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Original Article / Orijinal Araştırma

A Bibliometric Analysis Study on Percutaneous Diskectomy

Perkütan Diskektomi Üzerine Bir Bibliyometrik Analiz Çalışması

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Abstract

Aim: Percutaneous discectomy is an important issue in the field of neurosurgery. However, the outputs of scientific publications on this subject are not known. The goal of this study was to add to the body of knowledge by performing a bibliometric analysis of the original scientific studies on percutaneous discectomy that have been published since 1970.

Material and Method: The literature review was done using the Web of Science database. All articles and citations related to percutaneous discectomy containing the keywords Mesh were searched in the "title" section of the search engine. The articles produced by the countries and their developments was analyzed. The Vosviewer program was utilized to map the coauthorship, keywords, etc. of the articles.

Results: There was 619 articles between 1983-2021. The first articles were published in 1983 (3 articles). Nearly 73% of the articles have been published since 2000. The leading country on percutaneous discectomy was the People's Republic of China (n=264, 42.649%). Corresponding authors from China, South Korea, the United States of America (USA), Japan and Germany were the most productive authors. The publications from China had 2237 citations (8.47 per article), the publications from South Korea had 3483 citations (34.49 per article). Wooridul Spine Hospital (South Korea) was the mostly publishing affiliation.

Conclusion: Future research on percutaneous discectomy will be able to benefit from the data collected in this bibliometric study. The majority of the publications originated from China, followed by South Korea and the USA. The number of publications from other countries around the world was very limited. These numbers need to be increased.

Keywords: Article, bibliometrics, percutaneous discectomy

Öz

Amaç: Perkütan diskektomi beyin cerrahisi alanında önemli bir konudur. Ancak bu konudaki bilimsel yayınların çıktıları bilinmemektedir. Bu çalışmanın amacı perkütan diskektomi ile ilgili 1970 yılından beri yayınlanan orijinal bilimsel çalışmaların bibliyometrik analizini yaparak bilgi birikimine katkıda bulunmaktır.

Gereç ve Yöntem: Literatür taraması Web of Science veri tabanı kullanılarak yapılmıştır. Perkütan diskektomi ile ilgili Mesh anahtar kelimelerini içeren tüm makaleler ve alıntıları, arama motorunun "başlık" bölümünden aratıldı. Ülkelerin ürettikleri makale sayısı ve gelişmişlik göstergeleri analiz edilmiştir. Makalelerin ortak yazarlığını, anahtar kelimelerini vb. Haritalamak için Vosviewer programından yararlanıldı.

Bulgular: 1983-2021 yılları arasında 619 makale bulundu. İlk makaleler 1983 yılında yayınlanmıştı (3 makale). Makalelerin yaklaşık %73'ü 2000 yılından beri yayınlanmıştı. Perkütan diskektomi konusunda lider ülke Çin Halk Cumhuriyeti idi (n=264, %42.649). Çin, Güney Kore, Amerika Birleşik Devletleri (USA), Japonya ve Almanya'dan gelen yazarlar en üretken yazarlar idi. Çin'den yayınlanan yayınlara 2237 (makale başına 8,47), Güney Kore'den yayınlanan yayınlara 3483 (makale başına 34,49) atıf yapılmıştı. Wooridul Spine Hospital (Güney Kore) en çok yayın yapan kuruluştu.

Sonuç: Perkütan diskektomi ile ilgili gelecekteki araştırmalar, bu bibliyometrik çalışmada toplanan verilerden yararlanabilecektir. Nöroşirürji alanındaki yayınların çeşitliliği, en gelişmiş ülkelerde coğrafi olarak artmaya devam etmiştir. Gelişmiş ve gelişmekte olan ülkeler arasındaki yayın oranlarındaki eşitsizlik aynı zamanda sabit kalmıştır.

