ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

www.surgicalneurologyint.com

Surgical Neurology International

Editor-in-Chief: Nancy E. Epstein, MD, Professor of Clinical Neurosurgery, School of Medicine, State U. of NY at Stony Brook.

SNI: Neurovascular

Editor
Kazuhiro Hongo, MD
Shinshu University, Matsumoto, Japan

SNI
Open Access

Review Article

A bibliometric analysis of the 100 most-cited clinical articles in the research of intracranial artery stenosis and intracranial atherosclerosis

Yudai Hirano[1], Satoru Miyawaki[1], Yusuke Sakaguchi[1], Satoshi Koizumi[1], Hiroki Hongo[1], Nobuhito Saito[1]

[1]Department of Neurosurgery, Faculty of Medicine, The University of Tokyo, Japan.

E-mail: Yudai Hirano - yudai.hrn@gmail.com; *Satoru Miyawaki - miyawaki-tky@umin.ac.jp; Yusuke Sakaguchi - yusaka0818@gmail.com; Satoshi Koizumi - sakoizumi-tky@umin.net; Hiroki Hongo - hhhhongo@gmail.com; Nobuhito Saito - nsaito-tky@umin.net

***Corresponding author:**
Satoru Miyawaki,
Department of Neurosurgery,
Faculty of Medicine,
The University of Tokyo, Japan.

miyawaki-tky@umin.ac.jp

Received: 29 December 2023
Accepted: 19 January 2024
Published: 08 March 2024

DOI
10.25259/SNI_1030_2023

Quick Response Code:

ABSTRACT

Background: Intracranial arterial stenosis (ICAS), caused by intracranial atherosclerosis, is one of the major causes of ischemic stroke. This study identified the top 100 most-cited publications on ICAS through a bibliometric analysis.

Methods: Two independent authors conducted a search in the Web of Science database for clinical articles on ICAS published between 1993 and 2022. The top 100 most-cited articles were then extracted. For each article, the analysis covered the title, author, country of origin/affiliation, journal, total number of citations, number of citations per year, and type of study.

Results: The top 100 most-cited papers in the ICAS were authored by 565 authors from 12 countries and published in 29 journals. In terms of the 5-year trend, the largest number of papers were published between 2003 and 2007 (n = 31). The median number of citations for the 100 papers was 161 (range 109–1,115). The journal with the highest proportion of the 100 most published articles was *Stroke*, accounting for 41% of articles and 37% of the citations. According to country of origin, the United States of America accounted for the largest number of articles, followed by China, Japan, and South Korea, with these four countries together accounting for 81% of the total number of articles and 88% of the citations. Trends in the past five years included the use of terms such as *acute ischemic stroke* and *mechanical thrombectomy*.

Conclusion: The findings of this study provide novel insight into this field and will facilitate future research endeavors.

Keywords: Bibliometric analysis, Intracranial artery stenosis, Intracranial atherosclerosis, Neurosurgery, Vascular

INTRODUCTION

Intracranial artery stenosis (ICAS), of which intracranial atherosclerosis is the predominant background, is the leading cause of ischemic stroke, and its prevalence is high in individuals of Asian, African, and Hispanic ancestry.[19,34,103] Among Asians, ICAS was found in 30–56% of all ischemic strokes.[47,114] The risk of recurrence of cerebral infarction in the vascular territory of symptomatic ICAS is significantly increased in patients with a severe stenosis rate ≥70% and within 17 days of onset.[54] In a randomized controlled trial (RCT) that compared the best

medical treatment and stent placement for severe stenosis ≥70%, the prognosis in the endovascular treatment group was significantly poorer.[24] Therefore, further research is warranted to verify the efficacy of endovascular treatment. Epidemiological studies have indicated differences in prevalence among racial groups, and studies on genetic background have been conducted.[79]

Numerous ICAS studies have been published to date. Bibliometric analysis has been conducted in various fields and has gained immense popularity. Specifically in neurosurgery, it has been increasingly applied to investigate diseases[2,3,94] and treatment methods in the past few years.[22,93,106] The first objective was to identify the most recognized and important research topics to familiarize clinicians with important publications in the area. The second objective was to examine the results of the current stage in a specific area and maintain the academic quality of future research.

To the best of our knowledge, no published bibliometric studies have focused on ICAS and intracranial atherosclerosis. Therefore, in this study, we aim to extract the 100 most-cited articles in the field of ICAS/intracranial atherosclerosis and evaluate their influence using bibliometric methods.

MATERIALS AND METHODS

Bibliometric search strategy

On February 12, 2023, we conducted a search in the Web of Science database to identify the most-cited papers on ICAS. The search terms were used based on the title or abstract, as presented in Figure 1. The publication period was limited to the past 30 years, 1993–2022. The results are listed in descending order according to the number of citations in the Web of Science database. In cases where the number of citations was tied, the more recent publication was defined as the top, which has less chance of being cited. Two authors (Y.H. and Y.S.) independently screened the titles and abstracts. Articles on ICAS/intracranial atherosclerosis were included in the study.

Meanwhile, articles that are not published or require manual search, in which ICAS/intracranial atherosclerosis was not the main topic, that do not involve humans, with acute cerebral artery occlusion with etiology other than atherosclerosis (i.e., atrial fibrillation, radiation, and moyamoya) or extracranial carotid/vertebral artery stenosis/occlusion, and listed as a systemic atherosclerosis or stroke subtype were excluded from the study. A flow diagram of the data extraction is shown in Figure 1. A joint discussion decided the top 100 most-cited articles between two researchers under the verification of a second author (S.M.). This study did not require ethics committee approval, as it did not include data from therapeutic interventions or animal experiments.

Extraction of data and bibliometric parameters

A list of the top 100 most-cited articles selected from the database was arranged in a data table. General data such as title, author, total citations, annual citations, journal publication, and year of publication were extracted directly from the search results. Countries and institutions were determined according to the corresponding author's affiliation. Articles were classified as original articles or reviews based on the search results and subsequent checks. Two authors (Y.H. and Y.S.) classified the research themes of each article by screening 100 paper abstracts and keywords, and finally, verification was conducted by a third author (S.M.). Journal impact factors were obtained from the 2021 Incites Journal Citation Reports by Clarivate Analytics.

Statistical analysis

For comparisons between the two groups, the Student's *t*-test was used for continuous variables. Statistical analyses were performed using the JMP Pro 16 software (SAS Institute Inc., Cary, NC, United States of America [USA]). In addition, VOSviewer software, version 1.6.19 (Leiden University, Leiden, the Netherlands), for Windows, was used to plot the data of the visualization network.

RESULTS

A total of 49,799 publications were retrieved from the Web of Science database. The top 100 most-cited articles are listed in Supplemental Table S1.

Publication year and citation

A total of 100 articles were published between 1993 and 2019. For the 5-year trends, the most published interval was 2003–2007 (n = 31), followed by 1997–2002 (n = 24) and 2008–2012 (n = 21) [Figure 2]. Papers published after 2020 were not ranked among the 100 most-cited articles. The 100 articles had a total of 21,384 citations, with a median of 161 (range 109–1,115). The top 10 most-cited papers are presented in Table 1, accounting for 29% (n = 6,183) of the total citations of the 100 articles. The median annual citation was 9 (range, 4–90), and the list of the top 10 annually cited articles is described in Table 2. The top 10 annual citations had a median of 35 (range, 29–90). Of the papers ranked among the top 10 by annual citations, six were included in the top 10 in total citations, while the remaining four papers, including one ranked 74th in total citations, were newly ranked. Comparing the annual citations of papers published before 2002 with those published after 2003, the latter was significantly higher (8.2 vs. 17.1; $P < 0.001$).

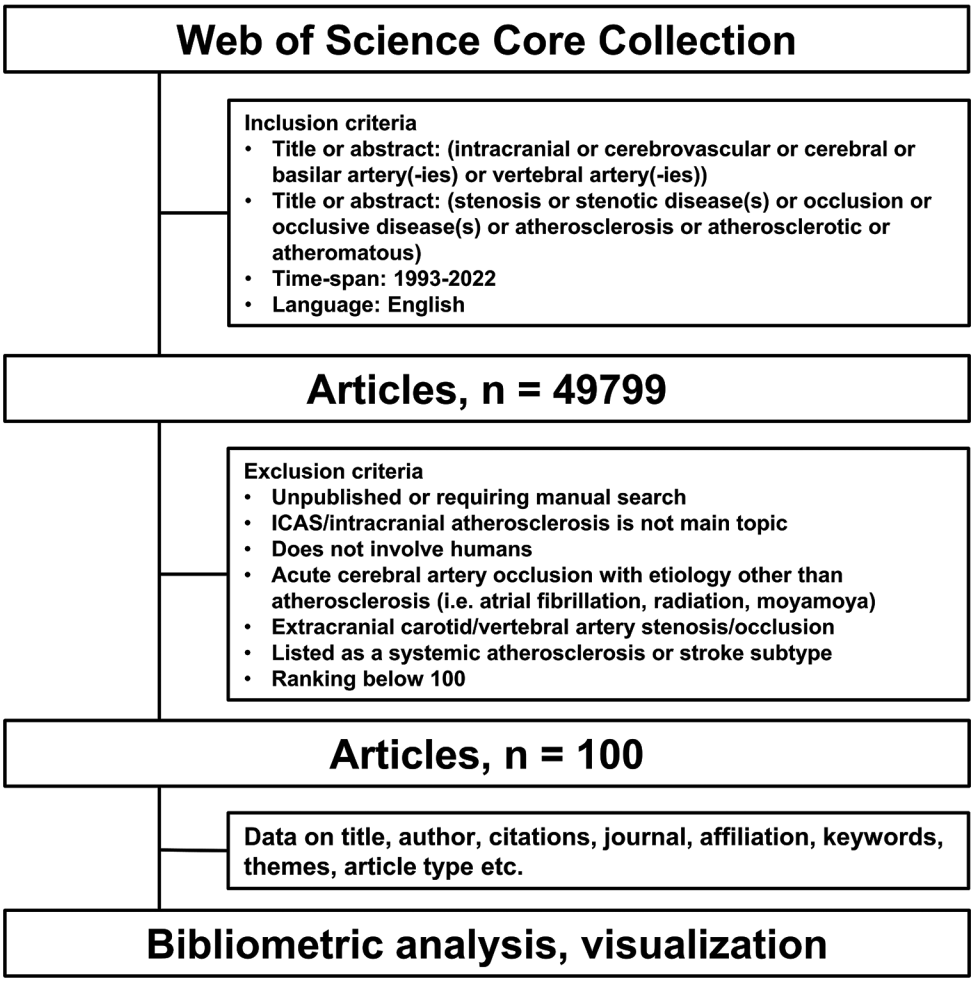

Figure 1: Flow diagram of data extraction of 100 most-cited publications.

