

Anatomical Research Trends in Neurosurgical Journals (2020–2024): A Bibliometric and Content Analysis

Nöroşirurji Dergilerinde Anatomik Araştırma Trendleri (2020–2024): Bibliyometrik ve İçerik Analizi

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Abstract

This study evaluated anatomy-focused articles published between 2020 and 2024 in 23 neurosurgery journals indexed in the Science Citation Index Expanded (SCIE) through bibliometric and content analysis. Out of 34,952 articles reviewed, only 162 (0.46%) were directly related to anatomy. Most of these publications (76.5%) were original research articles, and the most frequently used methods were cadaveric dissection and radiological analysis. The contribution of anatomists remained limited (41.35%), with only five papers authored exclusively by anatomists. World Neurosurgery had the highest number of anatomy-related publications, while the United States ranked first and Turkey second among contributing countries. The findings indicate that, despite neuroanatomy's fundamental role in neurosurgical practice, it remains underrepresented in the literature. The study highlights that anatomy-based research is essential for surgical planning, complication prevention, and intraoperative guidance. Therefore, promoting multidisciplinary collaborations and encouraging anatomy-focused publication policies are crucial for enhancing both scientific productivity and the overall quality of neurosurgical education.

Key Words: Bibliometrics analysis, interdisciplinary collaboration, neuroanatomy, neurosurgery

Özet

Bu çalışma, 2020–2024 yılları arasında Science Citation Index Expanded (SCIE) kapsamında yer alan 23 nöroşirurji dergisinde yayımlanan anatomi içerikli makaleleri bibliyometrik ve içerik analiziyle değerlendirmiştir. Toplam 34.952 makale incelenmiş ve bunlardan yalnızca 162'sinin (%0,46) doğrudan anatomiye odaklandığı belirlenmiştir. Bu makalelerin çoğu (%76,5) orijinal araştırma niteliğinde olup en sık kullanılan yöntemler kadavra diseksiyonu ve radyolojik analizlerdir. Anatomi uzmanlarının katkısı sınırlı kalmış (%41,35) ve yalnızca beş makale tamamen anatomistler tarafından yazılmıştır. En fazla yayın World Neurosurgery dergisinde yer almış, katkı sağlayan ülkeler arasında Amerika Birleşik Devletleri birinci, Türkiye ise ikinci sırada bulunmuştur. Bulgular, nöroanatominin nöroşirurji pratiğinde temel bir rol oynamasına rağmen literatürde yeterince temsil edilmediğini göstermektedir. Çalışma, nöroanatomiyi temelli araştırmaların cerrahi planlama, komplikasyon önleme ve intraoperatif yönlendirmede kritik öneme sahip olduğunu vurgulamaktadır. Bu nedenle, multidisipliner iş birliklerinin artırılması ve anatomiye özel yayın politikalarının teşvik edilmesi, hem bilimsel üretkenliğin hem de nöroşirurji eğitim kalitesinin gelişimine katkı sağlayacaktır.

Anahtar Kelimeler: Bibliyometri analizleri, disiplinlerarası iş birliği, nöroanatomiyi, nöroşirurji.

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1. Introduction

Studies examining scientific publication trends in the field of neurosurgery have demonstrated a remarkable growth in this area in recent years (Covell et al., 2025; Khorasanizadeh et al., 2024; Paradie et al., 2022). In neurosurgical journals, research commonly addresses fundamental neurosurgical topics such as brain tumors, spinal surgery, traumatic brain injury, stroke, and vascular surgery. Additionally, studies focusing on functional neurosurgical approaches, such as deep brain stimulation, epilepsy surgery, pain management, and interventions for neurodegenerative diseases including Parkinson's disease and multiple sclerosis, are frequently presented. Moreover, investigations focusing on technological advancements such as magnetic resonance imaging (MRI), intraoperative imaging, neuroendoscopy, and stereotactic surgery, as well as research on neuroradiological methods, novel surgical techniques, biomaterials, and cellular therapies, are increasingly featured. Particularly in the field of neurosurgery, an increase in research activity has been observed in subfields such as brain tumor surgery, spinal surgery, and vascular neurosurgery. Furthermore, emerging technologies such as artificial intelligence, robotic surgery, and imaging techniques have gained a prominent place in neurosurgical research (Ezzat et al., 2023; Farooq & Zahra, 2024).