Anahtar Kelimeler: Araştırma makalesi, bibliyometri, perkütan diskektomi

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INTRODUCTION

Vertebral discs hernias (VDH) especially lomber discs hernais (LDH) are a common cause of sciatica and back pain worldwide. Exploratory laminectomy has been replaced with percutaneous discectomy in the surgical treatment of VDH or prolapses.[1] Slighter invasive surgical methods, particularly for the treatment of LDHs, have been developed as a result of discussions about the outcomes of open spinal surgery, particularly on complications related to open surgery, such as post-discotomy syndrome. Percutaneous discectomy are based on a variety of intradiscal diagnostic and therapeutic approaches, including chemonucleolysis, retroperitoneal spinal disc fenestration, and discography.[2,3]

Since the 1970s, numerous techniques have been developed and put to use in clinical settings, including mechanical percutaneous nucleotomy, automated percutaneous nucleotomy, intradiscal laser procedures, and, to some extent, endoscopic intradiscal procedures. Depending on the author and study, the clinical outcomes range from 30-100% almost good/very good results. It is clear that there haven't been many prospective randomized studies with control groups receiving either conservative or surgical treatment. When compared to partially retrospective studies of a single method, which frequently have large case numbers but do not always meet the strict requirements for scientific study design.[2]

Yasargil performed the first removal of a herniated disc using the operating microscope in 1977.[4] However, it wasn't until the late 1980s that it started to be utilized more and more.[5] Many spinal surgeons gave up the traditional naked-eye discectomy procedure in the 1990s and switched to the common practice of microdiscectomy. The advantages of this method include the ability to remove any type of LDH with a limited laminoarthrectomy and a quick approach to the skin, fascia, and muscles. It is the procedure that the vast majority of spinal surgeons use and is regarded as the "gold standard" of surgical care for LDH.[6]

A methodological technique from the library sciences known as "bibliometric study" uses statistical analysis to estimate influence and impact by counting the number of times books, papers, and other publications have been cited. With this method reserchers can examine scientific literature by analyzing metrics at the author, article, and journal levels. Numerous bibliometric analyses have been conducted in a variety of specialities in medicine[7-18], including spine surgery.[19-23]

The objective of this study was to further knowledge by doing a bibliometric analysis of the original scientific studies on percutaneous discectomy that have been published since 1970.

MATERIAL AND METHOD

We looked through the Web of Science database for each article published between the dates of January 1, 1970, and December 31, 2021.

Mesh terms [Diskectomies, Percutaneous (Title) OR Percutaneous Diskectomies (Title) OR Percutaneous Diskectomy (Title) OR Discectomy, Percutaneous (Title) OR Discectomies, Percutaneous (Title) OR Percutaneous Discectomies (Title) OR Percutaneous Discectomy (Title) OR Nucleotomy, Percutaneous (Title) OR Nucleotomies, Percutaneous (Title) OR Percutaneous Nucleotomies (Title) OR Percutaneous Nucleotomy (Title)]

The overall number of articles, typical bibliometric measures like the H-index, and the absolute and average number of citations per article were also evaluated.

Also the Vosviewer program (VOSviewer 1.6.18 for Microsoft Windows systems) was utilized to map the coauthorship, keywords, etc. of the articles.

By using the visualization tool VOSviewer (created by the Science and Technology Research Center in Leiden, the Netherlands), it is possible to create visual network maps based on literature and, gain a thorough understanding of the scientific structure and dynamic development trend of a field.[24] VOSviewer can help for instance include journals, researchers, citations, bibliographic coupling, co-authorship relations, co-citation, etc. Additionally, text mining capabilities in VOSviewer may be used to create and display co-occurrence networks of significant terms taken from a corpus of scientific literature.[25]

RESULTS

There was 809 publications between 1970-2022 and 758 publications between 1983-2021. 619 of them articles. 93.053% of the articles published in Science Citation Index Expanded (SCI-EXPANDED) index and 94.507% of them in English language. These 619 articles cited 10,197 times in total and 16.47 times per article. The first articles were published in 1983 (3 articles). Nearly 73% of the articles published since 2000. The most productive year was 2020 with 76 published articles (**Figure 1**).

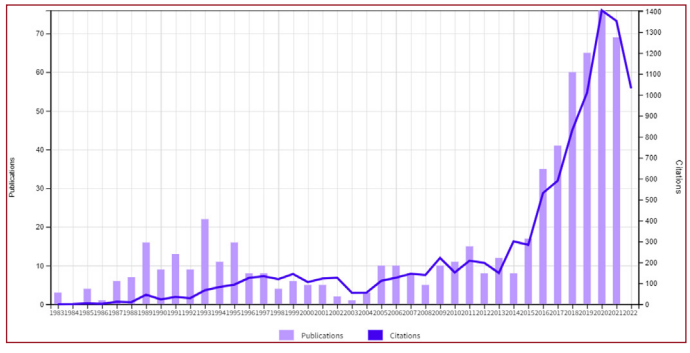

Figure 1. The quantity of percutaneous discectomy-related articles and citations between 1983 and 2021.

