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Angiography: In the shadow of a non-consensual Nobel

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Abstract. The most prolific period of medical research in Portugal, spanning approximately the 1930s to the 1960s of the 20th century, is often overshadowed by Moniz's controversial Nobel Prize for his work on prefrontal leucotomy. Despite the importance of their contributions, the achievements of Portuguese researchers have not received proper recognition in the history of medicine. While Egas Moniz's Nobel Prize for prefrontal leucotomy brought international attention to Portuguese medicine, it also eclipsed the pioneering work of the Porto School of Angiography. This article aims to systematically document the international impact of the Porto School, focusing on its network, innovations, and enduring influence on the field of radiology. This article aims to highlight the network of researchers and their impact on radiology, shedding light on their contributions to the international scientific community. systematically review and assess the international scientific impact of the Porto School of Angiography and its network of collaborators, highlighting their role in the development of radiology and vascular imaging. The study examines the international impact of the Porto School of Angiography from 1928 to 1970 through the work of investigators who collaborated with the Laboratory of Experimental Surgery based in Porto. We utilized three major databases—ISI Web of Science, Scopus, and Scimago—to select journals in the specific research fields of radiology, nuclear medicine, and imaging, and to track references to investigators from the School of Porto. Articles were accessed through PubMed, Google Scholar, or printed formats from online library resources. From a total of 44 documented collaborators, eight investigators were frequently cited as first authors in our timeline study. Sousa Pereira was the most cited author with his work on portography. The study also addresses challenges faced by the School, including language barriers, which may have affected its international recognition. This research not only sheds new light on the international impact of the Porto School of Angiography but also emphasizes the importance of accurate historical attribution in scientific achievements.

Key words: Portuguese School of Angiography, Portography, Radiology

Introduction

Aneurysms, tumors in any vascular corner of our body, aortic dissections, arteriovenous malformations - all possible, relentless causes of death, depending on size, place, and luck. However, in the time that we live right now, luck is being replaced by certainty and timing. We only need an image from the inside of the body. An intravenous contrast through a small catheter in a patient's arm with radiological equipment allows us, in a few minutes, to predict the future of that patient. Even in acute life-threatening conditions as an emergency surgery, the urgent decision-making is most often preceded by radiology intervention (1). With the discovery of X-rays by Roentgen in 1895 (2), it became possible to see inside the body without any surgical incision, where the prognosis remains restricted and success uncertain (3). Surgeons and patients grew expectations and ambitions, and medicine entered the 20th century with the optimism and safety

of a predictable science. During the first years, X-rays were mostly used for diagnosing fractures and localizing foreign bodies (4). Doctors were searching for new applications for this technology. In 1919, Dandy published the first images of the brain through ventriculography (5), which was met with poor acceptance from the neurological community because of the danger it posed to patients. This research established the conceptual and methodological groundwork that would later culminate in Moniz's introduction of encephalography in 1927 (6). Almeida Lima and Moniz came to the idea of injecting a radiopaque substance into the carotid arteries (7), and they succeeded in developing a diagnostic tool for localizing brain tumors, which is used today for detecting cerebral vascular abnormalities (8). Almeida Lima and Moniz were not alone. Two years later, Reynaldo Dos Santos, Augusto Lamas and Pereira-Caldas introduced aortography and arteriography of peripheral vessels (9), Lopo De Carvalho developed pulmonary angiography, João Cid Dos Santos discovered phlebography (10), and Hernâni Monteiro, Álvaro Rodrigues, Sousa Pereira and Roberto De Carvalho described lymphangiography in 1931 (11). There was a comprehensive national angiography investigation involving Porto and Lisbon medical schools. The so-called Portuguese School of Angiography (12) is the only pioneering scientific period in modern history and medicine to have been made in Portugal (13). Due to their research, Egas Moniz and Sousa Pereira were even nominated for the Nobel Prize (14,15). However, Egas Moniz won the Nobel Prize for Medicine in 1949 (16) for a different investigation that he introduced later: the prefrontal leucotomy, which was used for the treatment of psychoses (17). The awarding of this Nobel Prize has faced criticism, and Moniz was accused of inadequate documentation about the investigation and poor patient follow-up (18). Following Moniz´s surgical techniques, a lot of physicians such as Walter Freeman and James Watts adopted leucotomy, and it became a mainstay of surgical psychiatric treatment worldwide, although with controversial use and disturbing results (19). All this global attention obscured the school of angiography, which had been created in the meantime. Its advances and their diagnostic and therapeutic impact until today did not receive proper recognition in the field of history of medicine.

