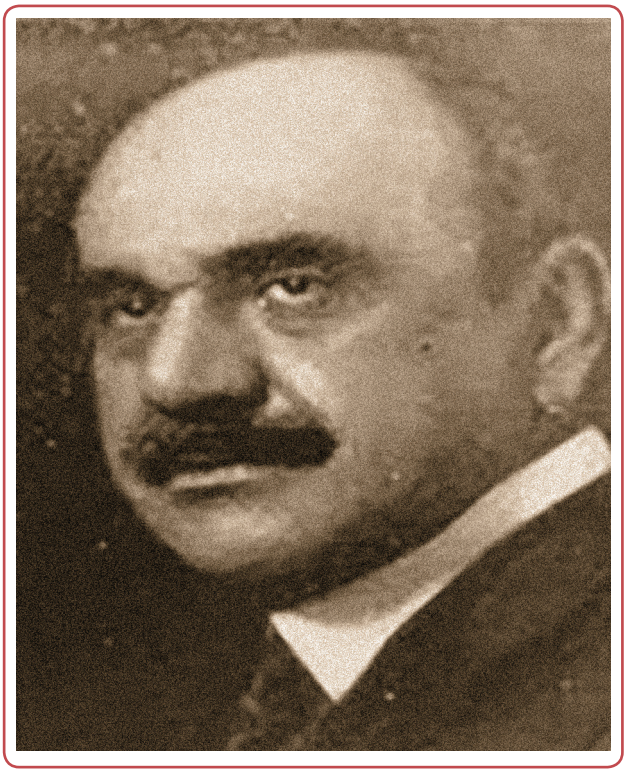

Figure 2: Ioannis G Chrysospathis
Source: National and Kapodistrian University of Athens.

Ioannis G Chrysospathis (1873-1938) was born in Kalamata, Greece (Figure 2). His enthusiasm to pursue a more sophisticated education than was available to him in Greece led him to study medicine in Leipzig, Germany and he ultimately obtained his doctorate *cum laude superato* in Freiburg in 1895. In 1899, he served as an assistant in the First Surgical Department of the New General Hospital of Eppendorf, in Hamburg, under Professor Hermann Kümmell's supervision. Chrysospathis specialised in orthopaedics, after having been trained in German, Austrian and French hospitals (1895-1900). He apprenticed under the German surgeon and orthopaedist Albert Hoffa (1859-1907) in his private clinic in Würzburg and he also attended the in-depth lectures of the Austrian surgeon Lorenz Böhler (1885-1973) in Vienna.[1,2,4-6]

Chrysospathis subsequently made major contributions to the art of orthopaedics in Greece. In 1901, he returned to his native country to establish the first orthopaedic practice in Athens. During this time period, numerous pioneering physicians in Greece were practicing orthopaedics and various institutions began to include it as well. Chrysospathis's initiatives in the country's first orthopaedic clinic included a laboratory in which customised orthopaedic devices were built under his own instruction for people with scoliosis and other deformities and an X-ray diagnostic laboratory that provided radiation therapy. He was the first Greek surgeon to carry out orthopaedic operations, such as transferring healthy tendons to paralysed tendons, reducing the congenital dislocation of the hip joint and correcting orthopaedic distortions.[1, 2, 4, 5, 7]

In 1905, during the 5th Panhellenic Medical Congress in Athens, Chrysospathis displayed the first radiographic images of various bone disorders. Three years later, in 1908, the orthopaedic discipline was established in the Medical School of Athens. Chrysospathis presented his thesis on ankylosing spondylitis and he was appointed Associate Professor of Orthopaedics and Chairman of the Orthopaedic Department at Astykliniki. He continuously worked to promote this newly formed branch of medicine and in 1925 he was elected the first Professor of Orthopaedics and Head Physician of the Hippocrateion Hospital (1926-1938).[1, 2, 4, 6, 8]

Chrysospathis was married to Marika Patsidi and they had a daughter, Anna, who married an Irish physician, Professor Charis Toole (1897-1980), who was later a distinguished surgeon. Chrysospathis was fluent in three languages, Greek, German and French. Among his writings, his treatise titled "Orthopaedics" (1932) stands out—it was the first orthopaedic textbook in Greek for the students of the School of Medicine. He also wrote many manuscripts, such as his thesis "Chronic ankylosing spondylitis" (1907), "Bone tuberculosis of the vertebral spine" (1910) and "Kyrtopodie" (1936). Apart from the art of orthopaedics, Chrysospathis was interested in the history of medicine. For this reason, he published "Orthotics from antiquity until nowadays" (1909), "Hippocratic orthopaedics" (1910) and "The evolution of orthopaedics during the last years" (1917). It is also worth mentioning that around 1901, he took the initiative to publish an advertising text within the public press to further promote orthopaedics. The text implies that he was an expert in

topics such as deformities of the vertebral spine and those caused by chronic arthritis, deformities due to rickets, congenital lameness, fractures of the extremities, lumbar radiculopathy, rheumatism and paralysis caused by central nervous system impairment.[1-4]