The leading country on percutaneous discectomy was the People's Republic of China (n=264, 42.649%). Corresponding authors from China, South Korea, the United States of America (USA), Japan and Germany were the most productive authors. The publications from China had 2237 citations (8.47 per article, H index:22), the publications from South Korea had 3483 citations (34.49 per article, H index: 35) (**Table 1**).

Table 1. Publication numbers of the most productive countries on percutaneous diskectomy

Countries/Regions	Record Count	% of 619
Peoples Rebuplic of China	264	42.649
South Korea	101	16.317
USA	83	13.409
Japan	36	5.816
Germany	31	5.008
France	19	3.069
Switzerland	12	1.939
Greece	9	1.454
Italy	9	1.454
Taiwan	9	1.454

*Showing 10 out of 38 countries; 2 records (0.323%) do not have data

A total of 1,958 authors contributed the publications on percutaneous diskectomy. Sang-Ho Lee from Wooridul Spine Hospital (South Korea) published most of the articles (**Figure 2**).

Figure 2. Mostly publishing authors

Wooridul Spine Hospital (South Korea) was the mostly publishing affiliation on percutaneous diskectomy. Tongji University (China), The Army Medical University (China), Chongqing Medical University (China) and Naval Medical University(China) were also mostly publishing affiliations.

Table 2. Publication numbers of the most productive countries on percutaneous diskectomy

Affiliations	n	% of 619
Wooridul Spine Hosp	37	5.977
Tongji University	29	4.685
Army Medical University	14	2.262
Chongqing Medical University	14	2.262
Naval Medical University	13	2.100
University of California System	13	2.100
Allegheny General Hospital	12	1.939
Seoul National University	12	1.939
Shanghai Jiao Tong University	12	1.939
Seoul National University Hospital	11	1.777
Sichuan University	11	1.777
Capital Medical University	10	1.616
Leon Wiltse Mem Hosp	10	1.616
Southern Medical University China	10	1.616
University of California San Francisco	10	1.616

National Natural Science Foundation Of China funded most of the articles (n=46).

Table 3. Main funding agencies on percutaneous diskectomy

Funding Agencies	n	% of 619
National Natural Science Foundation of China	46	7.431
Wooridul Spine Foundation	14	2.262
China Postdoctoral Science Foundation	3	0.485
Chinese Ministry of Health	3	0.485
Foundation for Leading Talent in Traditional Chinese Medicine of Jiangsu Province	3	0.485
Fundamental Research Funds for the Central Universities	3	0.485
Key Project of Medical Research of Chongqing Municipal Healthy Bureau	3	0.485
Korea Health Technology R D Project Through the Korea Health Industry Development Institute Khidi Ministry of Health Welfare Republic of Korea	3	0.485
National Key R D Program of China	3	0.485
Natural Science Foundation of Shandong Province	3	0.485

Showing 10 out of 196 entries; 447 record(s) (72.213%) do not contain data in the field being analyzed

The most of the articles (48.142%) were from Neurosciences/ Neurology research area (**Table 4**).

Table 4. Main research areas of the publications on percutaneous diskectomy

Research Areas	Record Count	% of 619
Neurosciences Neurology	298	48.142
Orthopedics	201	32.472
Surgery	193	31.179
General Internal Medicine	56	9.047
Radiology Nuclear Medicine Medical Imaging	56	9.047
Anesthesiology	50	8.078
Research Experimental Medicine	44	7.108
Biotechnology Applied Microbiology	15	2.423
Rheumatology	10	1.616
Cardiovascular System Cardiology	7	1.131

Showing 10 out of 31 entries

The most of the articles published in 'World Neurosurgery' journal. The mostly publishing journals on percutaneous discectomy listed in the **Table 5**.

Table 5. The list of the mostly publishing journals on percutaneous diskectomy.