The Royal Surgical Schools of Porto and Lisbon were created in 1825 by the influence of Teodoro Ferreira de Aguiar, Chief Surgeon of the Kingdom, with the contribution of others in a collective effort by "very intelligent people," according to the words of King João VI (20) during a period of political turmoil and pending civil war that occurred some years later (1828-1834). Despite being closely influenced by national politics and a lack of funding, both institutions tried to survive and improve medical care in Portugal (21). But only in the twenties of the 20th century, favorable conditions would arise to carry out medical research in Portugal. Egas Moniz (Lisboa) traveled to Paris and, having met the work of Pierre Marie, Babinski and Sicard (22) readily started investigations with Almeida Lima in 1924 (23) and later with Lopo de Carvalho, with the support of Institute Rocha Cabral by Ferreira de Mira (24). A few years before, Reynaldo Dos Santos (based in Lisbon) visited the United States and had contact with Cushing and Alexis Carrel (25). After that, Reynaldo Dos Santos, Pereira Caldas, and Augusto Lamas initiated the experiments at Arroios Hospital in Lisbon (26). The investigations in the School of Lisbon highlighted the work and relationships of Egas Moniz and Reynaldo dos Santos, and their groups were already being studied by some Portuguese historians within a national framework (27).

Based in Porto, Hernâni Monteiro created a Laboratory of Experimental Surgery in 1928 at the Faculty of Medicine of Porto. Unlike his colleagues in Lisbon, he gathered all investigations at this place in a unified single team (28). Álvaro Rodrigues, Sousa Pereira and Roberto de Carvalho were Monteiro´s main collaborators in the imaging studies (29). Although we have some publications on the biographical aspects of all investigators at the School of Porto individually (30–35), there was no information on whether they were actually relevant to the international scientific community at that time. The present article aims to document for the first time the network of researchers and advances made in radiology as well as their international impact in the shadow of Moniz's non-consensual Nobel Prize, with a focus on the School of Porto.

Material and methods

To assess the international impact of the Porto School of Angiography, we established the timeframe of this study between 1928—the year Hernâni Monteiro founded the Laboratory of Experimental Surgery—and 1970, as the political upheavals of the 1960s in Portugal significantly disrupted the institution's activities and nearly led to its dissolution (29). A PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) approach was employed (36), incorporating only digital archival research. Three major databases (ISI Web of Science, SCOPUS, SCIMAGO) were searched for citations of Porto School investigators in radiology, nuclear medicine, and imaging journals (1928–1970). Articles were accessed via PubMed, Google Scholar, and online library archives. Inclusion and exclusion criteria, as well as data extraction processes, were explicitly defined on Table 1. We identified 96 journals indexed in the SCOPUS database, 335 indexed in SCIMAGO Journal and Country Rank and 139 journals indexed in the Web of Science Master Journal List on Science Citation Index Expanded (SCI). Among them, we organized the journals that coexisted and excluded all journals that were created after 1970 The remaining 24 journals are presented in Table 3. All the journals were ordered by their first year of publication.

The subjects of our analysis were constituted by 44 investigators (28) who collaborated and published with the laboratory during 1928-1970 (Table 2). The keywords used were firstly each investigator's name (Table 2) and their affiliation, "Faculty of Medicine of

Table 1. Criteria of inclusion and exclusion for authors and publications

Inclusion Investigators affiliated with the Porto School of Angiography (1928–1970). Publications in radiology, nuclear medicine, and imaging journals indexed in ISI Web of Science, SCOPUS and SCIMAGO. Articles available via PubMed, Google Scholar, and online library archives.
Exclusion Journals established after 1970. Non-indexed or non-peer-reviewed publications. Secondary analyses or non-authentic documents.

