Original Research

It is time to move forward: a bibliometric analysis of top 50 cited articles in elbow arthroscopy

Jiyong Yang a,1, Qian Zhao b,1, Yi Zhou a, Huifeng Zhen b, Jiang Wu b, Xiao Chen b, Fuji Ren b, Jingmin Huang b,*

a The Fifth Clinical College of Guangzhou University of Chinese Medicine, Guangzhou 510095, China
b Department of Arthroscopy and Sports Medicine, Tianjin Hospital, Tianjin 300000, China

ARTICLE INFO

Keywords:
Elbow arthroscopy
Bibliometric analysis
Citation analysis
Top cited

ABSTRACT

Objectives: To analyze the bibliometric characteristics of the top 50 cited articles in elbow arthroscopy.

Methods: The Web of Science Core Collection was employed to systematically retrieve publications related to elbow arthroscopy. Subsequently, the top 50 cited articles meeting the predefined inclusion criteria were meticulously documented and subjected to comprehensive bibliometric analysis.

Results: The top 50 cited articles spanned the years 1999–2017, with the 2010s emerging as the most prolific decade. Citations per article varied from 24 to 211, and citation density ranged from 1.61 to 9.17. The United States dominated in article production and citations. Predominantly, the articles took the form of case series and expert opinions, with a notable absence of level I or II evidence. The keywords with the highest frequencies were “arthrofibrosis,” “complications,” and “release.” These keywords formed five main clusters: stiff elbow, osteoarthritis, osteochondritis dissecans, and lateral epicondylitis.

Conclusions: The majority of the top 50 cited articles in elbow arthroscopy comprised case series exhibiting Level IV or V evidence. Despite a dynamic development post-2010, elbow arthroscopy articles showed lower mean citations and citation density compared to other joints, potentially influenced by concerns about complications. However, with the increasing prevalence of elbow arthroscopy procedures, it is anticipated that higher-level articles, particularly those focusing on complications and exploring additional indications, will supersede some of the articles included in this analysis.

Level of evidence: IV

What are the new findings?

- The research areas of top 50 cited articles in elbow arthroscopy were focused on stiff elbow, osteoarthritis, osteochondritis dissecans, and lateral epicondylitis.
- The majority of the top 50 cited articles in elbow arthroscopy comprised case series exhibiting Level IV or V evidence.
- The top 50 cited in elbow arthroscopy articles showed lower mean citations and citation density compared to other joints, potentially influenced by concerns about complications.

* Corresponding author. Tel.: +8615522963771.
E-mail address: huangjinmin tjyy@163.com (J. Huang).
1 The authors contributed to this article equally.

https://doi.org/10.1016/j.jisako.2024.04.011

Received 22 February 2024; Received in revised form 15 April 2024; Accepted 16 April 2024

2059-7754/© 2024 The Author(s). Published by Elsevier Inc. on behalf of International Society of Arthroscopy, Knee Surgery and Orthopedic Sports Medicine. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Please cite this article as: Yang J et al., It is time to move forward: a bibliometric analysis of top 50 cited articles in elbow arthroscopy, Journal of ISAKOS, https://doi.org/10.1016/j.jisako.2024.04.011
INTRODUCTION

Elbow arthroscopy was initially performed on cadavers by Michael Burman in 1931 at the anatomy laboratory of New York University [1]. His initial attempt, reported in a subsequent article a year later, indicated the challenges of elbow arthroscopy [2]. In 1971, the introduction of smaller arthroscopes facilitated successful procedures by Ito and Maeda [3,4]. Andrews and Carson in 1985 and Johnson in 1986 further contributed by detailing their techniques and indications for elbow arthroscopy, initiating the application of elbow arthroscopy to clinical practice [5,6]. The early stages of elbow arthroscopies were associated with a notable risk of complications, ranging from 10% to 20% [7,8]. However, advancements in instrumentation, enhanced comprehension of arthroscopic anatomy, and the development of novel techniques led to a surge in the prevalence of elbow arthroscopy, concurrently enhancing its safety [9–11]. Meanwhile, the indications for elbow arthroscopy are expanding and the literature on the topic continues to grow [12].