Publication Titles	Record Count	% of 619
World Neurosurgery	48	7.754
Pain Physician	36	5.816
Spine	29	4.685
Medicine	22	3.554
Orthopaedic Surgery	18	2.908
Clinical Orthopaedics and Related Research	16	2.585
Biomed Research International	14	2.262
International Orthopaedics	14	2.262
Journal of Orthopaedic Surgery And Research	14	2.262
European Spine Journal	12	1.939
Zeitschrift Fur Orthopadie Und Ihre Grenzgebiete	11	1.777
Journal of Neurosurgery Spine	10	1.616
Bmc Musculoskeletal Disorders	9	1.454
Journal of Spinal Disorders	9	1.454
International Journal of Clinical and Experimental Medicine	8	1.292
Journal of Korean Neurosurgical Society	8	1.292
Journal of Neurological Surgery Part A Central European Neurosurgery	8	1.292
Korean Journal of Pain	8	1.292
Neuroradiology	8	1.292
Acta Neurochirurgica	7	1.131
Neurosurgery	7	1.131
Spine Journal	7	1.131
Acta Radiologica	6	0.969
Archives of Orthopaedic and Trauma Surgery	6	0.969
Journal of Spinal Disorders Techniques	6	0.969

*Showing 25 out of 178 entries

Mapping analysis (Co authorship analysis, Keyword analysis, Bibliographic coupling between countries and affiliations) with Vosviewer can be seen in **Figure 3-6**.