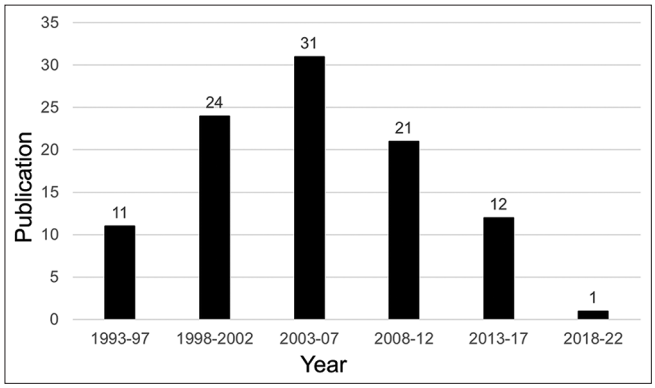

Figure 2: Distribution of the top 100 most-cited articles by publication year between 1993 and 2022.

Article types, keywords, and themes

Of the top 100 most-cited articles, 91 were original articles, and nine were reviews. There was no significant difference in the total number of citations (213 vs. 225; $P = 0.84$) or annual number of citations (13.4 vs. 20.3; $P = 0.12$) between the original and the review articles. Among the 100 most-cited papers, excluding reviews, the most featured themes were endovascular treatment (29%), radiological features and diagnosis (16%), risk factors (15%), and epidemiology (10%). To visualize the connection between keywords, the relationship between the words in the title and abstract was drawn using VOSviewer [Figure 3]. Of the total KeyWords Plus (810 keywords in 357 types) presented by Web of Science, the most frequently occurring words that appeared ≥10 times included *stroke* ($n = 23$), *percutaneous transluminal angioplasty* ($n = 16$), *middle cerebral artery* ($n = 14$), *atherosclerosis* ($n = 14$), *ischemic stroke* ($n = 12$), *prognosis* ($n = 12$), *risk factors* ($n = 11$), *race* ($n = 11$), and *angioplasty* ($n = 10$).

Recent trends

Since all but one of the papers published after 2018 were not included in the top 100 list, trends in the past few years could

Table 1: Ten most frequently cited publications on ICAS between 1993 and 2022.

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
1	Chimowitz *et al.*[25]	Comparison of warfarin and aspirin for symptomatic intracranial arterial stenosis	USA	1,115	*N. Engl. J. Med.*	2005	62
2	Chimowitz *et al.*[24]	Stenting versus aggressive medical therapy for intracranial arterial stenosis	USA	1,082	*N. Engl. J. Med.*	2011	90
3	Sacco *et al.*[91]	Race ethnicity and determinants of intracranial atherosclerotic cerebral infarction – the Northern Manhattan stroke study	USA	683	*Stroke*	1995	24
4	Samuels *et al.*[92]	A standardized method for measuring intracranial arterial stenosis	USA	659	*Am. J. Neuroradiol.*	2000	29
5	Kasner *et al.*[54]	Predictors of ischemic stroke in the territory of a symptomatic intracranial arterial stenosis	USA	502	*Circulation*	2006	30
6	Gorelick *et al.*[39]	Large artery intracranial occlusive disease – A large worldwide burden but a relatively neglected frontier	USA	442	*Stroke*	2008	29
7	Derdeyn *et al.*[32]	Aggressive medical treatment with or without stenting in high-risk patients with intracranial artery stenosis (SAMMPRIS): the final results of a randomized trial	USA	438	*Lancet*	2014	49
8	Powers *et al.*[85]	Extracranial-intracranial bypass surgery for stroke prevention in hemodynamic cerebral ischemia the carotid occlusion surgery study randomized trial	USA	430	*JAMA-J. Am. Med. Assoc.*	2011	36
9	Lutsep *et al.*[70]	Stenting of symptomatic atherosclerotic lesions in the vertebral or intracranial arteries (SSYLVIA) study results	USA	425	*Stroke*	2004	22
10	Chimowitz *et al.*[23]	The warfarin-aspirin symptomatic intracranial disease study	USA	407	*Neurology*	1995	15

ICAS: Intracranial arterial stenosis, USA: United States of America

not be reflected in the analysis. The top 10 most-cited papers published since 2018 are listed in Supplemental Table 2. Among these, the median number of citations and the annual number of citations for the ten papers were 58 (range, 45–122) and 14 (range, 10–31), respectively. Furthermore, five articles discussed mechanical thrombectomy for large-vessel occlusion (LVO) in the context of ICAS.

Journals, countries, authors, and institutions

In total, 100 articles were published in 27 journals. *Stroke* was the most common journal (n = 41), followed by *Neurology* (n = 13) and the *American Journal of Neuroradiology* (n = 9). The three journals accounted for 63% of the total publications. The journal's impact factors are presented in Table 3.

There were 565 authors involved in the 100 publications; the corresponding authors were from 12 countries [Figure 4]. Most of the top 100 most-cited articles were from the USA (n = 48), followed by China (n = 17), Japan (n = 9), and South Korea (n = 7). A total of 33 articles were published from East Asia. In terms of institutional output, the Chinese University of Hong Kong yielded the highest number of articles (n = 13), followed by the Medical University of South Carolina (n = 7) and the University of Pennsylvania (n = 5) [Supplemental Table 3]. As for the author, Chimowitz[9,20,23-26,32,35,36,47,54,55,69,92,98,124] published the largest number of articles (n = 16), with a total citation

Table 2: The top 10 ICAS publications in annual citations.

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
1	Chimowitz *et al.*[24]	Stenting versus aggressive medical therapy for intracranial arterial stenosis	USA	1,082	*N. Engl. J. Med.*	2011	90
2	Chimowitz *et al.*[25]	Comparison of warfarin and aspirin for symptomatic intracranial arterial stenosis	USA	1,115	*N. Engl. J. Med.*	2005	62
3	Derdeyn *et al.*[32]	Aggressive medical treatment with or without stenting in high-risk patients with intracranial artery stenosis (SAMMPRIS): the final results of a randomized trial	USA	438	*Lancet*	2014	49
4	Wang *et al.*[102]	Prevalence and Outcomes of symptomatic intracranial large artery stenoses and occlusions in China the Chinese intracranial atherosclerosis (CICAS) study	China	347	*Stroke*	2014	39
5	Powers *et al.*[85]	Extracranial-intracranial bypass surgery for stroke prevention in hemodynamic cerebral ischemia the carotid occlusion surgery study randomized trial	USA	430	*JAMA-J. Am. Med. Assoc.*	2011	36
6	Zaidat *et al.*[123]	Effect of a balloon-expandable intracranial stent versus medical therapy on risk of stroke in patients with symptomatic intracranial stenosis: the VISSIT randomized clinical trial	USA	273	*JAMA-J. Am. Med. Assoc.*	2015	34
7	Alexander *et al.*[1]	WEAVE trial final results in 152 on-label patients	USA	122	*Stroke*	2019	31
8	Kasner *et al.*[54]	Predictors of ischemic stroke in the territory of a symptomatic intracranial arterial stenosis	USA	502	*Circulation*	2006	30
9	Gorelick *et al.*[39]	Large artery intracranial occlusive disease – A large worldwide burden but a relatively neglected frontier	USA	442	*Stroke*	2008	29
10	Banerjee *et al.*[9]	Stroke caused by atherosclerosis of the major intracranial arteries	USA	174	*Circ. Res.*	2017	29

ICAS: Intracranial arterial stenosis, WEAVE: Wingspan stent system post-market surveillance, USA: United States of America

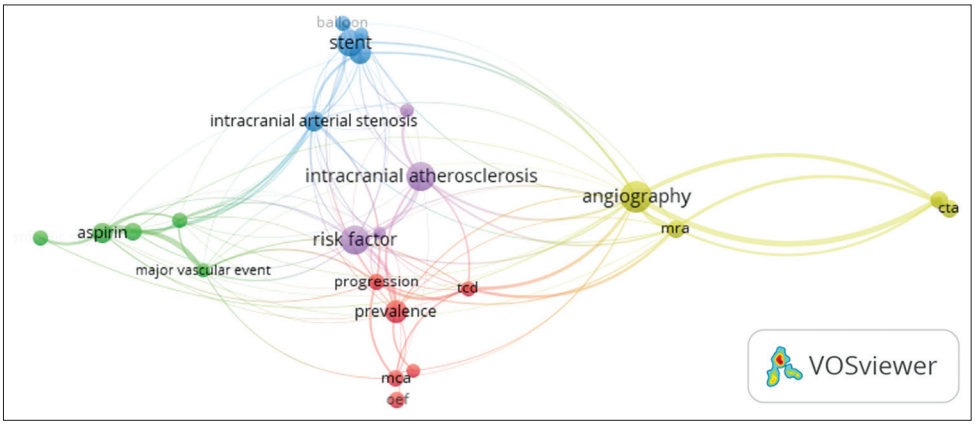

Figure 3: Network visualization of keywords in the titles and abstracts. The minimum number of keyword occurrences was fixed at 10, and the minimum cluster size was 3. The keywords that met the threshold were plotted in several clusters, with each color representing a different cluster: The red and purple clusters represent intracranial atherosclerosis and its pathophysiology; the yellow cluster represents radiological methods; the green cluster represents antithrombotic therapy for intracranial artery stenosis; and the blue cluster represents intracranial arterial stenosis and percutaneous endovascular treatment.

Table 3: The three journals that most frequently published the top 100 most-cited publications on ICAS.