Bibliometric analysis that included the analysis of top cited articles and overall article analysis, is a methodology for assessing the qualities and scrutinizing the characteristics of publications, offering valuable insights into the current state of a research area [13]. Highly cited articles represent high-quality and influential research results in the discipline, from which we may be able to get a glimpse of the current status and development trend [14]. Numerous studies have reported the most influential articles in orthopaedics, encompassing the specialty at large and specific subspecialties [15,16]. There has been one bibliometric review highlighting the top 25 most cited articles in arthroscopy. Of note, included in these 25 articles were articles on wrist, shoulder, knee, and hip arthroscopy, but there were no articles on elbow arthroscopy [17]. Similar results were also observed in the top 100 cited articles on arthroscopy by Tang et al. [14]. In addition, bibliometric analysis of top cited articles of knee, shoulder and hip arthroscopy were conducted recently [18–20]. However, to date, there was no bibliometric analysis conducted on the top cited articles of elbow arthroscopy.

The body of literature on elbow arthroscopy continues to expand with advancements in surgical techniques and the broadening of surgical indications. Consequently, the objective of the current study was to identify and analyze the bibliometric characteristics of top 50 cited articles on elbow arthroscopy. Our hypothesis posited that the bibliometric characteristics of these top-cited articles in elbow arthroscopy would align with those observed in studies focusing on other joints.

MATERIALS AND METHODS

Data sources and search strategies

Relevant literature for this study was gathered from the Web of Science Core Collection (WOSCC), recognized as one of the most comprehensive and authoritative databases in the academic realm. The last literature search, conducted on November 19, 2023, utilized Boolean queries to encompass all potential permutations of elbow arthroscopy research. Initially, a “topic” searching strategy was employed to identify pertinent documents. However, recognizing that this method encompassed some irrelevant literature, we subsequently adopted the “title” search strategy to enhance result relevance. The final Boolean search phrase was: TI = [(elbow AND (arthroscop*)) OR (elbow arthroscop* OR arthroscopic elbow)]. Language, article type, and publication date were not restricted. Notably, our search revealed instances of elbow arthroscopy in animal studies. However, as this article primarily focused on the application of elbow arthroscopy in humans, articles related to elbow arthroscopy involving animals were excluded from consideration. Two independent reviewers assessed titles and abstracts to ensure the relevance of the retrieved articles. The top 50 articles were then selected based on the number of citations. Subsequent to literature retrieval, bibliometric data were downloaded from the WOSCC database in the form of complete records and cited references for further analysis.

Bibliometric analysis and visualization

In the course of screening and extracting pertinent data from the final articles, two independent reviewers meticulously retrieved information encompassing publication dates, authors, countries, institutions, journals, impact factors, keywords, citation frequency, level of evidence, impact index, article types, and related details. The determination of the level of evidence for clinical articles adhered to the guidelines set forth by the Journal of Bone and Joint Surgery [21]. In instances of disagreement, a third reviewer was engaged. Additionally, citation density, denoting the number of citations per year, was computed for each of the 50 articles to assess their impact. Subsequently, Microsoft Office Excel 2019, GraphPad Prism 10 (GraphPad Software Inc, CA, United States), and VOSviewer 1.6.18 (Leiden University, Leiden, The Netherlands) were employed for comprehensive data collection, statistical analysis, and visual representation [22]. Descriptive bibliometric indicators, encompassing the number and types of

Fig. 1. The work flowchart of current study.
publications, countries, authors, institutions, journals, keywords, and citations, were scrutinized using Microsoft Excel 2019. Statistical analyses were performed using GraphPad Prism. Spearman correlation coefficients were utilized to discern correlations between selected variables, while one-way analysis of variance and unpaired t-tests facilitated comparisons of means and two-group assessments, respectively. The significance threshold for each test was set at $p < 0.05$. Furthermore, VOSviewer was employed to analyze the co-occurrence network of keywords.