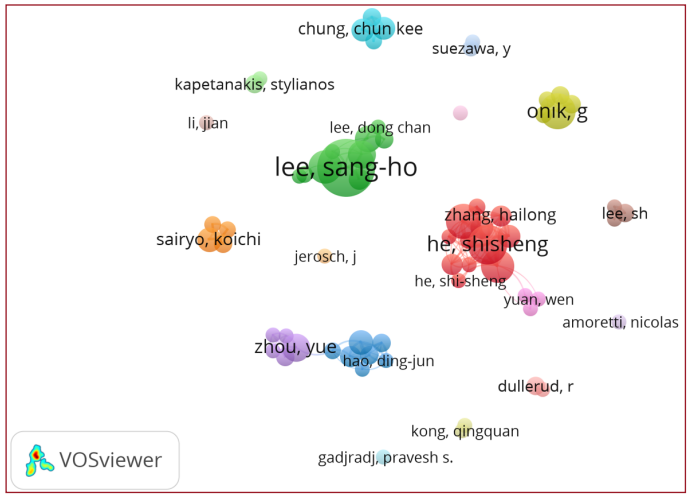

Figure 3. Co authorship analysis between authors with more than 5 articles

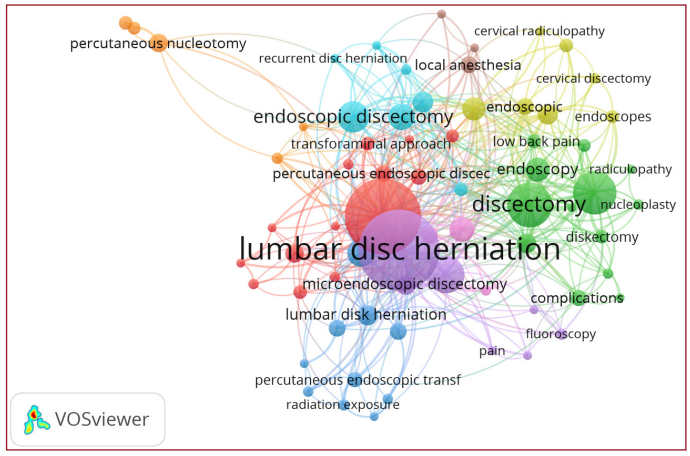

Figure 4. Keyword analysis

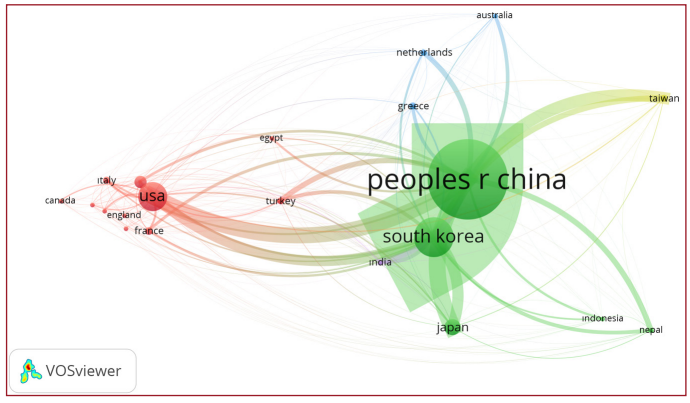

Figure 5. Bibliographic coupling between countries with minimum 3 articles

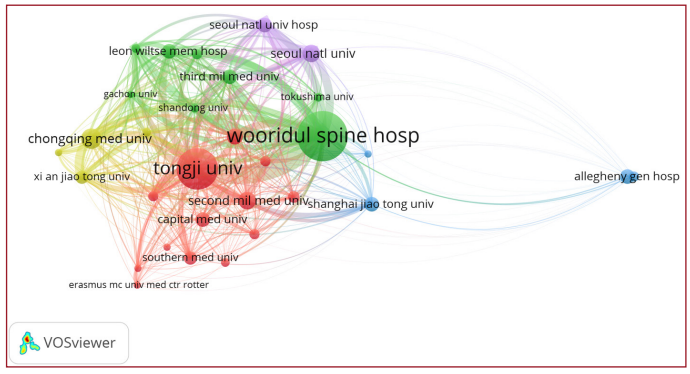

Figure 6. Bibliographic coupling between affiliations with minimum 3 articles

DISCUSSION

Neurosurgery is one example of a medical specialty that evolved later than other disciplines and is continually evolving due to new ideas and methods. For instance, in neurosurgery, bibliometrics was utilized to identify the top 100 referenced papers on carotid stenting, craniopharyngiomas, endovascular aneurysm therapy, pediatric neurosurgery, and skull base neurosurgery. It has been used to examine certain publications, databases of pediatric patients, funding and research from the US National Institutes of Health, as well as the publishing output of university neurosurgery departments and residency programs. To the best of our

knowledge, a thorough bibliometric analysis examination of the articles on percutaneous discectomy over the last 50 years has not yet been been out.[19-23] We tried to look into and determine regional publication trends (regional, national, and continental differences). Additionally, we looked at connections between authors, organizations, and countries.

This study's bibliometric analysis is based on the Web of Science Core Collection (WoSCC), whose high-quality and regularly updated literature can effectively guarantee the quality of literature analysis. For the purpose of visual analysis in this study, the literature obtained by WoSCC was imported into Microsoft Excel 2019 and VosViewer.

According to our analysis, the number of publications published has dramatically increased in recent years, particularly since 2000. Sang-Ho Lee from Wooridul Spine Hospital (South Korea) was the biggest contributor to the percutaneous discectomy literature.

38 countries made contributions articles, with China accounting for roughly half of them. China was also the majority of articles' corresponding author country of origin. The other most productive authors were those from South Korea, USA, Japan, and Germany. The publications from China had 2237 citations (8.47 per article, H index:22) and the publications from South Korea had 3483 citations (34.49 per article, H index: 35). In other words, although the number of articles originating from South Korea was less, the H index and the number of citations were considerably higher than those of China.

Universities and research institutes in the South Korea and China are the institutions with the most research and publications, according to the institutions' visual analysis. While there are still certain nations or areas that collaborate less with other nations, China has more research collaborations with South Korea and other developed European nations. It is advised that research organizations globally work aggressively together in the future to investigate the percutaneous discectomy.

The heart of a paper lies in its key words. In-depth study of keyword co-occurrence can more rapidly detect research hotspots and trends than keyword analysis, which represents the core and research emphasis of a document. A field's research hotspots and trends may be readily understood through the summary of key terms. A keyword co-occurrence map was created using VOSviewer to see and analyze all the terms.[26,27] The term cluster map created by VOSviewer reveals that it can be separated into four clusters based on various colors, including red, green, purple, and yellow. **Figure 4** displays the most frequent keywords and clusters.

Study Limitations

One of the study's drawbacks is that, in order to keep the research concise, we only looked at articles from journals that were indexed by WoS. Other significant publications that disseminate articles related to neurosurgery through other databases (Pubmed, Scopus, etc.) were not included.

CONCLUSIONS

Approximately half of the publications came from China, followed by South Korea, USA. There weren't many publications from other nations. Although upper- and lower-middle-income countries in Asia and America made significant contributions, there is still a sizable publication gap between industrialized and developing nations,they have not changed over the past 50 years.

ETHICAL DECLARATIONS

Ethics Committee Approval: As it is not a human or animal study there is no need for ethical approval.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The author has no conflicts of interest to declare.

Financial Disclosure: The author declared that this study has received no financial support.

Author Contributions: The author declare that he has all participated in the design, execution, and analysis of the paper, and that he has approved the final version.

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