In neurosurgical practice, detailed knowledge of regional anatomy and anatomical variations is critically important for achieving successful surgical outcomes. Such knowledge enables surgeons to remove intracranial masses while preserving vital functions and preventing brain injury. Furthermore, in neurosurgical education, the enhancement of neuroanatomical knowledge through a three-dimensional perspective and the acquisition of technical skills significantly improve surgeons' competence in managing complex neurosurgical conditions (Ahumada-Vizcaino et al., 2023; Iaconetta et al., 2018). Therefore, neurosurgical journals place particular emphasis on anatomy-oriented articles, including studies on surgical anatomy, anatomical variations and their clinical relevance, three-dimensional visualization and cadaveric investigations, neuroanatomy education, functional neuroanatomy, and clinical applications. In fact, some journals even dedicate special sections exclusively to anatomical studies.

The aim of this study is to analyze anatomy-related articles published over the past five years (2020–2024) in journals indexed in the Science Citation Index Expanded (SCIE) and, thereby, to comprehensively reveal the importance of anatomical knowledge in the neurosurgical literature in terms of scientific productivity and interdisciplinary collaboration.

2. Method

This study is a descriptive investigation based on a retrospective bibliometric and content analysis of anatomical articles published in the field of neurosurgery between January 1, 2020, and December 31, 2024.

2.1. Population and Sample of the Study

A total of 34,952 articles published in 23 peer-reviewed journals within the field of neurosurgery indexed in the Science Citation Index Expanded (SCIE) were included in the analysis. Among these, 162 articles with anatomical content were selected for inclusion in the study.

The journals were selected according to the following criteria:

- Being indexed in the Science Citation Index Expanded (SCIE) according to the Clarivate Web of Science Journal Citation Reports (JCR) database,
- Classification under the subject categories “Neurosurgery” or “Neurochirurgie”,
- Having published regularly between 2020 and 2024.

2.2. Data Collection and Data Tools

Data were manually collected using the official websites of the journals, as well as academic databases such as PubMed and Web of Science. To identify anatomy-related publications published between 2020 and 2024 in the selected journals, all articles were independently screened by two researchers based on their titles, abstracts, and, when necessary, full texts. Original research articles, case reports, reviews, technical notes, new insights, and clinical perspectives were included in the analysis if their primary aim was to describe or investigate normal or variant anatomical structures of the central or peripheral nervous system and if they did not contain patient-based clinical data, surgical procedures, pharmacological interventions, or therapeutic approaches. Eligible publications typically involved cadaveric dissection, morphometric analysis, imaging-based anatomical studies (e.g., MRI, CT), or three-dimensional reconstruction techniques. Letters to the editor, conference abstracts, and editorial articles were excluded, as were studies describing new surgical techniques, reporting clinical outcomes, or addressing pathological mechanisms related to disease. All eligible articles were analyzed both qualitatively and quantitatively.

No dedicated bibliometric software (e.g., VOSviewer, Bibliometrix, or CiteSpace) was used in this study. All screening, classification, and data extraction procedures were performed manually by the researchers through systematic examination of journal archives and database records. This manual approach was preferred due to the specific inclusion criteria focusing exclusively on anatomy-oriented articles without patient-based clinical content.

2.3. Data Analysis and Evaluation

The identified anatomical articles were examined according to the following criteria:

- Type of article (original research, review, case report, technical note, new insight, clinical perspective),
- Methodology employed in the study (cadaveric dissection, morphometric measurement, radiological interpretation, meta-analysis, microdissection, fiber dissection, microscopic analysis),
- Institutions or research centers where the study was conducted,

- Presence of at least one author affiliated with a department of anatomy
- Whether the corresponding author was an anatomist,
- Countries of the contributing authors and
- Contributions from institutions and authors based in Türkiye.

Descriptive statistics (frequencies and proportions) were calculated based on the manually extracted dataset. Automated bibliometric mapping, citation network analysis, or visualization tools were not applied, as the primary objective was to quantify and characterize anatomy-oriented publications within the selected neurosurgical journals.

3. Results

A total of 34,952 articles were published across the 23 journals included in this study, of which only 162 (0.46%) were anatomy-focused. Among these anatomical publications, 76.5% (n = 124) were classified as original research articles, 17.9% (n = 29) as reviews, 1.9% (n = 3) as clinical perspectives, 1.9% (n = 3) as case reports, 1.2% (n = 2) as technical notes, and 0.6% (n = 1) as new insights.