Table 2. List of collaborators of the Porto School of Angiography

Abel Tavares
Aguiar Nogueira
Afonso Guimarães
Albano Ramos
Alberto Sousa
Alfredo Araujo
Alfredo Veiga
Alvaro Rodrigues
Amândio Tavares
Antonio Coimbra
Armando Tavares
Cadete Leite
Carlos Jorge
Casimiro Azevedo
Castro Correia
Daniel Serrão
Esperança Pina
Fernando Magano
Hernani Monteiro
Izolette Amaral
Joaquim Bastos
José Trigueiros
Julio Costa
Krug Noronha
Luís de Pina
Lino Rodrigues
Mello Adrião
Moreira da Silva
Nuno Grande
Pereira Leite
Pinto Machado
Pires de Lima
Quintino Rogado
Rocha Melo
Roberto Carvalho
Rodrigues Canedo
Rogerio Gonzaga
Rui Abrunhosa
Silva Pinto
Sousa Pereira
Sousa Pinto
Tomé Ribeiro
Valdemar Cardoso

Table 3. List of eligible journals

JOURNAL	FIRST YEAR OF PUBLICATION
Röfo - Fortschritte Auf Dem Gebiet Der Röntgenstrahlen Und Der Bildgebenden Verfahren	1897
British Journal Of Radiology	1896
American Journal Of Roentgenology	1906
Radiología	1912
La Radiologia Medica	1914
Bulletin du Cancer	1914
Acta Radiologica	1921
Radiology	1923
Clinical Radiology	1949
Radiation Research	1954
Physics In Medicine And Biology	1956
Health Physics	1958
International Journal of Radiation Biology	1959
Clinical Radiology	1960
Journal of Nuclear Medicine	1960
Journal Of Radiation Research	1960
Nuklearmedizin	1961
Acta Oncologica	1963
Radiologic Clinics of North America	1963
Radiology and Oncology	1964
Investigative Radiology	1966
Canadian Association Of Radiologists Journal	1966
Seminars In Roentgenology	1966
Neuroradiology	1970

Porto/ University of Porto". However, assessment of citations of a particular scientific article is a method to evaluate the impact of its author or authors on the international scientific community (37). We were only able to accurately identify one cited article after 1965 when structured papers with Introduction, Methods, Results, Discussion, and References began to predominate (38) – it was indeed only in 1978 that this structure became a requirement by several biomedical journal editors (39). As a result, we have to searched each investigator (author) of the Medical Porto School in the "References" section of each article published in all indexed journals under the subject category "Radiology", "Nuclear Medicine" and "Imaging" in ISI Web of Science, SCOPUS and SCIMAGO Journal Country Rank, from 1928 until 1970.

Secondly we use the following keywords: "Porto", "Porto School" and "Portugal", as core institutional and geographic terms; "angiography,", "angiogram", "angiographic, "arteriography", "arteriogram", "venography", "venogram", "phlebography", "lymphangiography", "portography", "cerebral angiography", "coronary angiography", "pulmonary angiography", "aortography" based on individual publishing curriculums of each author and combine these terms in various ways to improve our accuracy and try to obtain a higher number of articles. To ensure transparency and reproducibility of the search strategy, we conducted a systematic search within the reference sections of articles published in target journals covering the period 1928–1970, documenting all search terms, databases, and journals consulted throughout the process.

The articles of each journal were obtained through PubMed, Google Scholar and Journal Archives if the article was available online, or in printed format by direct online journal library access. We use a standardized form to extract author, year, article title, journal, type of study, and number of citations.