RESULTS

In accordance with the specified search criteria, we retrieved the top 50 cited articles on elbow arthroscopy, authored by 171 individuals and published across 12 journals (Fig. 1, Supplementary Table 1). These articles, published between 1999 and 2017, were exclusively in English. Notably, almost half of the top 50 articles emerged post-2010 (Fig. 2A). The dataset included 10 articles from before 2000 and 16 articles between 2000 and 2010. The year 2006 witnessed the highest volume of publications, totaling 7 articles. This collection collectively cited 1016 articles, accumulating a total of 2416 citations, resulting in an average of 48 citations per document. Citations per article varied between 24 and 211, with a citation density ranging from 1.61 to 9.17. The most highly cited article, published in 2001 by Kelly et al. in the *Journal of Bone and Joint Surgery-American volume*, amassed 211 citations with a citation density of 9.17 [8]. The oldest article among the top 50, from 1999, garnered 49 citations with a citation density of 2.72, while the most recent, from 2017, secured 37 citations with a citation density of 5.29. A statistically significant negative correlation was observed between publication time and total citations ($r = -0.494, p < 0.001$) (Fig. 2B). However, no statistically significant correlation was identified between publication time and citation density ($r = 0.191, p = 0.185$) (Fig. 2C).

All the top 50 cited articles were published across 11 journals, showcasing impact factors ranging from 1.9 to 18.6 (Table 1). Notably, *Arthroscopy: The Journal of Arthroscopic & Related Surgery* led with the highest publication count (18), followed by the *Journal of Shoulder and Elbow Surgery* (12), and the *Journal of Bone and Joint Surgery-American Volume* (5). These journals also occupied the top three positions in terms of total citations. Interestingly, no statistically significant...
correlation emerged between the impact factor and the total number of citations ($r = 0.005, p = 0.635$) or citation density ($r = 0.001, p = 0.812$) (Fig. 3).

A total of 16 countries contributed to the top 50 cited articles on elbow arthroscopy (Table 1). Among them, the United States made the most substantial contribution to the highly cited articles (28), followed by Japan (4) and the Netherlands (4). Notably, the United States made the most substantial contribution with 28 highly cited articles, followed by Japan and the Netherlands, each with four articles. The United States also held the highest number of citations, underscoring its significant impact on the field. In total, 86 institutions contributed to the top 50 articles, with the Mayo Clinic leading with nine publications, followed by Mississippi Sports Medicine & Orthopaedic Center and Washington University, each with three publications (Table 1). These institutions also received the highest number of citations. Among the 171 authors, Savoie FH had the highest number of publications with five articles, followed by O’Driscoll SW, King GJW, and Steinmann SP, each with four articles (Table 1). O’Driscoll SW had the highest number of citations, totaling 322, and served as the corresponding author for the most highly cited article titled “Complications of Elbow Arthroscopy.”

Upon evaluating the articles with regard to their study designs, it was observed that case series predominated, constituting 28 of the top 50 articles. Following case series were publications in the form of narrative reviews or expert opinions (9) and case–control studies (7) (Fig. 4A). Notably, there were no randomized controlled trials or prospective cohort studies. Aligning with the study design is the level of evidence, where Level IV studies statistically significantly outnumbered all other levels, totaling 30 (Fig. 4B). Following this, Level V studies numbered 13. Consistent with the results of the study type, there were no Level I and II studies among the top 50 cited articles. The mean citation numbers for Level III, IV, and V studies were 40 ± 6, 53 ± 6, and 43 ± 5, respectively. No statistically significant differences were found between the level of evidence and the citation number per article ($p = 0.445$), citation density ($p = 0.081$), or the impact factor of the corresponding journal ($p = 0.669$) (Fig. 4C–E).

Keyword co-occurrence analysis serves as a valuable tool for elucidating the foundational content and structure within the academic domain of biochar. It offers insights into the research focus and potential future directions of this field. A total of 140 keywords were extracted from the most highly cited articles. To unveil the evolution of keywords, the exclusion of “arthroscopy” and “elbow,” each occurring 14 and 13 times, respectively, was implemented in the keyword network analysis (Fig. 5). Subsequently, the top three keywords with the highest frequencies were “arthrofibrosis” (10), “complications” (9), and “release” (8), representing the primary emphases in these highly cited articles. Utilizing Vosviewer’s keyword co-occurrence function, the keywords were broadly categorized into four main clusters: stiff elbow (yellow), osteoarthritis (green), osteochondritis dissecans (red), and lateral epicondylitis (purple). These clusters delineate the principal research contents of the top cited articles in elbow arthroscopy. Moreover, relatively minor keyword appearances were observed for other applications of elbow arthroscopy, such as instability and fractures.