In terms of methodology, 44.4% (n = 72) of the anatomy articles employed cadaveric studies, 17.9% (n = 29) utilized radiological methods, 3.7% (n = 6) applied fiber dissection, 3.7% (n = 6) used microdissection, 1.9% (n = 3) conducted microscopic image analysis, 3.1% (n = 5) performed meta-analyses, and 1.9% (n = 3) adopted three-dimensional (3D) modeling techniques. The remaining 23.5% consisted of review articles, technical notes, new insights, and clinical perspectives that did not include direct methodological procedures.

The contributions of anatomists in the published anatomy articles are presented in Table 1.

Table 1. Contribution Levels of Anatomists

Journal Name	Total Number of Anatomy Articles Published in the Last 5 Years	Number of Articles Conducted Exclusively by Anatomists	Number of Articles with at Least One Anatomist in the Research Team	Number of Articles with an Anatomist as the Corresponding Author	Number of Articles with No Anatomist in the Research Team
World Neurosurgery	51	4	21	18	30
Neurosurgical Review	22	0	14	7	8
Operative Neurosurgery	18	0	5	1	13
Journal of Neurosurgery	17	0	7	3	10
Acta Neurochirurgica	11	0	5	1	6
Turk Neurosurgery	9	1	4	2	5

Table 1. Contribution Levels of Anatomists (Continued)

Neurosurgical Science	9	0	1	1	8
Neurosurgery	4	0	1	1	3
Neurosurgical Focus	3	0	1	0	2
Neurochirurgie	3	0	1	1	2
JNS Spine	2	0	1	0	1
JNS Pediatrics	2	0	0	0	2
British Journal of Neurosurgery	2	0	2	2	0
Clinic Neurology and Neurosurgery	2	0	1	0	1
Neurosurgery Clinics of North America	2	0	0	0	2
Journal of Korean Neurosurgical Society	2	0	1	1	1
Stereotactic and Functional Neurosurgery	1	0	0	0	1
Česká a slovenská neurologie a neurochirurgie	1	0	1	1	0
Neurologia medico-chirurgica	1	0	1	0	0
Pediatric Neurosurgery	0	0	0	0	0
Neurospine	0	0	0	0	0
Journal of Neurology, Neurosurgery & Psychiatry	0	0	0	0	0
Journal of Neurological Surgery Part A-Central European Neurosurgery	0	0	0	0	0

When analyzed in terms of author contributions, it was observed that 96.91% of the articles included at least one author affiliated with the Department of Neurosurgery, whereas 41.35% involved the contribution of at least one anatomist. The number of articles authored exclusively by anatomists was five, while the participation of departments other than anatomy and neurosurgery, such as orthopedics and neurology, was found to be considerably limited.

Regarding the countries of affiliation of co-authors in anatomy-related publications, contributions were identified from 38 different countries. Country contribution analysis was based on the authors' institutional affiliations; for each included article, the countries of all contributing institutions listed in the author addresses were extracted individually. The highest contributions were provided by authors from the United States (10.47%), Turkey (2.48%), and Grenada (2.35%), respectively. The distribution of publications by country over the last five years is presented in Figure 1.