Results

Of the forty-four documented collaborators, eight individuals are identified as first authors in at least one publication produced between 1928 and 1970. Abel Tavares, Albano Ramos, Álvaro Rodrigues, Hernâni Monteiro, Melo Adrião, Sousa Pereira and Roberto de Carvalho were the often-cited authors in the imaging studies. We present the results in a bar graph organized by year and number of citations (Figure 1). The most cited author is Sousa Pereira with a total of 39 citations, followed by Abel Tavares with 12 citations, Albano Ramos with 10 citations, Álvaro Rodrigues and Hernâni Monteiro with nine citations each, Roberto de Carvalho with eight citations, Melo Adrião with seven citations and Lino Rodrigues with four citations. The most cited works are "Phlebography

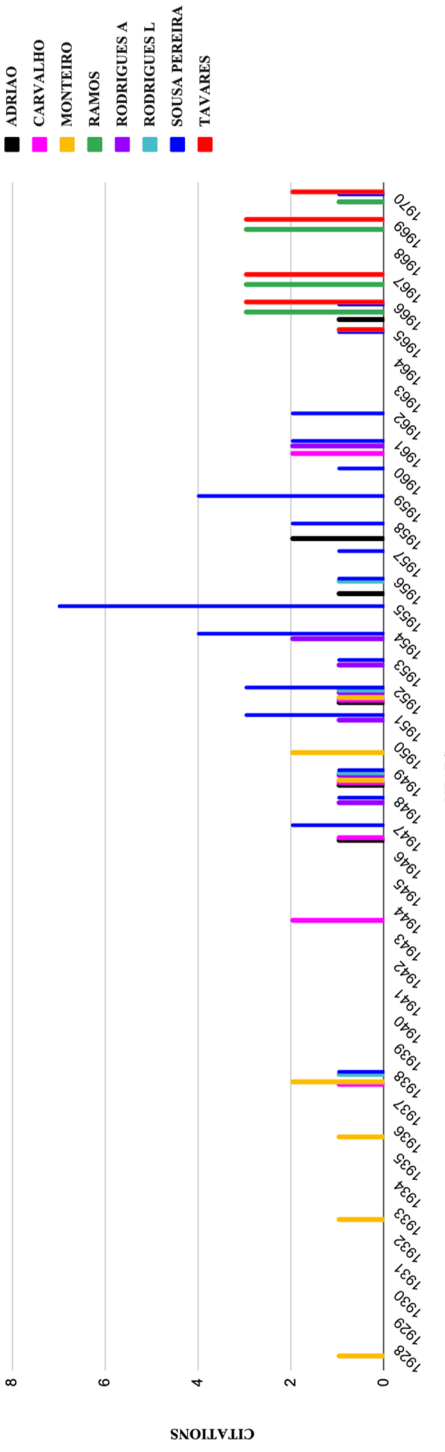

Figure 1. Citations of Porto School of Angiography authors in international radiology journals (1928-1970). The bar graph illustrates the number of citations for eight frequently cited authors from the Porto School of Angiography in international radiology journals between 1928 and 1970. The x-axis represents the years, while the y-axis shows the number of citations. Each bar is color-coded to represent different authors. The graph shows two notable periods of increased citations: 1951-1962 and 1966-1970, and it is seen that Sousa Pereira emerges as the most cited author.

in the study of disorders of the portal circulation" from Sousa Pereira, presented at a conference in 1949 (40) and published in 1945 (41) and "Collateral Venous Circulation in superior vena cava obstruction" by Abel Tavares and Albano Ramos published in 1965 (42). The journal where we could find 43% of the references from this School of Porto is "Radiology", which is nowadays the journal in imaging studies with the highest impact factor (43–45) that already existed during the timeline of this study, followed by Acta Radiologica and British Journal of Radiology which have high historical value in radiologic literature (38). Analysis of citation data revealed that references to the Porto School's investigation peaked during two distinct periods: from 1951 to 1962, and again from 1966 to 1970. These intervals correspond to periods of heightened international attention and increased publication output. We found a total of 98 citations in international journals that are currently indexed in ISI Web of Science, SCOPUS and SCIMAGO Journal Country Rank, between 1928 until 1970.