Ioannis Chrysospathis died in 1938 and the full extent of his legacy is still buried within the archives of the Athenian University. He fought for separating orthopaedics from general surgery, but he did not live long enough to see orthopaedics recognised as a medical specialty, which only occurred in 1947.[1, 9]

Theodoros Garofalidis (1898-1978)

Figure 3: Theodoros Garofalidis
Source: National and Kapodistrian University of Athens.

Theodoros Garofalidis (1898-1978) was born in Athens where he studied medicine, but his studies were interrupted for the five-year period when he served in the Greco-Turkish War (1919-1922) (Figure 3). In 1924, he continued his education at Asklepieion Voulas, the first sanatorium founded by the Hellenic Red Cross in Athens for children with bone tuberculosis and rickets. Recognising his contribution to the sanatorium's work, the Hellenic Red Cross designated Garofalidis as an internal director. During his training at Asklepieion Voulas, he performed spinal fusion surgery for the rehabilitation of tuberculous spondylitis. He also studied osteomyelitis, poliomyelitis, arthritis, scoliosis and congenital hip dislocation.[2, 8, 10, 11] In 1926, Garofalidis was awarded a doctorate. From 1926 to 1929, he worked at Aretaieion Hospital and then continued his studies in Paris, with a scholarship from the French Government, working next to the paediatric and plastic surgeon Louis Ombrédanne (1871-1956). He returned to Aretaieion Hospital in 1931 and five years later, in 1936, he was appointed Assistant Professor of Orthopaedics at the University of Athens. In 1938, he was appointed Chairman of the Second Orthopaedic Department of Asklepieion Voulas Hospital. In 1944, toward the end of World War II, a Department of Paediatric Surgery and Orthopaedics was established in "Evangelismos General Hospital" in Athens, with Athanasios Contargyris (1892-1954) as the chair. In 1947, this department was renamed as the Department of Orthopaedic Surgery of Athens University Medical School, where Contargyris was appointed as the second Professor of Orthopaedics in Greece. Four years later, the department was relocated to Laikon King's Paul Hospital and in 1954, after Contargyris' death, Garofalidis was elected Professor of Orthopaedics at the University of Athens as well as the chairman of the Orthopaedic Department, from 1956 until 1967.[2, 8, 10]

Garofalidis was married to Aristotle Onassis' sister, Artemis. He was the chair of the administrative council of Olympic Airlines and a board member of the Ministry of Social Welfare. He was also the first Greek orthopaedist to become a corresponding member of the American Orthopaedic Association (1953). In addition, he was the author of more than two hundred scientific papers, including ones of great significance such as "The tuberculosis of the bones and joints" (1945) and "Modern Orthopaedics" (1964) in collaboration with Georgios Hartofilakidis and Christos Rigopoulos. In 1966, Garofalidis was elected Dean of the School of Medicine at the University of Athens. He was also president of the Hellenic Association of Orthopaedic Surgery and Traumatology (HAOST), in 1957 and in 1962, chair of the Higher School of Physiotherapy, the Hellenic Society for the Protection and Rehabilitation of Disabled Children, the Hellenic Red Cross and the Patriotic Foundation for Social Protection and Awareness. In honour of his contributions to the development

of orthopaedics in Greece, the Orthopaedic Department of University of Athens in the "Apostolos Pavlos" Accident Hospital today known as KAT Hospital named its research centre "Th. Garofalidis". He died on 19 August 1978, in Athens.[10, 11]

Georgios Hartofilakidis (1927-2022)

Figure 4: Georgios Hartofylakidis
Source: Private collection.