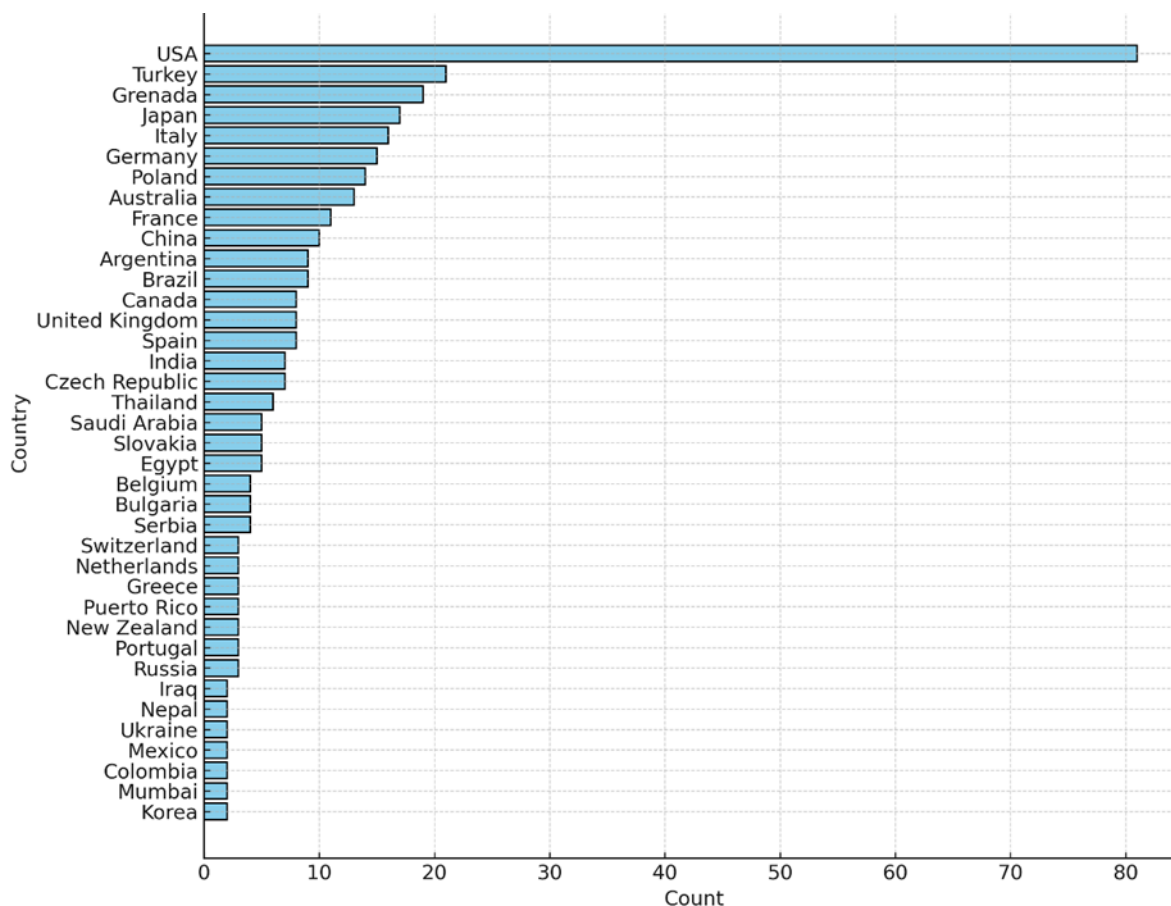


Figure 1. Publication Counts by Country

Upon analysis of the content of the published anatomy articles, 69.75% were found to focus on detailed investigations of the anatomy of regions of particular relevance to clinical procedures or surgical interventions, while 17.28% were based on neuroanatomical variations. Additionally, three studies were identified that provided original contributions to the literature through anatomical classifications and conceptual proposals.

Of the analyzed articles, 53.7% were conducted with single-center participation. Among the multicenter studies, the highest level of collaboration (70.6%) was observed among authors affiliated with institutions based in the United States. The international collaborations among authors contributing to the analyzed anatomy articles are illustrated in Figure 2.