Rank	Journal	Publication number	Citations (%)	IF
1	*Stroke*	41	7,881 (37)	10.17
2	*Neurology*	13	2,476 (12)	11.8
3	*American journal of neuroradiology*	9	1,912 (9)	4.966

IF: Impact factor, ICAS: Intracranial arterial stenosis

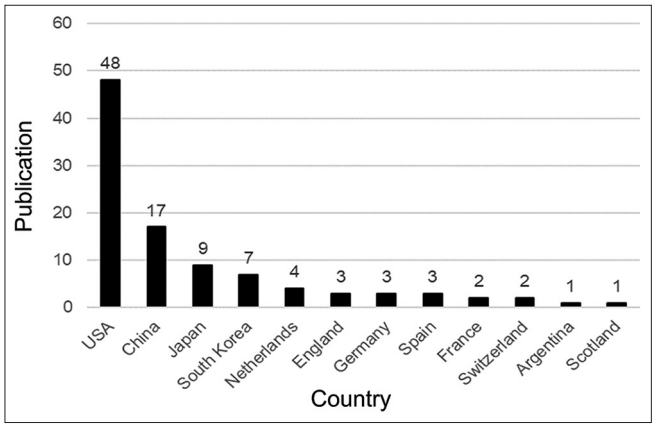

Figure 4: Distribution of the top 100 most-cited articles by countries.

of 5988, followed by Lynn (n = 12) and Wong (n = 12) [Supplemental Table 4].

DISCUSSION

Our study identified the 100 most-cited publications on ICAS/intracranial atherosclerosis and analyzed their overall characteristics, which clarified the overall progress of the research field, along with the journals, institutions, authors, and keyword levels. Bibliometric analysis is used to examine the characteristics of published articles based on specific parameters and has been applied in the field of neurosurgery.[2,3,22,94,106]

The top 100 most-cited articles are highly rated articles in a particular field, and a quantitative analysis of these articles reveals the synthesizing characteristics of key research. ICAS, the major cause of which is intracranial atherosclerosis, is the leading cause of ischemic stroke. Several hotspots regarding the epidemiology, pathophysiology, radiology/diagnosis, and medical and surgical treatments for the disease have been identified.

Terminology selection was challenging in this study since the terminology for ICAS and intracranial atherosclerosis was not standardized; multiple search terms were necessary to enable a comprehensive analysis. The search terms were elaborated such that a wide range of articles could be extracted without missing important papers. The results of the analysis of the terminology used in the titles are listed in Supplemental Table S5. *Intracranial* and *atherosclerosis* (*-tic*) are more frequently used.

Regarding the year of publication, both the number of papers and citations increased after 2003; the number of annual citations also significantly increased after 2003 compared with before 2002. This may be due to the publication of the warfarin-aspirin symptomatic intracranial disease trial, a representative RCT on medical treatment with two antithrombotic agents,[25] which compared the effects of warfarin and aspirin on symptomatic ICAS and showed that the rates of adverse events were significantly higher in the warfarin group. In addition, the stenting and aggressive medical management for preventing recurrent stroke in intracranial stenosis (SAMMPRIS) study, another RCT that compared medical and endovascular treatment, is an important clinical trial published in the *New England Journal of Medicine* in 2011[24] which ranked second in citation and first in annual citation among the 100 papers. The authors of this study demonstrated that intracranial stents were not effective in treating symptomatic ICAS. As for the article types, >90% of the top 100 cited articles were original articles, and <10% were review articles. In addition, annual citations were higher for review than original articles; however, no significant difference was observed. Although reviews usually tend to be more cited, many novel themes, including RCTs in the original articles, may have led to narrowing the numerical differences. Considering that papers published earlier have greater opportunities for citation, the number of citations received annually should be given more weightage. Only six out of the top 10 most-cited papers remained within the top 10 when considering annual citations. The other four publications that did not rank in the top 10 most-cited papers and were newly ranked in the top 10 annual citations comprised two articles on endovascular treatment, one on epidemiology, and one review.

The top four topics in the papers were endovascular treatment, radiological features and diagnosis, risk factors, and epidemiology, accounting for approximately 70% of the total. These results indicate that the mainstream research lies in endovascular treatment, whose efficacy has not yet been proven for ICAS, as well as diagnostic imaging and pathophysiology, including radiological features. Negative data on intracranial stents have a significant impact, and

many articles on intracranial stenting have been subsequently published.

Among them, the Wingspan stent system post market surveillance trial, published in 2019, is the most important study in recent years that demonstrated the potential of intracranial stents.[1] In this study, the patient selection criteria were very strict: Age 22–80 years, symptomatic ICAS 70–99%, ≥2 mm in length, modified Rankin Scale ≤3, and ≥ eight days post-onset, and the operators were limited to those with extensive experience in treating patients with Wingspan stents. In addition, blood pressure and activated clotting time during treatment were strictly monitored, and balloon size and air pressure were specified. The authors reported that the complication rate within 72 hours after the procedure decreased to 2.6%. In the future, intracranial stenting under strict indications may be firmly established.

One limitation of this research method is that except for one paper published after 2018,[1] newer publications have had fewer opportunities for citation, considering that they were recently published. Therefore, it was inferred that recent research themes were not appropriately reflected in this analysis. Among the papers published after 2018, five articles focused on mechanical thrombectomy for LVO with an ICAS background.[7,50,52,63,97] In recent years, the number of mechanical thrombectomies performed for acute LVO has increased as evidence for this procedure has become more established.[40,83] Accordingly, the treatment of LVO with ICAS has also been increasing; meanwhile, conventional treatment with a stent retriever tends to be refractory and causes intraoperative re-occlusion, and appropriate additional treatments such as balloon percutaneous transluminal angioplasty and intra-arterial infusion of glycoprotein IIb/IIIa inhibitors have been suggested to be useful.[7,52,97] Further studies are warranted to improve outcomes.

Analysis of keyword relevance yielded four independent clusters. The research topics differed slightly between intracranial atherosclerosis and ICAS. Since the former represents a pathological condition, it has typically been utilized in epidemiology, risk factors, pathophysiology, and diagnostic radiology studies. In the context of ICAS, secondary prevention is a primary aim, especially in symptomatic cases. Therefore, treatment measures were the focus of these studies, which can be interpreted as being closely associated with studies on the use of antithrombotic drugs and stent therapy.

Regarding journal analysis, most of the 100 articles were published in *Stroke*, followed by *Neurology* and the *American Journal of Neuroradiology*, which accounted for more than 60% of all publications. Two representative RCTs were published in the *New England Journal of Medicine*, the journal with the highest impact factor on the list. This may be explained by the high quality of articles in these journals and the fact that researchers tend to select journals with high-impact factors citing. Another factor is that neuroradiological diagnosis is very important in research on intracranial atherosclerosis. As for authors, Chimowitz, the authors of two RCTs from the USA,[24,25] published the largest number of papers. The number of publications from the USA was the highest by country. This trend is similar to that observed in most other fields of neurosurgical disease and treatment.[2,3,22,106] Meanwhile, reports from China, Japan, and South Korea accounted for 33% of the total. This is probably because ICAS is a more common cause of stroke in East Asians than in other racial groups,[19,34,47,103,114] which has led to the revitalization of research in this region. Although the prevalence of ICAS is high in other Asian countries, reports with a significant number of citations are lacking; therefore, future research in this area is anticipated.

This study has some limitations. First, although the Web of Science is a powerful tool for literature search, it does not necessarily cover all publications. Second, some authors might have been overestimated because self-citations were not excluded. Third, the analysis was mainly based on the number of citations; hence, recent papers were less likely to be cited, resulting in an underestimation of recent valuable papers. As a precaution, we have added an analysis of papers published in the most recent five years. Even though publications on the most recent topics that remain under development through research, such as genetic analyses, could not be covered. The prevalence of ICAS is higher in Asian, African, and Hispanic populations;[19,34,47,103,114] thus, the existence of genetic aspects has been suspected. An increasing number of studies have been conducted on the genetic analysis of ICAS recently.[33,78,101] Although the genetic factors underlying ICAS remain to be elucidated, current research approaches have missed our papers related to this issue. Despite these limitations, the strength of this study is its comprehensive analysis of ICAS, an important cause of ischemic stroke. The results of this study will serve as a benchmark for future studies.

CONCLUSION

This study conducted a bibliometric analysis of research on ICAS and intracranial atherosclerosis, listing important publications in this field. This analysis provides an objective view of the current state of knowledge in the clinical and research aspects within this field, providing insights into future research emphases.

Data availability

Data supporting this study's findings are available on request from the corresponding author.

Ethical approval

Institutional review board approval is not required.

