

## REVIEW ARTICLE

### A Review of the History of Spine Surgery in Greece until the Middle of the 20th Century

#### Abstract

Spine Surgery began its evolution in the beginning of the 19th century in order to reach nowadays the point of being considered an important subspecialty of Neurosurgery and Orthopaedics. The purpose of this historical review is the search and evaluation of the progress in spine surgery until the middle of the 20th century. This review concerns the inauguration and evolution of this field in Greece. Special references are made to the first achievements of this field, to the pioneers physicians and surgeons (general surgeons, orthopaedic surgeons and neurosurgeons) who inaugurated this subspecialty and to clinical and scientific work of that era. Eventually, the progress of medicine and technology who led to the first achievements of this subspecialty are shown and also the difficulties (both social and scientific) that the pioneers of this field faced are demonstrated. In Greece, with small exceptions, the new techniques emerged with a certain delay.

**Keywords:** Spine Surgery; Trauma; Deformity; Greece; historical review

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## Introduction

The purpose of this historical review is the investigation and evaluation of developments concerning spine surgery (SS) from the early 19th century to the period of the middle of the 20th century. The review concerns the typical international developments with particular emphasis on the creation and development of the specialty in Greece. It is demonstrated that the basic medical and technological developments of the era created the ground on which was built the beginnings of the specialty of SS. Finally, the importance of medical progress and technology is noted that led to early successes and achievements of that particular subspecialty under adverse conditions, social and scientific, experienced by the pioneers of the industry.<sup>1</sup>

## Materials and Methods

Our research was based on findings of literature in greater Athens area, Greece. We had to search material on libraries not online for most of the Greek literature. More specifically we search the library of the Medical School of Athens, the National library, the central library of the University of Athens, the library of the Greek Orthopaedics Society, the library of the Greek Surgical Society, the library of the Greek Neurosurgical Society and in addition hospital libraries mainly the "Evangelismos" Infirmary, the "Aretaieion" University Hospital and the "Asklipieio Voulas" Infirmary which are the oldest hospitals in modern Greece. In addition we had to search online resources for the international history of Spine Surgery (mainly PubMed, Scopus and other databases).

## International developments in medicine and surgery that led to the creation of the industry of Spine Surgery

In the historical investigation of SS one of the most basic parameters is the finding of developments in surgery of the 19th and 20th century, which created the conditions for operations performed in the spine. These breakthroughs were:

- a) the discovery of the contaminating microbes and their nature by Louis Pasteur (1822-1895) and of the bacterium of tuberculosis by Robert Koch (1843-1910).<sup>2,3</sup>
- b) the introduction of the principles of antisepsis and sterility in the surgical field by Joseph Lister (1827-1912) and the use of the tincture of iodine by Antonio Grossich (1849-1926).<sup>4</sup>
- c) the introduction of anesthesia in surgery, by William Thomas Green Morton (1819-1868), Robert Liston (1794-

- 1- Margotta, 1996: 40-65.
- 2- Varvarousis, 1996: 209-358.
- 3- Margotta, 1996: 40-65.
- 4- Ackerknecht, 1982: 340-372.



1847), Sir James Young Simpson (1811-1870) and Albert Friedrich Emil Niemann (1834-1861).<sup>5</sup>

d) the determination of the "spinal unit" by Christian Georg Schmorl (1861-1932) in 1926 which spurred biomechanical studies of the vertebral column.<sup>6</sup>

e) The observation of Loyal Davis (1896-1982) in 1929 characterizing a fracture as stable or unstable.<sup>7</sup>

f) the discovery of X-rays by Conrad Roentgen (1845-1923) in 1895 and their production in the tube that was invented by William Crookes (1832-1919) in 1874 that enabled imaging and diagnosis of diseases of the spine, especially its fractures.<sup>8</sup>