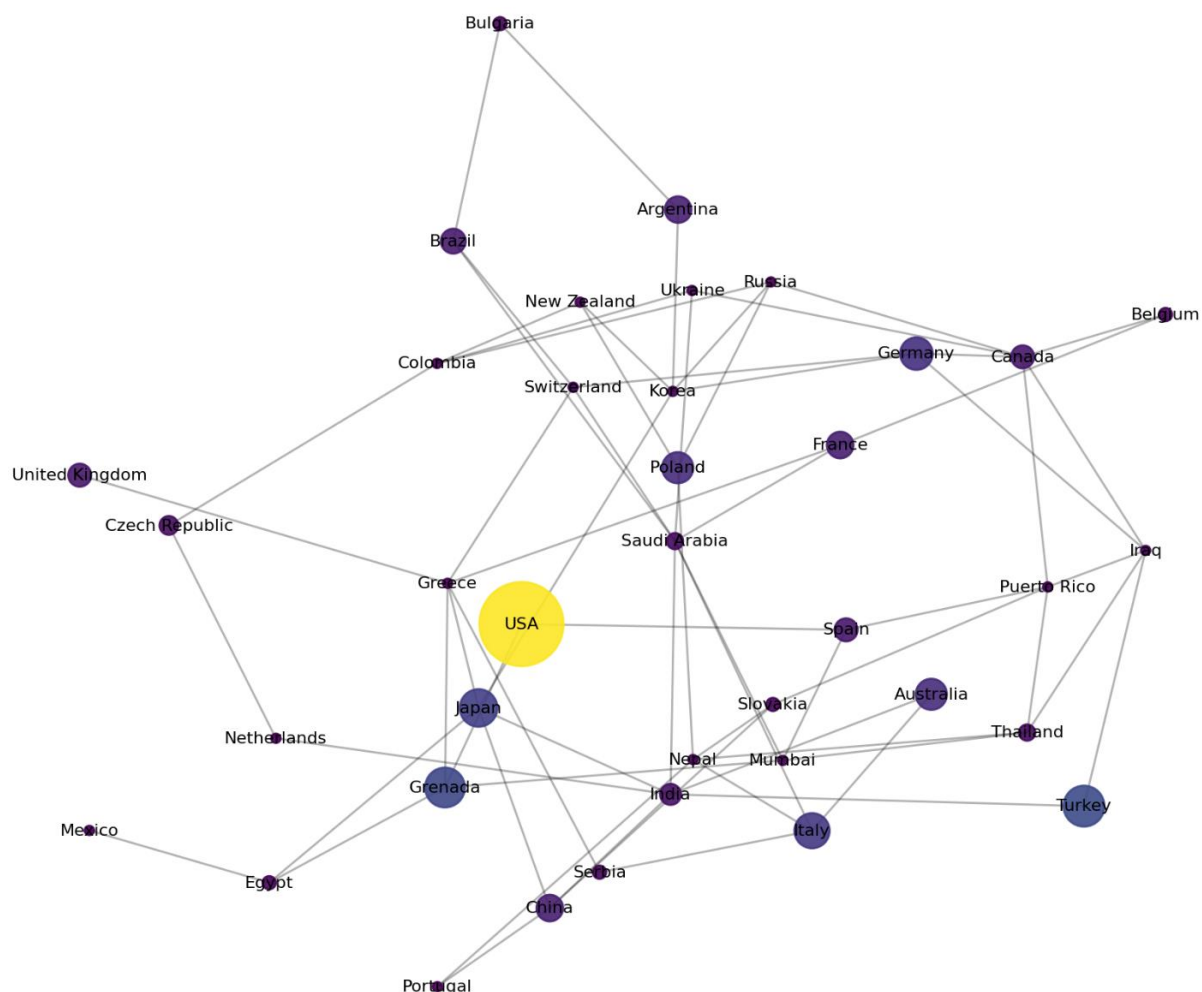


Figure 2. International Collaboration Network

According to the international collaboration network analysis presented in Figure 2, the United States stands out as the country with both the highest number of direct connections (degree centrality = 0.68) and the highest betweenness centrality value (0.56), indicating its role as a key bridge among other countries. Germany, Italy, Grenada, and Japan also emerge as significant sub-centers within the network. The average clustering coefficient (0.65) demonstrates that the network is highly organized and exhibits distinct regional clusters.

4. Discussion

Anatomy-based studies published in neurosurgical journals provide an essential framework for surgical practice and inform clinical decision-making. Through anatomical dissection and microscopic examination, surgeons develop the ability to navigate safely among complex structures. For instance, in a comprehensive review addressing microdissection, three-dimensional visualization, and stereotactic techniques, Ferreira (2002) highlighted that many modern applications, including intraoperative navigation, are rooted in anatomical knowledge. Similarly, Agosti et al. (2023) demonstrated that quantitative assessments of surgical approaches generate critical data for artificial intelligence-based analyses and further underscored how anatomical laboratory research supports clinical neurosurgery. In addition, an editorial on microsurgical anatomy education emphasized that

understanding surgical corridors to deep-seated lesions through microdissection is a key element of operative training (Isolan et al., 2021). Therefore, examining the quantitative and qualitative evolution of anatomy-themed publications in neurosurgical journals is important for clarifying academic orientations and research priorities within the field. In the present study, anatomical articles published between 2020 and 2024 in 23 neurosurgical journals indexed in the Science Citation Index Expanded (SCIE) were analyzed.