Discussion and conclusion

This study sheds new light on the presence of the Porto School of Angiography in the international scientific context within the imaging field, particularly in studies of the venous system, namely hepatic circulation and collateral circulation of the vena cava. At the same time, results showed increasing advances in radiology research from the School of Porto independently of the international attention given to the new neurological surgical technique developed by Egas Moniz at that time. We find undoubtedly objective references to this School of Porto and its investigators. However, a disparity arose between the number of known collaborators from the national bibliography (forty-four, see Table 2) and the number of relevant authors (eight), according to the methods and findings of this research. This comparison reveals the different reality between the historical articles produced in an academic context for a national frame that has been written about the School of Porto - where the investigations about lymphangiography stayed as the most widespread imaging studies in the international panorama - and the sample of its international impact that we are presenting in this article. In this regard, we demonstrate for the first time that portography is the most cited innovation.

The strengths of this study lie in the objective sources used to demonstrate the worldwide trends in imaging studies during our defined timeline (1928-1970). However, the number of citations is probably underestimated. Despite Hernâni Monteiro, Álvaro Rodrigues, Sousa Pereira, and Roberto de Carvalho publishing the first studies on lymphangiography in 1931, most international peers cited John Kinmonth (46). This author published only in 1952 and is considered a pioneer of the technique of dye injection into lymphatic vessels (46). Portography and the studies of venous vessels had the same fate: we see a lot of references to Lucien Leger as the first to describe portal venography in 1951 (47). However, Leger himself wrote in his article, published in 1955 that Sousa Pereira and his colleagues were the first to demonstrate that technique (48). Most authors stated that Abeatici and Campi were pioneers in performing portal venography, without quoting Sousa Pereira (49). There is a tendency to cite more recent or widely known publications over earlier ones, especially if those early and seminal articles are written in a non-mainstream language that is not commonly used within the scientific community. The language barrier (50) could also explain the discrepancy between the number of known collaborators and the number of internationally cited authors. Despite their important contributions, the international recognition of the Porto School was limited by several factors. Chief among these were language barriers (most articles were published in Portuguese), periods of political instability in Portugal, and publication practices of the time, which often favored more widely known or more recent sources. These challenges collectively hindered the global visibility and acknowledgment of the Porto Medical School's achievements.

The political environment in Portugal during the sixties, which culminated in the Carnation Revolution in 1974, had serious consequences for a lot of institutions. The Faculties of Medicine of Porto and Lisbon were no exceptions, which could have contributed negatively to the international visibility and recognition of the School of Porto's investigations.

Our study is not devoid of limitations. Firstly, we could not collect all the sample papers that we set out to research. We have accessed only the articles published after 1949 from the journal "Röfo - Fortschritte Auf Dem Gebiet Der Röntgenstrahlen Und Der Bildgebenden Verfahren", after 1964 from the journal "Radiation Research" and after 1975 from "La Radiologia Media", which could hypothetically lead to fewer number of citations identified. We excluded all journals not indexed until the year of 2023, which may reduce the oversight of the School of Porto on the history of radiology. Although scientific publishing has approximately 350 years of historical background, the practice of peer-reviewing of medical journals as a gold standard started only after 1965 (37), with direct effects on the accuracy of referenced authors. This type of publication practice had a significant impact on international recognition of the Porto School of Angiography (37). With these findings, the study underscores the need for more comprehensive historical research to ensure accurate attribution of scientific discoveries and techniques. Even with these weaknesses, it is now clear through this investigation that the Angiography School of Porto created by Hernâni Monteiro in 1928 had a major role in the current knowledge of venous and lymphatic vessel anatomy and pathophysiology, especially in the studies of the portal venous system introduced by Sousa Pereira, cementing its rightful place in the international History of Medicine of the twentieth century. It also reveals that despite all the challenges in funding and political stability, the contributions to vascular imaging have had a lasting impact on our understanding of vascular anatomy and pathophysiology. The most frequently cited work from the Porto School was Sousa Pereira's publication, "Phlebography in the study of disorders of the portal circulation. This review objectively documents the international scientific footprint of the Porto School of Angiography, particularly in studies of the venous system. The analysis reveals a discrepancy between the number of national collaborators and those recognized internationally, likely due to language barriers and the tendency to cite more recent or widely known publications. The Porto School of Angiography played a pivotal role in advancing the field of vascular imaging. Sousa Pereira's research on portography stands out as a landmark contribution. This review underscores the importance of thorough historical research and accurate attribution in the history of medicine. The legacy of the Porto School endures in modern radiology, underscoring the importance of recognizing underappreciated scientific achievements.