Declaration of patient consent

Patient's consent was not required as there are no patients in this study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Alexander MJ, Zauner A, Chaloupka JC, Baxter B, Callison RC, Gupta R, *et al*. WEAVE trial: Final results in 152 on-label patients. Stroke 2019;50:889-94.
2. Alfaifi A, AlMutairi O, Allhaidan M, Alsaleh S, Ajlan A. The top 50 most-cited articles on acoustic neuroma. World Neurosurg 2018;111:e454-64.
3. Almutairi O, Albakr A, Al-Habib A, Ajlan A. The top-100 most-cited articles on meningioma. World Neurosurg 2017;107:1025-32.e5.
4. Arenillas JF. Intracranial atherosclerosis: Current concepts. Stroke 2011;42(1 Suppl):S20-3.
5. Arenillas JF, Alvarez-Sabín J, Molina CA, Chacón P, Montaner J, Rovira A, *et al*. C-reactive protein predicts further ischemic events in first-ever transient ischemic attack or stroke patients with intracranial large-artery occlusive disease. Stroke 2003;34:2463-8.
6. Arenillas JF, Molina CA, Montaner J, Abilleira S, González-Sánchez MA, Alvarez-Sabín J. Progression and clinical recurrence of symptomatic middle cerebral artery stenosis: A long-term follow-up transcranial Doppler ultrasound study. Stroke 2001;32:2898-904.
7. Baek JH, Kim BM, Heo JH, Kim DJ, Nam HS, Kim YD, *et al*. Outcomes of endovascular treatment for acute intracranial atherosclerosis-related large vessel occlusion. Stroke 2018,49:2699-705.
8. Baik SH, Park HJ, Kim JH, Jang CK, Kim BM, Kim DJ. Mechanical thrombectomy in subtypes of basilar artery occlusion: Relationship to recanalization rate and clinical outcome. Radiology 2019;291:730-7.
9. Banerjee C, Chimowitz MI. Stroke caused by atherosclerosis of the major intracranial arteries. Circ Res 2017;120:502-13.
10. Bang OY. Intracranial atherosclerosis: Current understanding and perspectives. J Stroke 2014;16:27-35.
11. Bang OY, Kim JW, Lee JH, Lee MA, Lee PH, Joo IS, *et al*. Association of the metabolic syndrome with intracranial atherosclerotic stroke. Neurology 2005;65:296-8.
12. Bash S, Villablanca JP, Jahan R, Duckwiler G, Tillis M, Kidwell C, *et al*. Intracranial vascular stenosis and occlusive disease: Evaluation with CT angiography, MR angiography, and digital subtraction angiography. AJNR Am J Neuroradiol 2005;26:1012-21.
13. Baumgartner RW, Mattle HP, Schroth G. Assessment of >/=50% and <50% intracranial stenoses by transcranial color-coded duplex sonography. Stroke 1999;30:87-92.
14. Beach TG, Wilson JR, Sue LI, Newell A, Poston M, Cisneros R, *et al*. Circle of Willis atherosclerosis: Association with Alzheimer's disease, neuritic plaques and neurofibrillary tangles. Acta Neuropathol 2007;113:13-21.
15. Bos D, Portegies ML, van der Lugt A, Bos MJ, Koudstaal PJ, Hofman A, *et al*. Intracranial carotid artery atherosclerosis and the risk of stroke in whites: The Rotterdam Study. JAMA Neurol 2014;71:405-11.
16. Bos D, van der Rijk MJ, Geeraedts TE, Hofman A, Krestin GP, Witteman JC, *et al*. Intracranial carotid artery atherosclerosis: Prevalence and risk factors in the general population. Stroke 2012;43:1878-84.
17. Bose A, Hartmann M, Henkes H, Liu HM, Teng MM, Szikora I, *et al*. A novel, self-expanding, nitinol stent in medically refractory intracranial atherosclerotic stenoses: The Wingspan study. Stroke 2007;38:1531-7.
18. Brekenfeld C, Schroth G, Mattle HP, Do DD, Remonda L, Mordasini P, *et al*. Stent placement in acute cerebral artery occlusion: Use of a self-expandable intracranial stent for acute stroke treatment. Stroke 2009;40:847-52.
19. Caplan LR, Gorelick PB, Hier DB. Race, sex and occlusive cerebrovascular disease: A review. Stroke 1986;17:648-55.
20. Chaturvedi S, Turan TN, Lynn MJ, Kasner SE, Romano J, Cotsonis G, *et al*. Risk factor status and vascular events in patients with symptomatic intracranial stenosis. Neurology 2007;69:2063-8.
21. Chen XY, Wong KS, Lam WW, Zhao HL, Ng HK. Middle cerebral artery atherosclerosis: Histological comparison between plaques associated with and not associated with infarct in a postmortem study. Cerebrovasc Dis 2008;25:74-80.
22. Cheng W, Kang Q, Xiao Q. Bibliometric analysis of the top 100 influential studies on carotid artery stenting. World Neurosurg 2019;122:e1321-31.
23. Chimowitz MI, Kokkinos J, Strong J, Brown MB, Levine SR, Silliman S, *et al*. The Warfarin-aspirin symptomatic intracranial disease study. Neurology 1995;45:1488-93.
24. Chimowitz MI, Lynn MJ, Derdeyn CP, Turan TN, Fiorella D, Lane BF, *et al*. Stenting versus aggressive medical therapy for intracranial arterial stenosis. N Engl J Med 2011;365:993-1003.
25. Chimowitz MI, Lynn MJ, Howlett-Smith H, Stern BJ, Hertzberg VS, Frankel MR, *et al*. Warfarin-aspirin symptomatic intracranial disease trial investigators. Comparison of warfarin and aspirin for symptomatic intracranial arterial stenosis. N Engl J Med 2005;352:1305-16.

26. Chimowitz MI, Strong J, Brown MB, Perkins A, Liang WM, Yang I, *et al*. Prognosis of patients with symptomatic vertebral or basilar artery stenosis. Stroke 1998;29:1389-92.
27. Clark WM, Barnwell SL, Nesbit G, O'Neill OR, Wynn ML, Coull BM. Safety and efficacy of percutaneous transluminal angioplasty for intracranial atherosclerotic stenosis. Stroke 1995;26:1200-4.
28. Cloud GC, Markus HS. Diagnosis and management of vertebral artery stenosis. QJM 2003;96:27-54.
29. Connors JJ 3rd, Wojak JC. Percutaneous transluminal angioplasty for intracranial atherosclerotic lesions: Evolution of technique and short-term results. J Neurosurg 1999;91:415-23.
30. Coward LJ, McCabe DJ, Ederle J, Featherstone RL, Clifton A, Brown MM, *et al*. Long-term outcome after angioplasty and stenting for symptomatic vertebral artery stenosis compared with medical treatment in the Carotid And Vertebral Artery Transluminal Angioplasty Study (CAVATAS): A randomized trial. Stroke 2007;38:1526-30.
31. D'Armiento FP, Bianchi A, de Nigris F, Capuzzi DM, D'Armiento MR, Crimi G, *et al*. Age-related effects on atherogenesis and scavenger enzymes of intracranial and extracranial arteries in men without classic risk factors for atherosclerosis. Stroke 2001;32:2472-9.
32. Derdeyn CP, Chimowitz MI, Lynn MJ, Fiorella D, Turan TN, Janis LS, *et al*. Aggressive medical treatment with or without stenting in high-risk patients with intracranial artery stenosis (SAMMPRIS): The final results of a randomised trial. Lancet 2014;383:333-41.
33. Dofuku S, Sonehara K, Miyawaki S, Sakaue S, Imai H, Shimizu M, *et al*. Genome-wide association study of intracranial artery stenosis followed by phenome-wide association study. Transl Stroke Res 2023;14:322-33.
34. Feldmann E, Daneault N, Kwan E, Ho KJ, Pessin MS, Langenberg P, *et al*. Chinese-white differences in the distribution of occlusive cerebrovascular disease. Neurology 1990;40:1541-5.
35. Feldmann E, Wilterdink JL, Kosinski A, Lynn M, Chimowitz MI, Sarafin J, *et al*. The stroke outcomes and neuroimaging of intracranial atherosclerosis (SONIA) trial. Neurology 2007;68:2099-106.
36. Fiorella D, Derdeyn CP, Lynn MJ, Barnwell SL, Hoh BL, Levy EI, *et al*. Detailed analysis of periprocedural strokes in patients undergoing intracranial stenting in Stenting and Aggressive Medical Management for Preventing Recurrent Stroke in Intracranial Stenosis (SAMMPRIS). Stroke 2012;43:2682-8.
37. Fiorella D, Levy EI, Turk AS, Albuquerque FC, Niemann DB, Aagaard-Kienitz B, *et al*. US multicenter experience with the wingspan stent system for the treatment of intracranial atheromatous disease: Periprocedural results. Stroke 2007;38:881-7.
38. Gomez CR, Misra VK, Liu MW, Wadlington VR, Terry JB, Tulyapronchote R, *et al*. Elective stenting of symptomatic basilar artery stenosis. Stroke 2000;31:95-9.
39. Gorelick PB, Wong KS, Bae HJ, Pandey DK. Large artery intracranial occlusive disease: A large worldwide burden but a relatively neglected frontier. Stroke 2008;39:2396-9.
40. Goyal M, Menon BK, van Zwam WH, J Dippel, DW, Mitchell PJ, Demchuk AM, *et al*. Endovascular thrombectomy after large-vessel ischaemic stroke: A meta-analysis of individual patient data from five randomised trials. Lancet 2016,387:1723-31.
41. Gröschel K, Schnaudigel S, Pilgram SM, Wasser K, Kastrup A. A systematic review on outcome after stenting for intracranial atherosclerosis. Stroke 2009;40:e340-7.
42. Gupta R, Al-Ali F, Thomas AJ, Horowitz MB, Barrow T, Vora NA, *et al*. Safety, feasibility, and short-term follow-up of drug-eluting stent placement in the intracranial and extracranial circulation. Stroke 2006;37:2562-6.
43. Henkes H, Miloslavski E, Lowens S, Reinartz J, Liebig T, Kühne D. Treatment of intracranial atherosclerotic stenoses with balloon dilatation and self-expanding stent deployment (WingSpan). Neuroradiology 2005;47:222-8.
44. Higashida RT, Tsai FY, Halbach VV, Dowd CF, Smith T, Fraser K, *et al*. Transluminal angioplasty for atherosclerotic disease of the vertebral and basilar arteries. J Neurosurg 1993;78:192-8.
45. Hirai T, Korogi Y, Ono K, Nagano M, Maruoka K, Uemura S, *et al*. Prospective evaluation of suspected stenoocclusive disease of the intracranial artery: Combined MR angiography and CT angiography compared with digital subtraction angiography. AJNR Am J Neuroradiol 2002;23:93-101.
46. Hirano T, Minematsu K, Hasegawa Y, Tanaka Y, Hayashida K, Yamaguchi T. Acetazolamide reactivity on 123I-IMP single photon emission computed tomography in patients with major cerebral artery occlusive disease: Correlation with positron emission tomography parameters. J Cereb Blood Flow Metab 1994;14:763-70.
47. Holmstedt CA, Turan TN, Chimowitz MI. Atherosclerotic intracranial arterial stenosis: Risk factors, diagnosis, and treatment. Lancet Neurol 2013;12:1106-14.
48. Hoshino T, Sissani L, Labreuche J, Ducrocq G, Lavallée PC, Meseguer E, *et al*. Prevalence of systemic atherosclerosis burdens and overlapping stroke etiologies and their associations with long-term vascular prognosis in stroke with intracranial atherosclerotic disease. JAMA Neurol 2018;75:203-11.
49. Huang YN, Gao S, Li SW, Huang Y, Li JF, Wong KS, *et al*. Vascular lesions in Chinese patients with transient ischemic attacks. Neurology 1997;48:524-5.
50. Jia B, Feng L, Liebeskind DS, Huo X, Gao F, Ma N, *et al*. Mechanical thrombectomy and rescue therapy for intracranial large artery occlusion with underlying atherosclerosis. J Neurointerv Surg 2018;10:746-50.
51. Jiang WJ, Wang YJ, Du B, Wang SX, Wang GH, Jin M, *et al*. Stenting of symptomatic M1 stenosis of middle cerebral artery: An initial experience of 40 patients. Stroke 2004;35:1375-80.
52. Kang DH, Yoon W, Kim SK, Baek BH, Lee YY, Kim YW, *et al*. Endovascular treatment for emergent large vessel occlusion due to severe intracranial atherosclerotic stenosis. J Neurosurg 2018,130:1-8.
53. Kappelle LJ, Eliasziw M, Fox AJ, Sharpe BL, Barnett HJ. Importance of intracranial atherosclerotic disease in patients with symptomatic stenosis of the internal carotid artery. The North American Symptomatic Carotid Endarterectomy Trail. Stroke 1999;30:282-6.
54. Kasner SE, Chimowitz MI, Lynn MJ, Howlett-Smith H, Stern BJ, Hertzberg VS, *et al*. Warfarin aspirin symptomatic intracranial disease trial investigators. Predictors of ischemic stroke in the territory of a symptomatic intracranial arterial