Although neurosurgery is a relatively young specialty compared to other surgical disciplines, its literature has been expanding at an accelerating pace (Barrow and Bernard, 2019). The annual growth rate of neurosurgical articles has been reported as 6.82% in studies encompassing systematic reviews (Visconti-Lopez et al., 2023). Other bibliometric analyses have similarly documented substantial increases across subfields, such as publications on “neurosurgery and social media” and spinal surgery research (Abdullah et al., 2024; Kurland et al., 2023). Despite this overall growth, our findings revealed that only 162 (0.46%) of the 34,952 articles published in the 23 journals were directly anatomy-focused. This disproportion suggests that, while publication volume continues to rise, anatomically oriented research remains underrepresented. In this context, the present study differs from most previous bibliometric analyses in neurosurgery, which have generally focused on broad clinical subfields or overall publication trends. By applying a strict anatomy-oriented filter, our work specifically isolated studies devoted to normal or variant neuroanatomical structures, thereby providing a more targeted assessment of the visibility of anatomical research within high-impact neurosurgical journals. Furthermore, beyond simple publication counts, we incorporated disciplinary contribution indicators, such as the involvement of anatomy departments and anatomists as corresponding authors, offering an additional perspective on interdisciplinary participation. Although automated collaboration network mapping was not performed, the country-based distribution of authorship and the rate of international co-authorship provide an initial framework for understanding global research patterns in neurosurgical anatomy. Given the critical role of detailed anatomical understanding in supporting surgical training and safe operative practice, these results highlight the need for future academic efforts and journal editorial policies to allocate greater space to anatomical investigations.

Despite the fundamental role of neuroanatomy in surgical practice, the relatively low proportion of anatomy-focused publications may be explained by several structural and practical barriers. Anatomical research—particularly cadaver-based studies—requires access to well-established dissection laboratories, ethically approved body donation programs, and specialized technical expertise. In many regions, cadaver availability remains limited due to cultural factors, regulatory restrictions, and logistical challenges, which may constrain the production of high-quality anatomical studies. In addition, such investigations are often time-consuming, resource-intensive, and may not generate large clinical datasets, making them less competitive within journals that prioritize outcome-driven or technology-oriented clinical research. Editorial publication policies in high-impact neurosurgical journals may also favor studies with direct therapeutic implications, thereby unintentionally reducing the visibility of descriptive or morphology-based anatomical work. These

factors collectively contribute to the underrepresentation of anatomy-centered research within the rapidly expanding neurosurgical literature.

Studies analyzing the types of neurosurgical publications have shown that original research articles rank first by a considerable margin, followed by review papers (Garg et al., 2022; Khorasanizadeh et al., 2024). According to the results of our analysis, the distribution of anatomy-focused articles published in neurosurgical journals follows a similar pattern: original research, review articles, and clinical perspectives or case reports occupy the top three positions. This finding indicates a meaningful parallel between the general tendencies of neurosurgical literature and the typological distribution of anatomy-based publications. The predominance of original research articles demonstrates that anatomical knowledge in neurosurgery is being produced and renewed not only on a theoretical but also on an empirical level. The strong representation of review articles reflects the field's need for systematic organization and synthesis of existing knowledge. Finally, the inclusion of clinical viewpoints and case reports underscores the practical significance of case-based assessments of anatomical variations and surgical complications. Altogether, this pattern suggests that neurosurgical practice is built upon a robust anatomical foundation, one that is continually reinforced through diverse forms of scholarly publication.

In recent years, studies in the field of neurosurgery have increasingly emphasized technologies such as neuronavigation and real-time imaging systems (intraoperative MRI and ultrasonography), frameless stereotaxy-based navigation and iMRI integration, robotic surgical systems, and artificial intelligence techniques used to generate live intraoperative roadmaps from imaging data (Ezzat et al., 2023; El-Hajj et al., 2023; Taha et al., 2025). A marked increase has also been reported in publications addressing spinal surgery involving augmented and virtual reality technologies, particularly after 2005 (Buwaider et al., 2024; Farooq & Zahra, 2024). Within the scope of our review of publications from the past five years, anatomy-related studies were found to employ a variety of techniques, including cadaveric and radiological imaging analyses, microdissection, fiber dissection, and 3D reconstruction. This indicates that anatomical studies focusing on the three-dimensional visualization and modeling of clinically significant but surgically challenging regions have gained growing prominence in the neurosurgical literature, highlighting the diversification of technological applications in anatomical research.

The contribution rate of anatomists to anatomy-related articles published in neurosurgical journals suggests that the interdisciplinary balance in this area has not yet reached an ideal level. According to our findings, only 41.35% of the articles included at least one anatomist among the authors, and the number of papers written entirely by anatomists was limited to five. This reveals that in a domain such as neuroanatomy, which fundamentally relies on basic science expertise, clinical practitioners dominate scientific output, while the contribution of basic science specialists remains relatively limited. However, previous literature has emphasized that anatomists' participation in surgical research is indispensable in terms of the applicability of dissection techniques, accuracy of anatomical terminology, and depth of morphological interpretation (Ahumada-Vizcaino et al., 2023; Ferreira, 2002).