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References

1. Leppäniemi A. Organization of emergency surgery. Br J Surg 2014; 101: e7–e8.
2. Röntgen, W. Eine neue Art von Strahlen. Würzburg: Verlag der Stahel'schen K. Hof- Und Universitäts -Buch-Und Kunsthandlung; 1895.
3. López-Valverde A, Montero J, Albaladejo A, Gómez de Diego R. The Discovery of Surgical Anesthesia: Discrepancies Regarding Its Authorship. J Dent Res 2011; 90:31–4.
4. Kilgore EJ, Elster AD. Walter Dandy and the history of ventriculography. Radiology 1995; 194:657–60.
5. Dandy W. Roentgenography of the brain after the injection of air into the spinal canal. Ann Surg 1919; 70:397–403.
6. Moniz E. L'encéphalographie artérielle, son importance dans la localisation des tumeurs cérébrales. Rev Neurol (Paris) 1927; 2:72–90.
7. Moniz E. Les injections carotidiennes et les substances opaques. Presse Med 1927; 63:969–71.
8. Lutters B, Koehler PJ. Cerebral pneumography and the 20th century localization of brain tumours. Brain 2018; 141:927–33.
9. Dos Santos R, Lamas A, Pereira Caldas J. A arteriografia dos membros. Med Contemp 1929; 16.
10. Cid Dos Santos. A Flebografia. Med Contemp 1937; 10.
11. Carvalho R, Rodrigues A, Sousa Pereira A. La mise en evidence, par la radiographie du système lymphatique chez le vivant. Ann Anat Pathol Anat Norm Med Chir 1931; 8:193–7.
12. Benton C. Book review: Pioneers in Angiography 2d ed. Radiology 1988; 69:634.
13. Alves M, História da Medicina em Portugal. Porto Editora; 2014.