stenosis. Circulation 2006;113:555-63.
55. Kasner SE, Lynn MJ, Chimowitz MI, Frankel MR, Howlett-Smith H, Hertzberg VS, *et al*. Warfarin vs aspirin for symptomatic intracranial stenosis: Subgroup analyses from WASID. Neurology 2006;67:1275-8.
56. Kern R, Steinke W, Daffertshofer M, Prager R, Hennerici M. Stroke recurrences in patients with symptomatic vs asymptomatic middle cerebral artery disease. Neurology 2005;65:859-64.
57. Kim JS, Nah HW, Park SM, Kim SK, Cho KH, Lee J, *et al*. Risk factors and stroke mechanisms in atherosclerotic stroke: Intracranial compared with extracranial and anterior compared with posterior circulation disease. Stroke 2012;43:3313-8.
58. Konishi M, Iso H, Komachi Y, Iida M, Shimamoto T, Jacobs DR Jr., *et al*. Associations of serum total cholesterol, different types of stroke, and stenosis distribution of cerebral arteries. The Akita Pathology Study. Stroke 1993;24:954-64.
59. Kuroda S, Houkin K, Kamiyama H, Mitsumori K, Iwasaki Y, Abe H. Long-term prognosis of medically treated patients with internal carotid or middle cerebral artery occlusion: Can acetazolamide test predict it? Stroke 2001;32:2110-6.
60. Kwon SU, Cho YJ, Koo JS, Bae HJ, Lee YS, Hong KS, *et al*. Cilostazol prevents the progression of the symptomatic intracranial arterial stenosis: The multicenter double-blind placebo-controlled trial of cilostazol in symptomatic intracranial arterial stenosis. Stroke 2005;36:782-6.
61. Lammie GA, Sandercock PA, Dennis MS. Recently occluded intracranial and extracranial carotid arteries. Relevance of the unstable atherosclerotic plaque. Stroke 1999;30:1319-25.
62. Lee DK, Kim JS, Kwon SU, Yoo SH, Kang DW. Lesion patterns and stroke mechanism in atherosclerotic middle cerebral artery disease: Early diffusion-weighted imaging study. Stroke 2005;36:2583-8.
63. Lee JS, Lee SJ, Yoo JS, Hong JH, Kim CH, KimYW, *et al*. Prognosis of acute intracranial atherosclerosis-related occlusion after endovascular treatment. J Stroke 2018,20:394-403.
64. Leung SY, Ng TH, Yuen ST, Lauder IJ, Ho FC. Pattern of cerebral atherosclerosis in Hong Kong Chinese. Severity in intracranial and extracranial vessels. Stroke 1993;24:779-86.
65. Levy EI, Horowitz MB, Koebbe CJ, Jungreis CC, Pride GL, Dutton K, *et al*. Transluminal stent-assisted angiplasty of the intracranial vertebrobasilar system for medically refractory, posterior circulation ischemia: early results. Neurosurgery 2001;48:1215-21; discussion 1221-3.
66. Levy EI, Mehta R, Gupta R, Hanel RA, Chamczuk AJ, Fiorella D, *et al*. Self-expanding stents for recanalization of acute cerebrovascular occlusions. AJNR Am J Neuroradiol 2007;28:816-22.
67. Levy EI, Turk AS, Albuquerque FC, Niemann DB, Aagaard-Kienitz B, Pride L, *et al*. Wingspan in-stent restenosis and thrombosis: incidence, clinical presentation, and management. Neurosurgery 2007;61:644-50; discussion 650-1.
68. Li X, Wang A, Wang J, Wu J, Wang D, Gao X, *et al*. Association between High-density-lipoprotein-cholesterol levels and the prevalence of asymptomatic intracranial arterial stenosis. Sci Rep 2017;7:573.
69. Liebeskind DS, Cotsonis GA, Saver JL, Lynn MJ, Turan TN, Cloft HJ, *et al*. Collaterals dramatically alter stroke risk in intracranial atherosclerosis. Ann Neurol 2011;69:963-74.
70. Lutsep HL, Barnwell S, Mawad M, Chiu D, Hartmann M, Hacke W, *et al*. Stenting of symptomatic atherosclerotic lesions in the vertebral or intracranial arteries (SSYLVIA): Study results. Stroke 2004;35:1388-92.
71. Lylyk P, Cohen JE, Ceratto R, Ferrario A, Miranda C. Angioplasty and stent placement in intracranial atherosclerotic stenoses and dissections. AJNR Am J Neuroradiol 2002;23:430-6.
72. Marks MP, Marcellus M, Norbash AM, Steinberg GK, Tong D, Albers GW. Outcome of angioplasty for atherosclerotic intracranial stenosis. Stroke 1999;30:1065-9.
73. Marks MP, Wojak JC, Al-Ali F, Jayaraman M, Marcellus ML, Connors JJ, *et al*. Angioplasty for symptomatic intracranial stenosis: Clinical outcome. Stroke 2006;37:1016-20.
74. Marquardt L, Kuker W, Chandratheva A, Geraghty O, Rothwell PM. Incidence and prognosis of > or = 50% symptomatic vertebral or basilar artery stenosis: Prospective population-based study. Brain 2009;132:982-8.
75. Mazighi M, Labreuche J, Gongora-Rivera F, Duyckaerts C, Hauw JJ, Amarenco P. Autopsy prevalence of intracranial atherosclerosis in patients with fatal stroke. Stroke 2008;39:1142-7.
76. Mazighi M, Tanasescu R, Ducrocq X, Vicaut E, Bracard S, Houdart E, *et al*. Prospective study of symptomatic atherothrombotic intracranial stenoses: The GESICA study. Neurology 2006;66:1187-91.
77. Meng R, Asmaro K, Meng L, Liu Y, Ma C, Xi C, *et al*. Upper limb ischemic preconditioning prevents recurrent stroke in intracranial arterial stenosis. Neurology 2012;79:1853-61.
78. Miyawaki S, Imai H, Shimizu M, Yagi S, Ono H, Hukasa A, *et al*. Genetic variant RNF213 c.14576G>A in various phenotypes of intracranial major artery stenosis/occlusion. Stroke 2013,44:2894-7.
79. Miyawaki S, Imai H, Takayanagi S, Mukasa A, Nakatomi H, Saito N. Identification of a genetic variant common to moyamoya disease and intracranial major artery stenosis/occlusion. Stroke 2012;43:3371-4.
80. Mori T, Fukuoka M, Kazita K, Mori K. Follow-up study after intracranial percutaneous transluminal cerebral balloon angioplasty. AJNR Am J Neuroradiol 1998;19:1525-33.
81. Mori T, Kazita K, Chokyu K, Mima T, Mori K. Short-term arteriographic and clinical outcome after cerebral angioplasty and stenting for intracranial vertebrobasilar and carotid atherosclerotic occlusive disease. AJNR Am J Neuroradiol 2000;21:249-54.
82. Nguyen-Huynh MN, Wintermark M, English J, Lam J, Vittinghoff E, Smith WS, *et al*. How accurate is CT angiography in evaluating intracranial atherosclerotic disease? Stroke 2008;39:1184-8.
83. Nogueira RG, Jadhav AP, Haussen DC, Bonafe A, Budzik RF, Bhuva P, *et al*. Thrombectomy 6 to 24 hours after stroke with a mismatch between deficit and infarct. N Engl J Med 2018;378:11-21.
84. Ogasawara K, Ogawa A, Yoshimoto T. Cerebrovascular reactivity to acetazolamide and outcome in patients with symptomatic internal carotid or middle cerebral artery occlusion: A xenon-133 single-photon emission computed tomography study. Stroke 2002;33:1857-62.