### International developments in spine surgery

In the 5th century BC, Hippocrates was the first to describe the fractures and dislocations of the spine and proposes their conservative treatment, suggesting that their surgical intervention was devastating. Avicenna followed in the Middle Ages,<sup>9</sup> Ambroise Parre in the Renaissance<sup>10</sup> and Malaigne in 1847.<sup>11</sup> Lorenz Bohler (1885-1973), William Steele Haughton (1869-1951)<sup>12</sup> and Sir Geoffrey Jefferson (1886-1961)<sup>13</sup> suggest the hyperextension of the spine. B.F. Wilkins introduced fusion with wire.<sup>14</sup> Hubert von Luschka (1820-1875)<sup>15</sup> describes with remarkable accuracy the nucleus pulposus. Charles Elsberg (1871-1948)<sup>16</sup> in New York named their extradural chordomas tumors and was the first to attempt the opening of the spinal canal. Alfred W. Adson (1887-1951) and W. Ott announced the first successful removal of tumors and results suggested that these tumors in their majority were nothing but the intervertebral disc itself.<sup>17</sup> W. Scott used the contrast injection into the spinal canal and gradually established the spinal myelography.<sup>18</sup>

Surgical reconstruction efforts were made by Jules Guerin (1801-1885), Joseph-François Malgaigne (1806-1865), Richard von Volkmann (1830-1889), Sir William Arbuthnot Lane (1856-1943), Hermann Julius Von Lackum (1802-1884) and P. Harmon. The use of grafts was first introduced by Russell Hibbs (1869-1932).<sup>19</sup>

### Developments in Spine Surgery in Greece until the 2nd World War

In the evolution of the spine surgery in Greece a prominent role played the surgical clinics where orthopedic surgeons were trained with the one of the "Aretaieion" Hospital as the most significant. Moreover, significant presence and activity

- 5- Margotta, 1996: 40-65.
- 6- Varvarousis, 1996: 209-358.
- 7- Ibid.
- 8- Margotta, 1996: 40-65.
- 9- Avicenna, 1564: 483-547.
- 10- Paré, 1598: 632-749.
- 11- Malaigne, 1847: 47-68.
- 12- Haughton, 1866: 23-34.
- 13- Jefferson, 1920: 407-22.
- 14- Hadra, 1891: 423-32.
- 15- Luschka, 1858: 132-56.
- 16- Elsber, 1916: 237-311.
- 17- Adson *et al.*, 1922: 522.
- 18- Scott *et al.*, 1944: 241-9.
- 19- Walker, 2004: 163-78.





was observed in the surgical department of the “Evangelismos” Infirmary (figure 1-2) and the newly founded hospital of the Greek Red Cross, “Asklepíeio Voulas” Infirmary (figure 3) (1920).<sup>20</sup>

20- Varvarousis, 1996: 209-358.



*Figure 1. The historical first building of the “Evangelismos” Infirmary in Athens at the beginning of the 20th century.*



*Figure 2. Contemporary air photography of the “Evangelismos” Infirmary. In the front is the historical first building. In the rear, the modern accommodation of the Infirmary.*





*Figure 3. Aspect of the modern front view of the “Asklepieio Voulas” Infirmary. As a former hospital of the Greek Red Cross, in here the first spine operations in Greece were performed.*

It seems that the modern era of surgery of the spine in Greece followed the international with a short delay. Although a scientific interest was active in Greece by 1900 when Krokkidias Spyridon presented a work for spinal deformity from rickets,<sup>21</sup> Nicholas Alivizatos prepared a dissertation fellowship entitled “On the treatment of the Pott disease and the very abrupt alignment of the spine under chloroform by a new device”<sup>22</sup> and Ioannis Chrysospathis prepared a PhD thesis and dissertation on fellowship,<sup>23,24</sup> the first attempts at surgical treatment is quite delayed. Specifically, the first operations were performed in the 1920s originally in the “Asklepieio Voulas” Infirmary. The first attempts at fusion with the Albee technique were made by T. Garofalidis in 1926 ( PhD thesis Garofalidis T )<sup>25</sup> and V. Kourias in 1928.<sup>26</sup> In the Annals of the Greek Surgical Society in 1929, A. Contargyris also publishes a case of a patient operated in 1928 for lumbar spondylitis with the fusion technique Albee-Fokas. This was a modification of the classic Albee technique by Gerasimos Fokas, professor of surgery at the “Aretaeio” Hospital.<sup>27</sup>