Georgios Hartofilakidis (1927-2022) was born in Athens and he graduated from the School of Medicine (University of Athens) in 1955 (Figure 4). He undertook postgraduate studies at the Orthopaedic Department at the Laikon King's Paul Hospital, supervised by Garofalidis and later at the Columbia University Medical Centre in New York. In 1960, he was awarded a doctorate in medicine.[10, 11] By the end of 1947, twenty-two pioneering orthopaedists—including the first Greek woman orthopaedic surgeon, Marika Daniilidou—had already founded the HAOST in Greece. The first president of the association was Richardos Livathinopoulos (1868-1954) while Athanasios Contargyris was responsible for editing the first issue of the "Bulletin of the HAOST" (later *Acta Orthopaedica et Traumatologica Hellenica*), which was published in 1948. Years later in 1969, when Hartofilakidis served as a President of HAOST arranged its first scientific meeting in Thessaloniki.[2]

On his own recommendation, which was accepted by the School of Medicine (1969), the Orthopaedic Department of University of Athens was transferred from the Laikon Hospital to the KAT Hospital in 1970. In 1969, Hartofilakidis was elected Professor of Orthopaedics and Chairman of the Orthopaedic Department, a position he held for twenty-five consecutive years while undertaking important, pioneering and enviable work, until his retirement, in 1994. He organised the Department according to international standards and promoted cooperation with specialised departments all over the world in various fields of orthopaedics, bringing pioneer knowledge to the Greek area. In the academic year 1974-1975, he was elected Dean of the School of Medicine at the University of Athens and in 1976-1977, member of the Senate. In 1978, he founded the Laboratory for Research of the Musculoskeletal System "Theodoros Garofalidis" (LRMS) while he contributed to the creation of specialised departments of KAT Hospital such as the Hand, Upper Limb and Microsurgery Department, the Department of Sports Injuries and the Scoliosis and Spine Department. In 1994, he was also awarded the title of Emeritus Professor of Orthopaedics.[2, 10, 11]

Hartofilakidis was the first President of the Hellenic College of Orthopaedic Surgeons (1983-1988) and President of the Higher School of Physiotherapy (1969-1982), as well as Vice President of the Hellenic Society for the Protection and Rehabilitation of Disabled Children in Greece. He was also Vice President of the Education and Post-Education Committee of the Central Board of Health. Furthermore, he held high administrative positions in many hospitals and institutions, such as the KAT Hospital, offering important scientific and administrative work. At the same time, he was a member of various committees on health education issues and of many scientific associations and societies, including the HAOST, the Hellenic Surgical Society, the American Orthopaedic Association, the British Orthopaedic Association and the American College of Surgeons. In addition, he was an active volunteer and scientific director of the Polyclinic of the Olympic Village, thus contributing to the field of Health of Athletes and Volunteers during the 2004 Olympic Games in Athens.[10, 11]

Hartofilakidis devoted his career to establishing and systematising the teaching of the art of orthopaedics to the next generation of orthopaedists. He offered pioneering research work focusing on osteoarthritis of the hip, congenital hip disease and total hip arthroplasty. His authorship includes scientific papers and books both in Greek and English, with many being published after his retirement from the University (within the period from 1994 to 2022). These papers demonstrate his international contribution to the study of hip diseases. He contributed to the establishment of terminology, classification, description of the natural history and surgical treatment of congenital hip disease. All data derived from his invaluable registry established in the early 1970s. This registry includes approximately 1000 total hip arthroplasties, except from other interesting cases, performed by him from 1973 to 1994 and then followed continuously by him during lifetime. It should also be mentioned that the "Hartofilakidis classification of congenital hip disease in adults" is currently used in top-tier orthopaedic centres worldwide.[12]

He has been recognised as the father of modern orthopaedics in Greece.[2] In his honour, among others, the auditorium of KAT Hospital was named "Professor's G Hartofilakidis auditorium" in 2005, an honorary event for his 90 years was held in the Great Hall of the National and Kapodistrian University of Athens in 2017 and Professorship Hall of LRMS was named "Professor's G Hartofilakidis Hall" in 2020. In 2019, he was honoured with the EFORT Recognition Award by the EFORT which recognises his outstanding contribution to worldwide orthopaedic surgery as a lifetime achievement.[13]

Hartofilakidis was married to Anna Gorga, with whom he had two children, Maria and Konstantinos. He passed away in 2022. His excellent ability to deal with difficulties and avoid conflicts will always be remembered as a catalyst for the re-development of orthopaedics in Greece.[11, 13]

What is already known on this topic: the contribution of ancient Greek physicians, such as Hippocrates, to the foundation of practical surgery and orthopaedic art is already known through the study of written and non-written testimonies.

What this study adds: the present study delves into the contribution of innovative doctors such as Chrysospathis, Garofalidis and Chartofylakidis, who dedicated themselves to the emergence of orthopaedics as an independent branch of medical science in Modern Greece.

Conclusion

The field of orthopaedics in Greece gradually evolved over centuries. With the establishment of the Greek State in 1830, several general surgeons focused on diseases of the musculoskeletal system. The innovative achievements of the pioneering doctors profiled in this paper contributed significantly to the development and establishment of orthopaedics as an independent branch of medicine.

Ethics

Our institution does not require ethics approval for articles reporting the history of medicine.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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