**DISCUSSION**

Since its clinical introduction in the 1980s, elbow arthroscopy has experienced consistent growth [12]. The analysis of influential articles with high citations proves valuable in identifying research hotspots and tracking trends within the field of elbow arthroscopy. Notably, this study represented the inaugural bibliometric analysis and visualized exploration dedicated to elbow arthroscopy. Our approach adopted a diverse range of methods to analyze the characteristics of the top 50 cited articles, providing a comprehensive overview of the current research landscape in this domain.

Elbow arthroscopy was in a developing stage, but in an inferior status compared to arthroscopic research in other joints. It is generally assumed that older articles will have a higher impact due to the likelihood that they will be cited more frequently. Our study also uncovered a negative correlation between publication time and total citations in top cited articles. However, in terms of the more objective impact indicator, citation density, no correlation was identified between publication time and citation density. This suggested that newly published articles exhibit a comparable impact to the old articles. Notably, nearly half of the top 50 cited articles were published post-2010, underscoring the dynamic and promising nature of elbow arthroscopy research. Our results were similar to the findings in knee, shoulder, and hip arthroscopy, but the top cited articles in elbow arthroscopy received considerably lower citations than those in other joints. The mean citations for knee, shoulder, and hip were 243, 278, and 166, respectively, whereas the mean citation for the top 50 cited elbow arthroscopy articles was only 48 [18–20]. This discrepancy indicated that research in elbow arthroscopy was comparatively less vigorous than in other arthroscopic domains.

The under-prioritization of research in elbow arthroscopy was also evident when examining the study types and levels of evidence in the top 50 cited articles in this field. More than half of these articles were case series, with a notable absence of randomized controlled trials or prospective cohort studies. Correspondingly, the level of evidence in these articles tended to be low, primarily falling within Level IV and V categories. Similar trends were observed in top-cited articles in arthroscopy for other joints [18–20]. However, the noteworthy absence of randomized controlled trials and prospective cohort studies (Level I and II evidence) in the top 50 cited articles on elbow arthroscopy should not be overlooked. Meanwhile, a recent systematic review by Tsenkov et al. also fail to include randomized controlled trials or prospective cohort studies on elbow arthroscopy. In contrast, the top 50 cited articles on knee, shoulder, and hip arthroscopy included 36%, 24%, and 4% articles with...
Fig. 4. (A) The study type distribution of top 50 cited articles in elbow arthroscopy. (B) The level of evidence distribution of top 50 cited articles in elbow arthroscopy. (C) Mean citation number per article based on the level of evidence. (D) Mean citation density based on the level of evidence. (E) Mean impact factor per corresponding journal based on the level of evidence.

Fig. 5. Keywords co-occurrence networks of top 50 cited articles in elbow arthroscopy generated via VOSviewer.
evidence levels of II or higher, respectively [18–20]. Although no relationship between the level of evidence and citations or citation density was found, emphasizing high-quality studies in elbow arthroscopy is crucial for potentially yielding practice-changing results in future research.

The limited attention given to elbow arthroscopy was surprising, considering its gradual expansion in clinical practice. Initially focused on diagnostic arthroscopy and arthroscopic loose body removal, elbow arthroscopy has evolved to encompass more sophisticated procedures like contracture release, osteocapsular arthroplasty, and arthroscopically assisted fracture fixation and soft tissue reconstruction [23–26]. The primary research focus in top 50 cited articles on elbow arthroscopy, as revealed by the keywords network, centered around the stiff elbow, osteoarthritis, osteochondritis dissecans, and lateral epicondylitis, with comparatively less exploration of applications for joint instability and assisted fracture fixation. Furthermore, recent studies have shown that elbow arthroscopy has good clinical efficacy in a variety of indications and an Editorial Commentary recommended elbow arthroscopy for the surgical treatment of elbow lateral epicondylitis [24,25,27].