Beyond individual collaboration patterns, the limited representation of anatomists in neurosurgical anatomy publications may also reflect broader structural factors within academic medicine. In many institutions, anatomical research is primarily positioned as an educational rather than a high-output scientific discipline, which may reduce incentives for anatomists to engage in clinically oriented publishing environments. Furthermore, authorship roles in surgical journals are often dominated by clinicians, while anatomists may contribute mainly at the technical or methodological level without being consistently included as leading or corresponding authors. Editorial priorities in neurosurgical journals, which tend to emphasize clinical innovation and outcome-based research, may also indirectly limit the visibility of basic science contributors. Therefore, the observed underrepresentation of anatomists should be interpreted not only as a lack of interdisciplinary interaction but also as a consequence of academic organization, publication practices, and role distribution between clinical and basic science fields. The effective execution of microsurgical anatomical studies, in particular, requires the active involvement not only of clinicians but also of anatomists experienced in these techniques. Agosti and colleagues (2023) stated that the methodological validity of anatomical research can only be achieved through interdisciplinary collaboration and that many publications exploring surgical anatomy lack sufficient methodological depth. Similarly, in the study by Iaconetta et al. (2018), the hypoglossal nerve was microscopically analyzed and segmented along its entire course, demonstrating that such detailed surgical anatomical knowledge can only be attained through multidisciplinary collaboration between experienced anatomists and surgeons. In this context, the systematic promotion of clinician–anatomist collaborations in anatomical publications within the neurosurgical literature is of great importance for both scientific accuracy and educational impact. Expanding the use of multidisciplinary research teams will enhance not only the quality of scientific studies but also the effective integration of fundamental anatomical knowledge into surgical decision-making processes.

In the field of neurosurgery, *World Neurosurgery*, *Journal of Neurosurgery*, and *Neurosurgery* occupy a central position in terms of both publication volume and citation impact. A bibliometric analysis reported that 35% of the 50 most-cited neurosurgical publications appeared in *World Neurosurgery*, while 23% were published in the *Journal of Neurosurgery* (Chanbour et al., 2021; Jamjoom et al., 2024). Similarly, among the journals with the highest number of anatomy-related articles, *World Neurosurgery* ranks first (31.5%), followed by *Neurosurgical Review* and *Operative Neurosurgery*. These findings reveal a strong overlap between the journals that publish neurosurgical studies and those that include anatomy-focused research. The prominent position of *World Neurosurgery* in both domains indicates that the journal serves not only as a platform for clinical neurosurgical research but also provides a broad avenue for anatomy-related studies. This highlights the growing integration between clinical neurosurgery and anatomical sciences and underscores the decisive role that anatomical knowledge plays in clinical decision-making within neurosurgery. Moreover, the inclusion of anatomy-based studies in journals such as *Neurosurgical Review* and *Operative Neurosurgery* demonstrates the ongoing enhancement of interdisciplinary collaboration, suggesting that these journals embrace not only clinical but also educational and structural content. It is also noteworthy that

Operative Neurosurgery features a dedicated section on anatomy in nearly every issue, with at least one article consistently published under this heading.

From a geographical perspective, the majority of neurosurgical publications originate from authors affiliated with the United States (El-Hajj et al., 2022; Khorasanizadeh et al., 2024). In another study analyzing publications over the past decade in six major neurosurgical journals that were also included among the 23 journals examined in the present research, the United States ranked first, followed by China and Japan, with Turkey and Western European countries trailing behind (Garg et al., 2022). Similarly, the analysis of anatomy-related studies revealed that authors affiliated with the United States contributed most frequently, with Turkey ranking immediately second. The mean clustering coefficient of 0.65 indicates that the studies exhibit a high degree of organization and regional clustering. These findings suggest that scientific productivity in neurosurgery is predominantly driven by countries with strong research capacities. The United States clearly leads both in general neurosurgical publications and in subspecialized research areas. The growing contributions from countries such as China and Japan reflect the impact of scientific investment and infrastructural development on publication performance. Turkey's prominent position in anatomy-based studies, on the other hand, points to its emerging international visibility in specific subfields and the presence of strong, specialized research groups. However, it should be noted that the country contribution rates reported in this study are based on absolute publication counts derived from authors' institutional affiliations and were not normalized according to population size, number of active researchers, or overall national scientific output. Therefore, cross-national comparisons should be interpreted with caution, as the observed dominance of certain countries may partly reflect broader differences in research capacity and publication volume rather than anatomy-specific productivity alone. Future bibliometric studies may benefit from incorporating normalized indicators to enable more balanced international comparisons.