85. Powers WJ, Clarke WR, Grubb RL Jr., Videen TO, Adams HP Jr., Derdeyn CP, *et al*. Extracranial-intracranial bypass surgery for stroke prevention in hemodynamic cerebral ischemia: The Carotid Occlusion Surgery Study randomized trial. JAMA 2011;306:1983-92.
86. Qiao Y, Zeiler SR, Mirbagheri S, Leigh R, Urrutia V, Wityk R, *et al*. Intracranial plaque enhancement in patients with cerebrovascular events on high-spatial-resolution MR images. Radiology 2014;271:534-42.
87. Qureshi AI, Caplan LR. Intracranial atherosclerosis. Lancet 2014;383:984-98.
88. Qureshi AI, Ziai WC, Yahia AM, Mohammad Y, Sen S, Agarwal P, *et al*. Stroke-free survival and its determinants in patients with symptomatic vertebrobasilar stenosis: A multicenter study. Neurosurgery 2003;52:1033-9; discussion 1039-40.
89. Ritz K, Denswil NP, Stam OC, van Lieshout JJ, Daemen MJ. Cause and mechanisms of intracranial atherosclerosis. Circulation 2014;130:1407-14.
90. Roher AE, Esh C, Rahman A, Kokjohn TA, Beach TG. Atherosclerosis of cerebral arteries in Alzheimer disease. Stroke 2004;35(11 Suppl 1):2623-7.
91. Sacco RL, Kargman DE, Gu Q, Zamanillo MC. Race-ethnicity and determinants of intracranial atherosclerotic cerebral infarction. The Northern Manhattan Stroke Study. Stroke 1995;26:14-20.
92. Samuels OB, Joseph GJ, Lynn MJ, Smith HA, Chimowitz MI. A standardized method for measuring intracranial arterial stenosis. AJNR Am J Neuroradiol 2000;21:643-6.
93. Sheehan JP. Journal of neurosurgery's top 25 highly cited articles on gamma knife surgery for meningioma. J Neurosurg 2017;27(Suppl1):1-2.
94. Singh R, McLelland MD, De La Peña NM, Pollock JR, Catapano JS, Srinivasan VM, *et al*. Research advances in the diagnosis and treatment of moyamoya disease: A bibliometric analysis. Neurosurg Rev 2022;45:1977-85.
95. Takis C, Kwan ES, Pessin MS, Jacobs DH, Caplan LR. Intracranial angioplasty: Experience and complications. AJNR Am J Neuroradiol 1997;18:1661-8.
96. Thijs VN, Albers GW. Symptomatic intracranial atherosclerosis: Outcome of patients who fail antithrombotic therapy. Neurology 2000;55:490-7.
97. Tsang AC, Orru E, Klostranec JM, Yang IH, Lau KK, Pong Tsanget FC, *et al*. Thrombectomy outcomes of intracranial atherosclerosis-related occlusions. Stroke 2019,50:1460-6.
98. Turan TN, Cotsonis G, Lynn MJ, Chaturvedi S, Chimowitz M; Warfarin-Aspirin Symptomatic Intracranial Disease (WASID) Trial Investigators. Relationship between blood pressure and stroke recurrence in patients with intracranial arterial stenosis. Circulation 2007;115:2969-75.
99. Turk AS, Levy EI, Albuquerque FC, Pride GL Jr., Woo H, Welch BG, *et al*. Influence of patient age and stenosis location on wingspan in-stent restenosis. AJNR Am J Neuroradiol 2008;29:23-7.
100. Voetsch B, DeWitt LD, Pessin MS, Caplan LR. Basilar artery occlusive disease in the New England Medical Center Posterior Circulation Registry. Arch Neurol 2004;61:496-504.
101. Wang Y, Mambiya M, Li Q, Yang L, Jia H, Han Y, *et al*. RNF213 p.R4810K Polymorphism and the risk of moyamoya disease, intracranial major artery stenosis/occlusion, and quasi-moyamoya disease: A meta-analysis. J Stroke Cerebrovasc Dis 2018;27:2259-70.
102. Wang Y, Zhao X, Liu L, Soo YO, Pu Y, Pan Y, *et al*. Prevalence and outcomes of symptomatic intracranial large artery stenoses and occlusions in China: The Chinese Intracranial Atherosclerosis (CICAS) Study. Stroke 2014;45:663-9.
103. White H, Boden-Albala B, Wang C, Elkind MS, Rundek T, Wringht CB, *et al*. Ischemic stroke subtype incidence among whites, blacks, and Hispanics: the Northern Manhattan Study. Circulation 2005;111:1327-31.
104. Wingo AP, Fan W, Duong DM, Gerasimov ES, Dammer EB, Liu Y, *et al*. Shared proteomic effects of cerebral atherosclerosis and Alzheimer's disease on the human brain. Nat Neurosci 2020;23:696-700.
105. Wityk RJ, Lehman D, Klag M, Coresh J, Ahn H, Litt B. Race and sex differences in the distribution of cerebral atherosclerosis. Stroke 1996;27:1974-80.
106. Wolff Fernandes F, Krauss JK. Microvascular decompression: A bibliometric analysis of the 100 most cited articles. World Neurosurg 20221;64:e671.
107. Wong KS, Gao S, Chan YL, Hansberg T, Lam WW, Droste DW, *et al*. Mechanisms of acute cerebral infarctions in patients with middle cerebral artery stenosis: A diffusion-weighted imaging and microemboli monitoring study. Ann Neurol 2002;52:74-81.
108. Wong KS, Huang YN, Gao S, Lam WW, Chan YL, Kay R. Intracranial stenosis in Chinese patients with acute stroke. Neurology 1998;50:812-3.
109. Wong KS, Li H. Long-term mortality and recurrent stroke risk among Chinese stroke patients with predominant intracranial atherosclerosis. Stroke 2003;34:2361-6.
110. Wong KS, Li H, Chan YL, Ahuja A, Lam WW, Wong A, *et al*. Use of transcranial Doppler ultrasound to predict outcome in patients with intracranial large-artery occlusive disease. Stroke 2000;31:2641-7.
111. Wong KS, Li H, Lam WW, Chan YL, Kay R. Progression of middle cerebral artery occlusive disease and its relationship with further vascular events after stroke. Stroke 2002;33:532-6.
112. Wong KS, Ng PW, Tang A, Liu R, Yeung V, Tomlinson B. Prevalence of asymptomatic intracranial atherosclerosis in high-risk patients. Neurology 2007;68:2035-8.
113. Wong KS, Chen C, Fu J, Chang HM, Suwanwela NC, Huang YN, *et al*. Clopidogrel plus aspirin versus aspirin alone for reducing embolisation in patients with acute symptomatic cerebral or carotid artery stenosis (CLAIR study): A randomised, open-label, blinded-endpoint trial. Lancet Neurol 2010;9:489-97.
114. Wong LK. Global burden of intracranial atherosclerosis. Int J Stroke 2006;1:158-9.
115. Wu F, Song H, Ma Q, Xiao J, Jiang T, Huang X, *et al*. Hyperintense plaque on intracranial vessel wall magnetic resonance imaging as a predictor of artery-to-artery embolic infarction. Stroke 2018;49:905-11.
116. Xu WH, Li ML, Gao S, Ni J, Yao M, Zhou LX, *et al*. Middle cerebral artery intraplaque hemorrhage: Prevalence and clinical relevance. Ann Neurol 2012;71:195-8.
117. Xu WH, Li ML, Gao S, Ni J, Zhou LX, Yao M, *et al*. *In vivo* high-resolution MR imaging of symptomatic and asymptomatic

middle cerebral artery atherosclerotic stenosis. Atherosclerosis 2010;212:507-11.
118. Yamauchi H, Fukuyama H, Nagahama Y, Nabatame H, Nakamura K, Yamamoto Y, *et al*. Evidence of misery perfusion and risk for recurrent stroke in major cerebral arterial occlusive diseases from PET. J Neurol Neurosurg Psychiatry 1996;61:18-25.
119. Yamauchi H, Fukuyama H, Nagahama Y, Nabatame H, Ueno M, Nishizawa S, *et al*. Significance of increased oxygen extraction fraction in five-year prognosis of major cerebral arterial occlusive diseases. J Nucl Med 1999;40:1992-8.
120. Yarchoan M, Xie SX, Kling MA, Toledo JB, Wolk DA, Lee EB, *et al*. Cerebrovascular atherosclerosis correlates with Alzheimer pathology in neurodegenerative dementias. Brain 2012;135:3749-56.
121. Yoo JH, Chung CS, Kang SS. Relation of plasma homocyst(e)ine to cerebral infarction and cerebral atherosclerosis. Stroke 1998;29:2478-83.
122. Yoon W, Kim SK, Park MS, Kim BC, Kang HK. Endovascular treatment and the outcomes of atherosclerotic intracranial stenosis in patients with hyperacute stroke. Neurosurgery 2015;76:680-6; discussion 686.
123. Zaidat OO, Fitzsimmons BF, Woodward BK, Wang Z, Killer-Oberpfalzer M, Wakhloo A, *et al*. Effect of a balloon-expandable intracranial stent vs medical therapy on risk of stroke in patients with symptomatic intracranial stenosis: The VISSIT randomized clinical trial. JAMA 2015;313:1240-8.
124. Zaidat OO, Klucznik R, Alexander MJ, Chaloupka J, Lutsep H, Barnwell S, *et al*. The NIH registry on use of the Wingspan stent for symptomatic 70-99% intracranial arterial stenosis. Neurology 2008;70:1518-24.

How to cite this article: Hirano Y, Miyawaki S, Sakaguchi Y, Koizumi S, Hongo H, Saito N. A bibliometric analysis of the 100 most-cited clinical articles in the research of intracranial artery stenosis and intracranial atherosclerosis. Surg Neurol Int. 2024;15:74. doi: 10.25259/SNI_1030_2023

SUPPLEMENTAL TABLES

Supplemental Table 1: The 100 most frequently cited publications on ICAS between 1993 and 2022.

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
1	Chimowitz *et al.*[25]	Comparison of warfarin and aspirin for symptomatic intracranial arterial stenosis	USA	1,115	*N. Engl. J. Med.*	2005	62
2	Chimowitz *et al.*[24]	Stenting versus aggressive medical therapy for intracranial arterial stenosis	USA	1,082	*N. Engl. J. Med.*	2011	90
3	Sacco *et al.*[91]	Race ethnicity and determinants of intracranial atherosclerotic cerebral infarction – the Northern Manhattan stroke study	USA	683	*Stroke*	1995	24
4	Samuels *et al.*[92]	A standardized method for measuring intracranial arterial stenosis	USA	659	*Am. J. Neuroradiol.*	2000	29
5	Kasner *et al.*[54]	Predictors of ischemic stroke in the territory of a symptomatic intracranial arterial stenosis	USA	502	*Circulation*	2006	30
6	Gorelick *et al.*[39]	Large artery intracranial occlusive disease - A large worldwide burden but a relatively neglected frontier	USA	442	*Stroke*	2008	29
7	Derdeyn *et al.*[32]	Aggressive medical treatment with or without stenting in high-risk patients with intracranial artery stenosis (SAMMPRIS): the final results of a randomized trial	USA	438	*Lancet*	2014	49
8	Powers *et al.*[85]	Extracranial-intracranial bypass surgery for stroke prevention in hemodynamic cerebral ischemia the carotid occlusion surgery study randomized trial	USA	430	*JAMA-J. Am. Med. Assoc.*	2011	36
9	Lutsep *et al.*[70]	SSYLVIA study results	USA	425	*Stroke*	2004	22
10	Chimowitz *et al.*[23]	The warfarin-aspirin symptomatic intracranial disease study	USA	407	*Neurology*	1995	15
11	Wong[114]	Global burden of intracranial atherosclerosis	China	375	*Int. J. Stroke*	2006	22
12	Wityk *et al.*[105]	Race and sex differences in the distribution of cerebral atherosclerosis	USA	358	*Stroke*	1996	13
13	Wang *et al.*[102]	Prevalence and outcomes of symptomatic intracranial large artery stenoses and occlusions in China the Chinese intracranial atherosclerosis (CICAS) study	China	347	*Stroke*	2014	39
14	Bash *et al.*[12]	Intracranial vascular stenosis and occlusive disease: Evaluation with CT angiography, MR angiography, and digital subtraction angiography	USA	313	*Am. J. Neuroradiol.*	2005	17
15	Bose *et al.*[17]	A novel, self-expanding, and nitinol stent in medically refractory intracranial atherosclerotic stenoses – the Wingspan study	USA	286	*Stroke*	2007	18

(Contd...)

