



## Research article

# Anterior shoulder dislocation: A bibliometric analysis in the past two decades (2003–2022)

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## ABSTRACT

**Background:** Anterior shoulder dislocation is the most common type of shoulder dislocation and is easy to develop into recurrent type, causing economic burden to society. This study uses the bibliometric method to analyze the global research status, hotspots and trends of anterior shoulder dislocation, aiming to promote the exploration of anterior shoulder dislocation.

**Methods:** The literature on anterior shoulder dislocation in the past two decades were retrieved and downloaded from the Web of Science Core Collection (WOSCC) database. CiteSpace, VOSviewer and bibliometrix package of R software were used to conduct scientific bibliometric analysis of the literature. Finally, some statistical graphics were performed in Graphpad Prism.

**Results:** A total of 3914 publications related to anterior shoulder dislocation from 2003 to 2022 were retrieved and screened from the WOSCC database. The ranking of the analysis results showed that Provencher MT was the author with the highest frequency of occurrence. Rush University was the most notable contributor. The American Journal of Sports Medicine was the most comprehensive journal. The United States was the most prominent country. Keywords related to surgical treatment were more significant than others.

**Conclusion:** In the past two decades, the research output on anterior shoulder dislocation have been increasing year by year. The focus has gradually shifted to surgical treatment. Surgical treatment may continue to be the research hotspots in this field in the future.

## 1. Introduction

The shoulder joint is the joint with the largest range of motion in the human body, making it the most prone to dislocation in the whole body [1–3]. Clinicians and researchers are increasingly concerned about the disease. Numerous studies on shoulder dislocation emerges every year, and it is difficult for researchers with less experience to gain insight into research progress and trends. Therefore, it is necessary to review and analyze the related studies of anterior shoulder dislocation, the most common type of shoulder dislocation.

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However, it lacks of literature on analyzing the global development in the field of anterior shoulder dislocation over the past decades.

Bibliometrics uses mathematics and statistics to quantitatively analyze literature, which helps to objectively discover knowledge, present the current state of the field, understand the social processes supporting the development of the field, understand the trend of the field, and locate future research directions [4,5]. The results are important to both scientists and funders [6]. Compared with systematic reviews, bibliometrics is more objective in content and broader in scope. It can be said that bibliometrics has become one of the popular methods and important tools for research [7,8].

The purpose of this study is to use the bibliometric method to summarize, count and analyze the literature related to anterior shoulder dislocation in the past two decades in the database, so as to provide relevant information on the current situation, hotspots and trends for researchers in this field, and to provide reference for researchers' further study, project cooperation and funding application.

## 2. Materials and methods

### 2.1. Study design

This study intends to use the bibliometric method to search the relevant literature on anterior shoulder dislocation in the database, screen out the literature in the past two decades, and study the selected data through statistical and analysis software to summarize and analyze the research status and future trend of anterior shoulder dislocation, so as to provide information support for further research in related fields.

### 2.2. Search strategy

Data for this study were collected on January 2, 2023. The search terms TS= (anterior AND shoulder AND (instability OR dislocation)) and the time determiner PY= (2003–2022) were used in the Web of Science Core Collection (WOSCC) database. At the same time, editions include Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (AHCI), Conference Proceedings Citation Index - Science (CPCI-S), Conference Proceedings Citation Index - Social Science & Humanities (CPCI-SSH), Emerging Sources Citation Index (ESCI), Current Chemical Reactions (CCR-EXPANDED) and Index