Concerns about potential complications likely contributed to the limited research in elbow arthroscopy. In the current study, the keyword “complications” had the second-highest frequency among keywords. Additionally, the top 1 cited article, titled “Complications of elbow arthroscopy,” highlighted that the prevalence of temporary or minor complications following elbow arthroscopy might be higher than previously reported, with a total complications rate of 11.8% [8]. Anatomically, elbow arthroscopy inherently poses a higher risk compared to other joints due to the complexity of the elbow joint structure and its proximity to neurovascular structures. Nevertheless, advancements in surgical instrumentation, enhanced understanding of arthroscopic anatomy, and novel techniques have collectively improved the safety of elbow arthroscopy [7,28–30]. In a recent comprehensive analysis by Klerk et al., compiling data from 114 studies covering almost 19,000 elbow arthroscopies, a median incidence of complications of 3% and a reoperation incidence of 2% were reported, with transient nerve palsies accounting for approximately one-third of these complications [31]. Furthermore, compared to arthroscopic complication rates in other joints, the complications rate for elbow arthroscopy was not significantly elevated. Shin et al. reported an overall complication rate of 7.9% for arthroscopic shoulder procedures and Arriaza et al. reported a complication rate of 7.7% in hip arthroscopy [32,33]. Selection of appropriate indications, mastery of anatomy as well as safe surgical techniques, concerns about potential complications should not hinder the development of elbow arthroscopy.

The present study also analyzed other bibliometric characteristics of the top 50 cited articles on elbow arthroscopy. The findings mirrored patterns observed in the top cited articles on arthroscopy in other joints, encompassing journal distributions, language usage, and country origins [14,18–20]. A significant portion of these top articles found their place in journals renowned for their impact in the fields of arthroscopy and orthopedics, with over half published in the Arthroscopy and Journal of Shoulder and Elbow Surgery. Notably, all top cited articles were composed in English, and the United States emerged as the most prolific country. This trend extended to the distribution of top-ranked authors and institutions, predominantly hailing from the United States, with Savoie FH and Mayo Clinic producing the highest number of articles. Remarkably, the United States emerged as the leader in the majority of subspecialties within orthopaedics, a phenomenon attributed to their advanced technology, specialized researchers, and substantial funding [15,16,34].

LIMITATIONS

Several noteworthy limitations were inherent in this study. Firstly, despite utilizing the comprehensive Web of Science Core Collection database, there was a possibility of missing specific manuscripts available in other sources, such as Google Scholar, Scoups or PubMed. Additionally, differences in the number of citations per article across databases may introduce variability. Secondly, the selection of articles was based solely on the total number of citations, an imperfect measure of an article’s impact. Furthermore, newer articles may exhibit higher citation densities but lower total citation counts, potentially leading to the oversight of newer yet significant contributions to elbow arthroscopy. Nevertheless, the study indicated that the majority of articles in this bibliometric analysis were recently published, suggesting that publication time-distance may be less critical in the continually evolving field of elbow arthroscopy. Thirdly, the analysis focused solely on the characteristics of the top 50 cited articles, influencing the type of study, level of evidence, and main topic based on various factors and not fully representing the comprehensive landscape of elbow arthroscopy research.

CONCLUSIONS

In congruence with bibliometric patterns observed in highly cited articles on arthroscopy involving other joints, the majority of the top 50 cited articles in elbow arthroscopy comprised case series exhibiting Level IV or V evidence. Notably, over half of these articles surfaced post-2010, indicative of the dynamic evolution within elbow arthroscopy. Despite identifying various applications through keyword co-occurrence networks (such as stiff elbow, osteoarthritis, osteochondritis dissecans, and lateral epicondylitis), the mean citations and citation density of top cited articles in elbow arthroscopy were notably lower than their counterparts in arthroscopy of other joints. Concerns regarding potential complications likely contributed to the restricted research focus in elbow arthroscopy. However, with the increasing prevalence of elbow arthroscopy procedures, it is anticipated that higher-level articles, particularly those focusing on complications and exploring additional indications, will supersede some of the articles included in this analysis.

Funding

None.

Authorship declaration

Jiyong Yang and Qian Zhao: conceptualization, methodology, writing—original draft preparation. Yi Zhou: software, investigation, formal analysis; Hufeng Zhen: software, validation, formal analysis; Jiang Wu and Xiao Chen: data curation and visualization; Fuji Ren: resources, visualization. Jingmin Huang: writing—reviewing and editing. All authors read and approved the final manuscript.

Availability of data and material

Not applicable.

Code availability

Not applicable.

Ethics approval

Not applicable.

Consent to participate

Not applicable.

Consent for publication

Not applicable.
Declaration of competing interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Acknowledgements

Not applicable.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jisako.2024.04.011.

References