Supplemental Table 1: *(Continued).*

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
16	Wong[113]	Clopidogrel plus aspirin versus aspirin alone for reducing embolization in patients with acute symptomatic cerebral or carotid artery stenosis (CLAIR study): A randomized, open-label, and blinded-endpoint trial	China	276	*Lancet Neurol.*	2010	21
17	Zaidat *et al.*[113]	Effect of a balloon-expandable intracranial stent versus medical therapy on risk of stroke in patients with symptomatic intracranial stenosis the VISSIT randomized clinical trial	USA	273	*JAMA-J. Am. Med. Assoc.*	2015	34
18	Holmstedt *et al.*[47]	Atherosclerotic intracranial arterial stenosis: risk factors, diagnosis, and treatment	USA	263	*Lancet Neurol.*	2013	26
19	Wong[108]	Intracranial stenosis in Chinese patients with acute stroke	China	257	*Neurology*	1998	10
20	Fiorella *et al.*[37]	US multicenter experience with the wingspan stent system for the treatment of intracranial atheromatous disease – Periprocedural results	USA	250	*Stroke*	2007	16
21	Zaidat *et al.*[124]	The NIH registry on use of the Wingspan stent for symptomatic 70-99% intracranial arterial stenosis	USA	247	*Neurology*	2008	16
22	Meng *et al.*[77]	Upper limb ischemic preconditioning prevents recurrent stroke in intracranial arterial stenosis	China	244	*Neurology*	2012	22
23	Chimowitz *et al.*[26]	Prognosis of patients with symptomatic vertebral or basilar artery stenosis	USA	239	*Stroke*	1998	10
24	Kuroda *et al.*[59]	Long-term prognosis of medically treated patients with internal carotid or middle cerebral artery occlusion – Can acetazolamide test predict it?	Japan	232	*Stroke*	2001	11
25	Higashida *et al.*[44]	Transluminal angioplasty for atherosclerotic disease of the vertebral and basilar arteries	USA	229	*J. Neurosurg.*	1993	8
26	Qureshi *et al.*[87]	Intracranial atherosclerosis	USA	224	*Lancet*	2014	25
27	Kwon *et al.*[60]	Cilostazol prevents the progression of the symptomatic intracranial arterial stenosis – The Multicenter double-blind placebo-controlled trial of cilostazol in symptomatic intracranial arterial stenosis	South Korea	222	*Stroke*	2005	12
28	Mazighi *et al.*[76]	Prospective study of symptomatic atherothrombotic intracranial stenoses – The GESICA Study	France	219	*Neurology*	2006	13
29	Feldmann *et al.*[35]	The SONIA trial	USA	211	*Neurology*	2007	13
30	Thijs *et al.*[96]	Symptomatic intracranial atherosclerosis - Outcome of patients who fail antithrombotic therapy	USA	208	*Neurology*	2000	9

(Contd...)

Supplemental Table 1: *(Continued).*

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
31	Wong[110]	Use of transcranial Doppler ultrasound to predict outcome in patients with intracranial large-artery occlusive disease	China	206	*Stroke*	2000	9
32	Liebeskind *et al.*[69]	Collaterals dramatically alter stroke risk in intracranial atherosclerosis	USA	199	*Ann. Neurol.*	2011	17
33	Connors *et al.*[29]	Percutaneous transluminal angioplasty for intracranial atherosclerotic lesions: evolution of technique and short-term results	USA	196	*J. Neurosurg.*	1999	8
34	Levy *et al.*[67]	Wingspan in-stent restenosis and thrombosis: Incidence, clinical presentation, and management	USA	193	*Neurosurgery*	2007	12
35	Baumgartner *et al.*[13]	Assessment of ≥50% and <50% intracranial stenoses by transcranial color-coded duplex sonography	Switzerland	192	*Stroke*	1999	8
36	Yarchoan *et al.*[120]	Cerebrovascular atherosclerosis correlates with Alzheimer pathology in neurodegenerative dementias	USA	190	*Brain*	2012	17
37	Kim *et al.*[57]	Risk factors and stroke mechanisms in atherosclerotic stroke intracranial compared with extracranial and anterior compared with posterior circulation disease	South Korea	189	*Stroke*	2012	17
38	Yamauchi *et al.*[119]	Significance of increased oxygen extraction fraction in 5-year prognosis of major cerebral arterial occlusive diseases	Japan	189	*J. Nucl. Med.*	1999	8
39	Beach *et al.*[14]	Circle of Willis atherosclerosis: association with Alzheimer's disease, neuritic plaques, and neurofibrillary tangles	USA	184	*Acta Neuropathol.*	2007	12
40	Ogasawara *et al.*[84]	Cerebrovascular reactivity to acetazolamide and outcome in patients with symptomatic internal carotid or middle cerebral artery occlusion – A xenon-133 single-photon emission computed tomography study	Japan	184	*Stroke*	2002	9
41	Mori *et al.*[80]	Follow-up study after intracranial percutaneous transluminal cerebral balloon angioplasty	Japan	183	*Am. J. Neuroradiol.*	1998	7
42	Yamauchi *et al.*[118]	Evidence of misery perfusion and risk for recurrent stroke in major cerebral arterial occlusive diseases from PET	Japan	183	*J. Neurol. Neurosurg. Psychiatry*	1996	7
43	Qiao *et al.*[86]	Intracranial plaque enhancement in patients with cerebrovascular events on high-spatial-resolution MR images	USA	181	*Radiology*	2014	20

(Contd...)

Supplemental Table 1: *(Continued).*

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
44	Wong[107]	Mechanisms of acute cerebral infarctions in patients with middle cerebral artery stenosis: A diffusion-weighted imaging and microemboli monitoring study	China	180	*Ann. Neurol.*	2002	9
45	Wong[109]	Long-term mortality and recurrent stroke risk among Chinese stroke patients with predominant intracranial atherosclerosis	China	176	*Stroke*	2003	9
46	Banerjee *et al.*[9]	Stroke caused by atherosclerosis of the major intracranial arteries	USA	174	*Circ.Res.*	2017	29
47	Xu *et al.*[117]	*In vivo* high-resolution MR imaging of symptomatic and asymptomatic middle cerebral artery atherosclerotic stenosis	China	163	*Atherosclerosis*	2010	13
48	Marks *et al.*[73]	Angioplasty for symptomatic intracranial stenosis – Clinical outcome	USA	163	*Stroke*	2006	10
49	Leung *et al.*[64]	Pattern of cerebral atherosclerosis in Hong-Kong Chinese – Severity in intracranial and extracranial vessels	China	163	*Stroke*	1993	5
50	Li *et al.*[68]	Association between high-density-lipoprotein-cholesterol levels and the prevalence of asymptomatic intracranial arterial stenosis	China	161	*Sci Rep*	2017	27
51	Arenillas *et al.*[4]	Intracranial atherosclerosis current concepts	Spain	161	*Stroke*	2011	13
52	Mazighi *et al.*[75]	Autopsy prevalence of intracranial atherosclerosis in patients with fatal stroke	France	161	*Stroke*	2008	11
53	Konishi *et al.*[58]	Associations of serum total cholesterol, different types of stroke, and stenosis distribution of cerebral-arteries the Akita pathology study	Japan	161	*Stroke*	1993	5
54	Levy *et al.*[66]	Self-expanding stents for recanalization of acute cerebrovascular occlusions	USA	151	*Am. J. Neuroradiol.*	2007	9
55	Gomez *et al.*[38]	Elective stenting of symptomatic basilar artery stenosis	USA	149	*Stroke*	2000	6
56	Arenillas *et al.*[6]	Progression and clinical recurrence of symptomatic middle cerebral artery stenosis – A long-term follow-up transcranial Doppler ultrasound study	Spain	148	*Stroke*	2001	7
57	Voetsch *et al.*[100]	Basilar artery occlusive disease in the New England medical center posterior circulation registry	USA	145	*Arch. Neurol.*	2004	8
58	Bang *et al.*[10]	Intracranial atherosclerosis: Current understanding and perspectives	South Korea	142	*J. Stroke*	2014	16
59	Gupta *et al.*[42]	Safety, feasibility, and short-term follow-up of drug-eluting stent placement in the intracranial and extracranial circulation	USA	140	*Stroke*	2006	8

(Contd...)