V. Kourias attributed to Matthaïos Makkas, in 1934, the first discectomy of intervertebral disc in Greece (Greek Surgical Society newsletter) and reported his own case.<sup>28</sup> M. Makkas had worked at the “Evangelismos” Infirmary until 1930 and then on he continued in the “Asklepieio Voulas”

- 21- Chrysospathis, 1937: 125-86.
- 22- Alevizatos, 1907: 83-109.
- 23- Chrysospathis, 1907: 22-89.
- 24- Chrysospathis, 1908: 28-49.
- 25- Garofalidis, 1928: 15-87.
- 26- Kourias, 1943: 31-2.
- 27- Contargyris, 1928: 87-98.
- 28- Kourias, 1943: 31-2.





Hospital which was the hospital of the Greek Red Cross. He performed his first discectomy the same year that W. Dandy did, suggesting that individual efforts of Greek surgeons were found occasionally in the global vanguard of spine surgery. Moreover, A. Xanthopoulos, in 1935, reports a drainage of an abscess in acute osteomyelitis of the spine.<sup>29</sup> Such cases therein were mentioned by Garofalidis T. and C. Toole.<sup>30</sup> At about the same time, in the 1930s, reports are made of the first attempts at surgical correction of scoliosis with spinal fusion with the Albee technique by A. Chatzigeorgiou and T. Garofalidis.<sup>31</sup>

Significant boost in spine surgery at that period was given by Ioannis Chrysospathis with the establishment of the chair of Orthopaedics at the National University of Athens and the fellowship thesis "On chronic ankylosing spondylitis" and the work of A. Contargyris, who succeeded him.<sup>32</sup>

Also an important role at the time had the establishing of the aforementioned "Asklepieio Voulas" Infirmary, the foundation of the first Orthopaedics Clinic at the General Hospital of Athens, in 1939, under Michael Chrisafis, the establishment of the Orthopaedic Clinic of the "Evangelismos" Infirmary at the initiative of A. Contargyris in 1944, who became its first director<sup>33</sup> and the formation of the first Neurosurgery Department in 1939 at the "Agios Savvas" Hospital.

### **Greek literature and scientific work of the early period**

In this early period of the development of SS, in the literature demonstrating early writings in the Greek area. In this time in Greece existed only a Medical School, the one of the National University of Athens, in which the first doctoral theses and dissertations for fellowship were drafted. The most important of these were:

- 1) Palamidis A. (1942) "Kummell-Verneil disease or traumatic spondylitis." PhD Thesis, Athens 1942.<sup>34</sup>
- 2) Chrysospathis I. (1907) "Ankylosing spondylitis" PhD Thesis, Athens 1907.<sup>35</sup>
- 3) Alevizatos N. (1900) "On the treatment of the Pott disease and the very abrupt alignment of the spine under chloroform by a new device" PhD Thesis, Athens 1907.<sup>36</sup>
- 4) Chrysospathis I. (1908) "On chronic ankylosing spondylitis" Thesis for fellowship, Athens 1908.<sup>37</sup>
- 5) Garofalidis T. (1928) "Contribution to the study of the treatment of tuberculous spondylitis by the Albee surgical technique." PhD Thesis, Athens 1928.<sup>38</sup>

At the same era, the first publications were made in the

- 29- Xanthopoulos, 1935: 182-9.
- 30- Garofalidis *et al.*, 1935: 282-4.
- 31- Mihalatos *et al.*, 1979: 73-8.
- 32- Varvarousis, 1996: 209-358.
- 33- Ibid.
- 34- Palamidis, 1942.
- 35- Chrysospathis, 1907: 22-89.
- 36- Alevizatos, 1907: 83-109.
- 37- Chrysospathis, 1908: 28-49.
- 38- Garofalidis, 1928: 15-87.