Although a previous review reported that the vast majority of neurosurgical articles (87.2%) were single-center studies, a comprehensive bibliometric analysis examining publication trends in neurosurgery from 1977 to 2023 demonstrated a significant increase in the number of authors and collaborations in recent years, indicating a notable rise in international authorship groups (Khorasanizadeh et al., 2024; Covell et al., 2025). In our study, while most anatomy-related articles published in neurosurgical journals were also conducted as single-center studies, the number of international collaborations was found to be considerably high (46.3%), consistent with the trends reported in the literature. This finding suggests that, similar to the broader neurosurgical field, research in anatomy is becoming increasingly interdisciplinary and international in scope. It also underscores the growing need for inter-institutional collaboration, particularly in areas closely related to basic sciences such as anatomy. International multicenter studies not only enhance data diversity but also enable broader generalization to clinical applications. This trend contributes to improving research quality and impact while simultaneously strengthening academic networks on a global scale. It further demonstrates that the neurosurgical community is progressively adopting more holistic and integrative research approaches.

5. Limitations of the Study

The analysis was confined to 23 neurosurgery journals indexed in the Science Citation Index Expanded (SCIE); therefore, anatomical studies published in other multidisciplinary journals were excluded from the scope. In addition, since only publications from 2020 to 2024 were examined, it was possible to reflect long-term trends or the impact of the pandemic on scientific productivity only to a limited extent. Although two independent reviewers participated in the article selection process, content classifications may still be subject to a certain degree of interpretative variation. Finally, the bibliometric analysis primarily focused on quantitative parameters such as citation counts, country contributions, and author profiles; however, qualitative aspects—such as the educational impact of these publications, their relevance to clinical practice, or feedback from students and specialists—were not included in the analysis. In particular, while anatomy-based research may hold educational importance for neurosurgical training, the present study did not assess measurable educational outcomes. Therefore, interpretations regarding the educational contribution of these publications should be regarded as suggestive rather than directly evidenced.

5. Conclusion

This study presents a comprehensive bibliometric and content analysis of anatomy-based articles published between 2020 and 2024 in 23 neurosurgical journals indexed in the Science Citation Index Expanded (SCIE), revealing publication trends, methodological preferences, and the geographical distribution of scientific productivity in the field. The findings indicate that neuroanatomy continues to play a vital role in neurosurgical practice; however, this importance is not sufficiently reflected in the publication volume. Neuroanatomy provides a crucial reference framework for surgical planning, complication prevention, and intraoperative navigation. Nevertheless, the analyzed publication volume demonstrates that this contribution occupies a limited position in the current literature. Therefore, it is recommended that journal editors adopt policies encouraging studies grounded in fundamental anatomical knowledge and issue special calls for anatomy-focused editions to enhance academic visibility in this domain. Topics such as microsurgical anatomy, three-dimensional modeling, fiber dissection, and cadaver-based research should be prioritized within these special issues. The data also reveal that a significant proportion of the analyzed articles were conducted as single-center studies, while interdisciplinary collaborations remain relatively limited. Collaborative projects that bring together diverse disciplines such as neurosurgery, anatomy, radiology, biomedical engineering, and computer science have significant potential to promote both academic progress and technological innovation.

A considerable portion of the analyzed anatomy-related articles provides detailed descriptions and three-dimensional visualizations of clinically critical regions. These features hold significant educational value, particularly for neurosurgical residency training and neuroanatomy instruction. Accordingly, it is recommended that insights derived from the existing literature be integrated into neuroanatomy education through digital content, surgical simulation modules, and microsurgical

anatomy workshops. Such integration would support the advancement of both theoretical understanding and practical skill development.

Author Contributions

Concept: HAB; **Design:** HAB, DT; **Planning:** DT, HAB; **Data collection and analysis:** DT, HAB; **Writing the manuscript:** DT, HAB; **Critical review:** HAB.

Conflict of Interest

All authors report no conflict of interest.

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