14. Pina ME, Correia M. Egas Moniz (1874-1955): cultura e ciência. Hist cienc saude-Manguinhos 2012; 19:431–50.
15. Janeiro C, Ferraz A. António de Sousa Pereira (1904-1986) The Nobel Prize nomination. Vesalius : acta internationales historiae medicinae 2020; 26:206.
16. Reis M. Nobel. Os oito portugueses que ficaram a um passo do prémio. Jornal I 2009; 12:32–3.
17. Tan SY, Yip A. Antonio Egas Moniz (1874-1955): Lobotomy pioneer and Nobel laureate. Singapore Med J 2014; 55: 175–6.
18. Moniz E. Les premières tentatives opératoires dans le traitement de certaines psychoses. Encéphale 1936; 31:1–29.
19. Mehta SS, Vadali S, Singh J, Sadana S, Singh A. The Legacy of Egas Moniz: Triumphs and Controversies in Medical Innovation. Cureus 2024; 16.
20. Botelho LS. Teodoro Ferreira de Aguiar. Rev Port Cardiol 1995; 144:343–4.
21. Monteiro H. Origens da Cirurgia Portuense. Porto: Araújo & Sobrinho; 1926.
22. Antunes L. Egas Moniz - uma biografia. Lisboa: Gradiva; 2010.
23. Macedo M. The "Portuguese School of Angiography". Rev Port Cardiol 1999; 19:9–10.
24. Sociedade Ciências Médicas. Actas da sociedade. Lisboa: Imprensa Nacional; 1946.
25. Veloso AJ. Médicos e Sociedade. Lisboa: By the Book; 2017.
26. Cid Dos Santos. In memoriam Reynaldo dos Santos: profile of a scientist. J Cardiovasc Surg 1971; 12:78–81.
27. Reis M. Imagem médica - sua génese e paradigma - interação com a urgência extra-hospitalar. Porto: Tese de Doutoramento em Ciências Médicas-ICBAS; 2012.
28. Monteiro H. O Laboratória de Cirurgia Experimental da Faculdade de Medicina do Porto. Lisboa: Bertrand (Irmãos); 1942.
29. Tavares AS. O Instituto de Anatomia da Faculdade de Medicina do Porto. Porto; 2000.
30. Janeiro C. António de Sousa Pereira. Porto: Tese de Mestrado em Medicina - FMUP; 2017.
31. Leal M. Vida e Obra do Professor Doutor Álvaro António Pinheiro Rodrigues. Tese de Mestrado em Medicina - FMUP; 2014.
32. Magalhães R. A Vida e Obra do Professor Doutor Abel Sampaio Tavares. Tese de Mestrado em Medicina - FMUP; 2020.
33. Teixeira A. O Professor Universitário Manuel de Melo Adrião. O Exemplo do Humanismo na Medicina. Tese de Mestrado em Medicina - FMUP; 2022.
34. Ferraz A. Hernâni Monteiro. Figura Eminente da U.Porto. Porto: Universidade do Porto; 2018.
35. Teixeira S. Albano Ramos, Radiologista e Professor Universitário de Excelência. Tese de Mestrado em Medicina - FMUP; 2019.
36. Yi H, Cao Y, Leng Q, Wang Y, Zhang G, Mao Y. The impact of open access on citations, pageviews and downloads: a scientometric analysis in Postgraduate Medical Journal. Postgrad Med J 2024; 100:679–85.
37. Sollaci LB, Pereira MG. The introduction, methods, results, and discussion (IMRAD) structure: fifty-year survey. J Med LibrAssoc. 2004; 92:364–7.
38. Marta M, A brief history of the evolution of the medical research article. Clujul Med 2015; 88:567–70.
39. Cohn I, Gage IM. Thirteenth Congress of the International Society of Surgery. New Orleans: Wetzel Printing; 1949.
40. Sousa Pereira. Phlebography in the study of disorders of the portal circulation. Lyon Chir. 1951; 46:291–302.
41. Tavares A, Ramos A. Collateral venous circulation in superior vena cava obstruction. J Fr Med Chir Thorac. 1965; 19:253–65.
42. Clarivate. Web of Science. Master Journal List. Science Citation Index Expanded (SCIE). Available from:
43. https://mjl.clarivate.com://search-results?issn=2366-004X,1076-6332,0284-1851,0195-6108,0361-803X,0914-7187,1931-7557,0007-1285,0846-5371,1740-5025&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-these-results.
44. Scopus. Journal ranking. Saved List 1. Available from: https://www.scopus.com/sources.uri?origin=savedlist&listId=64924235&resultsListTypeValue=Sources&sourcePageDataSource=List.
45. Scimago Journal & Country Rank. Available from: https://www.scimagojr.com/journalrank.php?category=2741.
46. Schaik C, Boer L, Draaisma J et al. The lymphatic system throughout history: From hieroglyphic translations to state of the art radiological techniques. Clin Anat 2022; 35: 701–10.
47. Fuld H, Irwin DT. Clinical application of portal venography. Br Med J 1954; 6:312–3.
48. Leger L, Spléno-portographie: étude radiologique et clinique de la circulation portale normale et pathologique. Paris: Masson; 1955.
49. Gvosdanovic V, Hauptmann E. Further Experience with Percutaneous Lieno-Portal Venography. Acta Radiol 1955; 43:177–8.
50. Leriche R. Souvenirs de Ma Vie Morte. Paris: éditions du Seuil; 1956.

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