Greek and international medical press of general articles and references to the literature by Greek physicians and surgeons. This fruitful scientific work demonstrates the interest of surgeons of that era for the emerging field of SS. It also demonstrates the effort to follow international trends in the treatment of spine disease. This activity decreases sharply with the beginning of the 2nd World War and the Civil War that followed.

One observes that most communications - publications of scientific work of the era, with regard to the spine, were published in the official journal of the Greek Surgical Society. This is rather predictable since at that time the Orthopaedic Surgery and Neurosurgery had not yet become autonomous medical specialties. Regarding the medical literature of that era, the first anatomical description of the spine in modern and systematic way by George Sklavounos in 1915,<sup>39</sup> the pathology of Mellisinos,<sup>40</sup> the chapters on Spine Surgery in the books of that era and the first textbook of orthopaedics in Greek, "Orthopaedics" by I. Chrysospathis in 1932<sup>41,42</sup> stand out. Noteworthy are the publications of Nicholas Christeas, Greek and international,<sup>43-46</sup> since they reflect the European and international trend to shift towards experimental surgery of which he was one of the pioneers in Greece.

Of particular importance is the work of Papaioannou Loukas<sup>47,48</sup> in 1889. It is the oldest publication in Greece on the SS and covers the historical origins of nomenclature (anatomical and physiological) of deformities and other elements. Moreover, a special reference should be made to the publication of Petrou in 1897 in the journal "Revue d' Orthopedie". This relates to the description of tuberculous spondylitis (Pott disease) in international journals and is the oldest international publication for the SS by a Greek physician.<sup>49</sup>

It is clarified that most publications concerning that era concern conservative treatments for the diseases of the spine using braces. Remarkable is the treatment recommended by T. Garofalidis and P. Alevisatos for fractures of the vertebrae with bed rest and bracing in traction.<sup>50</sup> This mindset reflects the reluctance of surgeons of this era to intervene surgically in spine due to lack of experience but also because of the frequent report of devastating complications resulting in disability and poor postoperative outcomes.

The most significant of these references by Professor Nicholas Giannestras reflects the international preference for conservative treatments.<sup>51</sup> This publication has a special significance since it is the most important publication in this

- 39- Sklavounos, 1915: 143-98.
- 40- Melissinos, 1927.
- 41- Varvarousis, 1996: 209-358.
- 42- Chrysospathis, 1932.
- 43- Christeas *et al.*, 1940: 169-92.
- 44- Christeas, 1938b: 434.
- 45- Christeas, 1938a: 227-35.
- 46- Christeas *et al.*, 1938: 184-98.
- 47- Papaioannou, 1889: 629-43.
- 48- Karaberopoulos, 2009: 342.
- 49- Petrou, 1897: 125-9.
- 50- Garofalidis *et al.*, 1935: 282-95.
- 51- Giannestras, 1938: 1050-2.



field from a Greek doctor in the prewar years by a prominent Greek-American professor of Orthopaedics in Pennsylvania, USA. He played an important role in SS internationally in the second half of the 20th century, and in Greece he defined the evolution of SS by being the first to apply spinal fusion with metallic orthopedic implants.<sup>52</sup>

52- Varvarousis, 1996: 209-358.

### Conclusion

From the above it becomes clear that the productivity, surgical and scientific, of the pioneers of SS in Greece in the first half of the 20th century was ample. They made a concerned effort to follow the international developments and in some cases, as in the first discectomy in 1934 by M. Makkas, they were found in the international forefront. This activity keeps unabated initially but it decreases dramatically due to the difficult conditions that occur with the onset of the 2nd World War and later with the Greek Civil War. In these early years the role of the Medical School of the University of Athens and the Greek Surgical Society is instrumental in the development of this specialty since the Orthopaedic Surgery and Neurosurgery were not yet independent specialties, but they were carried out as parts of General Surgery.

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