Supplemental Table 1: *(Continued).*

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
60	Kappelle *et al.*[53]	Importance of intracranial atherosclerotic disease in patients with symptomatic stenosis of the internal carotid artery	Netherlands	139	*Stroke*	1999	6
61	Arenillas *et al.*[5]	C-reactive protein predicts further ischemic events in first-ever transient ischemic attack or stroke patients with intracranial large-artery occlusive disease	Spain	136	*Stroke*	2003	7
62	Turk *et al.*[99]	Influence of patient age and stenosis location on Wingspan in-stent restenosis	USA	134	*Am. J. Neuroradiol.*	2008	9
63	Clark *et al.*[27]	Safety and efficacy of percutaneous transluminal angioplasty for intracranial atherosclerotic stenosis	USA	131	*Stroke*	1995	5
64	Lee *et al.*[62]	Lesion patterns and stroke mechanism in atherosclerotic middle cerebral artery disease – Early diffusion-weighted imaging study	South Korea	130	*Stroke*	2005	7
65	Marks *et al.*[72]	Outcome of angioplasty for atherosclerotic intracranial stenosis	USA	130	*Stroke*	1999	5
66	Nguyen-Huynh *et al.*[82]	How accurate is CT angiography in evaluating intracranial atherosclerotic disease?	USA	128	*Stroke*	2008	9
67	Henkes *et al.*[43]	Treatment of intracranial atherosclerotic stenoses with balloon dilatation and self-expanding stent deployment (WingSpan)	Germany	128	*Neuroradiology*	2005	7
68	Mori *et al.*[81]	Short-term arteriographic and clinical outcome after cerebral angioplasty and stenting for intracranial vertebrobasilar and carotid atherosclerotic occlusive disease	Japan	128	*Am. J. Neuroradiol.*	2000	6
69	Coward *et al.*[30]	Long-term outcome after angioplasty and stenting for symptomatic vertebral artery stenosis compared with medical treatment in the CAVATAS - A randomized trial	England	126	*Stroke*	2007	8
70	D'Armiento *et al.*[31]	Age-related effects on atherogenesis and scavenger enzymes of intracranial and extracranial arteries in men without classic risk factors for atherosclerosis	USA	126	*Stroke*	2001	6
71	Ritz *et al.*[89]	Cause and mechanisms of intracranial atherosclerosis	Netherlands	124	*Circulation*	2014	14
72	Bos *et al.*[15]	Intracranial carotid artery atherosclerosis and the risk of stroke in whites the Rotterdam study	Netherlands	124	*JAMA Neurol.*	2014	14
73	Huang *et al.*[49]	Vascular lesions in Chinese patients with transient ischemic attacks	China	123	*Neurology*	1997	5
74	Alexander *et al.*[1]	WEAVE trial final results in 152 on-label patients	USA	122	*Stroke*	2019	31

(Contd...)

Supplemental Table 1: *(Continued).*

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
75	Hirano *et al.*[46]	Acetazolamide reactivity on I-123 IMP single-photon emission computed-tomography in patients with major cerebral-artery occlusive disease – correlation with positron emission tomography parameters	Japan	122	*J. Cereb. Blood Flow Metab.*	1994	4
76	Groschel *et al.*[41]	A systematic review on outcome after stenting for intracranial atherosclerosis	Germany	121	*Stroke*	2009	9
77	Cloud *et al.*[28]	Diagnosis and management of vertebral artery stenosis	England	121	*QJM-An Int. J. Med.*	2003	6
78	Xu *et al.*[116]	Middle cerebral artery intraplaque hemorrhage: Prevalence and clinical relevance	China	120	*Ann. Neurol.*	2012	11
79	Marquardt *et al.*[74]	Incidence and prognosis of 50 symptomatic vertebral or basilar artery stenosis: prospective population-based study	England	120	*Brain*	2009	9
80	Qureshi *et al.*[88]	Stroke-free survival and its determinants in patients with symptomatic vertebrobasilar stenosis: A multicenter study	USA	120	*Neurosurgery*	2003	6
81	Jiang *et al.*[51]	Stenting of symptomatic M1 stenosis of middle cerebral artery – An initial experience of 40 patients	China	119	*Stroke*	2004	6
82	Brekenfeld *et al.*[18]	Stent placement in acute cerebral artery occlusion use of a self-expandable intracranial stent for acute stroke treatment	Switzerland	118	*Stroke*	2009	8
83	Lylyk *et al.*[71]	Angioplasty and stent placement in intracranial atherosclerotic stenoses and dissections	Argentina	118	*Am. J. Neuroradiol.*	2002	6
84	Bos *et al.*[16]	Intracranial carotid artery atherosclerosis prevalence and risk factors in the general population	Netherlands	117	*Stroke*	2012	11
85	Fiorella *et al.*[36]	Detailed analysis of periprocedural strokes in patients undergoing intracranial stenting in SAMMPRIS	USA	116	*Stroke*	2012	11
86	Levy *et al.*[65]	Transluminal stent-assisted angioplasty of the intracranial vertebrobasilar system for medically refractory, posterior circulation ischemia: Early results	USA	116	*Neurosurgery*	2001	5
87	Takis *et al.*[95]	Intracranial angioplasty: Experience and complications	USA	115	*Am. J. Neuroradiol.*	1997	4
88	Wong[111]	Progression of middle cerebral artery occlusive disease and its relationship with further vascular events after stroke	China	114	*Stroke*	2002	5
89	Chen *et al.*[21]	Middle cerebral artery atherosclerosis: Histological comparison between plaques associated with and not associated with infarct in a postmortem study	China	113	*Cerebrovasc. Dis.*	2008	8

(Contd...)

Supplemental Table 1: *(Continued).*

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
90	Chaturvedi *et al.*[20]	Risk factor status and vascular events in patients with symptomatic intracranial stenosis	USA	113	*Neurology*	2007	7
91	Kasner *et al.*[55]	Warfarin versus aspirin for symptomatic intracranial stenosis: Subgroup analyses from WASID	USA	113	*Neurology*	2006	7
92	Bang *et al.*[11]	Association of the metabolic syndrome with intracranial atherosclerotic stroke	South Korea	113	*Neurology*	2005	6
93	Wong[112]	Prevalence of asymptomatic intracranial atherosclerosis in high-risk patients	China	112	*Neurology*	2007	7
94	Roher *et al.*[90]	Atherosclerosis of cerebral arteries in Alzheimer disease	USA	112	*Stroke*	2004	6
95	Hirai *et al.*[45]	Prospective evaluation of suspected stenoocclusive disease of the intracranial artery: Combined MR angiography and CT angiography compared with digital subtraction angiography	Japan	111	*Am. J. Neuroradiol.*	2002	5
96	Yoon *et al.*[122]	Endovascular treatment and the outcomes of atherosclerotic intracranial stenosis in patients with hyperacute stroke	South Korea	110	*Neurosurgery*	2015	14
97	Turan *et al.*[98]	Relationship between blood pressure and stroke recurrence in patients with intracranial arterial stenosis	USA	110	*Circulation*	2007	7
98	Lammie *et al.*[61]	Recently occluded intracranial and extracranial carotid arteries – Relevance of the unstable atherosclerotic plaque	Scotland	110	*Stroke*	1999	5
99	Kern *et al.*[56]	Stroke recurrences in patients with symptomatic versus asymptomatic middle cerebral artery disease	Germany	109	*Neurology*	2005	6
100	Yoo *et al.*[121]	Relation of plasma homocyst(e)ine to cerebral infarction and cerebral atherosclerosis	South Korea	109	*Stroke*	1998	4

SSYLVIA: Stenting of symptomatic atherosclerotic lesions in the vertebral or intracranial arteries, SAMMPRIS: Stenting and aggressive medical management for preventing recurrent stroke in intracranial stenosis, CAVATAS: Carotid and vertebral artery transluminal angioplasty study, SONIA: Stroke outcomes and neuroimaging of intracranial atherosclerosis

Supplemental Table 2: The ten most frequently cited publications on ICAS between 2018 and 2022.

Rank	Authors	Title	Country	Citations	Journal	Year	Annual citations
1	Alexander *et al.*[1]	WEAVE trial final results in 152 on-label patients	USA	122	*Stroke*	2019	31
2	Jia *et al.*[50]	Mechanical thrombectomy and rescue therapy for intracranial large artery occlusion with underlying atherosclerosis	China	81	*J. NeuroInterventional Surg.*	2018	16
3	Baek *et al.*[7]	Outcomes of endovascular treatment for acute intracranial atherosclerosis-related large vessel occlusion	South Korea	66	*Stroke*	2018	13
4	Tsang *et al.*[97]	Thrombectomy outcomes of intracranial atherosclerosis-related occlusions: A systematic review and meta-analysis	China	63	*Stroke*	2019	16
5	Kang *et al.*[52]	Endovascular treatment for emergent large vessel occlusion due to severe intracranial atherosclerotic stenosis	South Korea	59	*J. Neurosurg.*	2019	15
6	Lee *et al.*[63]	Prognosis of acute intracranial atherosclerosis-related occlusion after endovascular treatment	South Korea	57	*J. Stroke*	2018	11
7	Hoshino *et al.*[48]	Prevalence of systemic atherosclerosis burdens and overlapping stroke etiologies and their associations with long-term vascular prognosis in stroke with intracranial atherosclerotic disease	France	52	*JAMA Neurol.*	2018	10
8	Wingo *et al.*[104]	Shared proteomic effects of cerebral atherosclerosis and Alzheimer's disease on the human brain	USA	51	*Nat. Neurosci.*	2020	17
9	Wu *et al.*[115]	Hyperintense plaque on intracranial vessel wall magnetic resonance imaging as a predictor of artery-to-artery embolic infarction	China	48	*Stroke*	2018	10
10	Baik *et al.*[8]	Mechanical thrombectomy in subtypes of basilar artery occlusion: relationship to recanalization rate and clinical outcome	South Korea	45	*Radiology*	2019	11

Supplemental Table 3: Three institutions most frequently affiliated among the 100 most frequently cited publications.

Rank	Institutions, country	Publication number	Citations
1	Chinese University of Hong Kong, China	13	3.007
2	Medical University of South Carolina, USA	7	2.406
3	University of Pennsylvania, USA	5	2.033

Supplemental Table 4: Three highest-ranked authors among the 100 most frequently cited publications.

Rank	Authors	Publication number	Citations
1	Chimowitz[9,20,23-26,32,35,36,47,54,55,69,92,98,124]	16	5.988
2	Lynn[20,24,25,32,35,36,54,55,69,92,98,124]	12	4.905
3	Wong[21,39,49,102,107-114]	12	2.721

Supplemental Table 5: Number of times each term was used in the titles of the top 100 cited publications.

Terms	Count
Intracranial	66
Cerebral	25
Cerebrovascular	4
Stenosis (-tic)	36
Occlusion (-sive)	17
Atherosclerosis (-tic)	43
Atheromatous	1