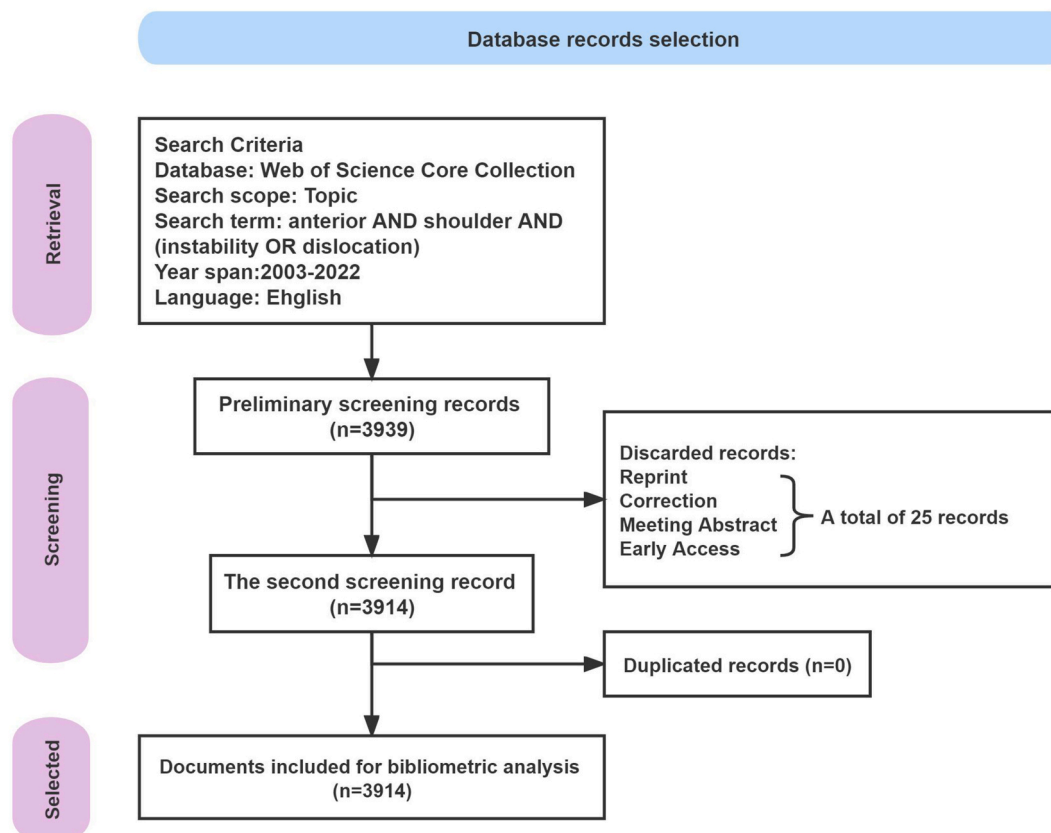


Fig. 1. Flow chart of literature search and screening for anterior shoulder dislocation.

Chemicus (IC). Given CiteSpace’s inability to de-duplicate and analyze some literature types. Reprint, Correction, Meeting Abstract, Early Access, and non-English literature were excluded. The full record and cited references of the retrieved literature results were downloaded in the form of txt text (Fig. 1 is the retrieval process of this study).

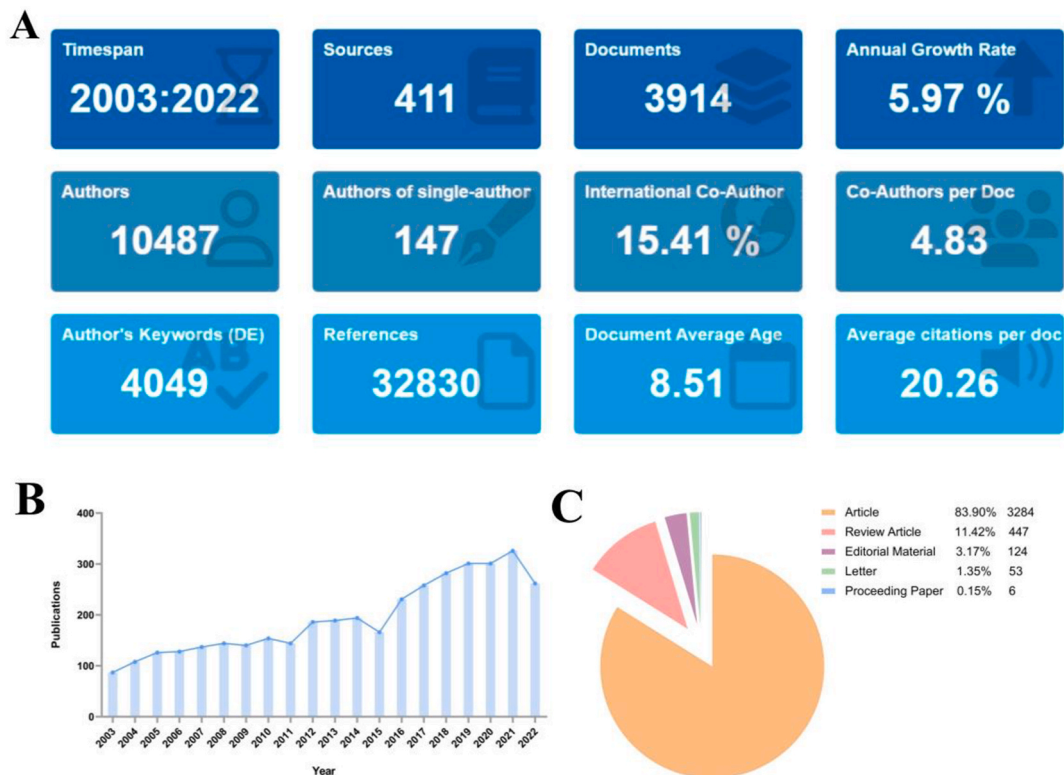
### 2.3. Data analysis and statistics

In data analysis, we used CiteSpace, VOSviewer and Bibliometrix. CiteSpace mainly presents the research structure and development trend of a subject field, and explores the dynamics of the time-varying mapping from the research frontier to its knowledge base. The literature data downloaded in WOSCC were imported into CiteSpace (5.7.R1) for deduplicated and format conversion, and a series of metrological analysis such as keyword outbreak (or keywords bursts) and clustering were carried out on the literature in CiteSpace. Keyword cluster analysis is used to understand the research status of the field. Keyword burst detection analysis can be used to study keywords in stages, and to grasp the heat and trend of research topics in this field in real time [9,10]. VOSviewer is mainly used to construct and visualize network maps. The literature data of converted format were imported into VOSviewer (1.6.18.0) for visual analysis such as co-citation and co-occurrence. Keyword co-occurrence analysis and term co-occurrence analysis can show the research hotspots and trends, and reveal the influence and relationship between them. Bibliographic coupling is used to measure the degree of link between publications (and their attributes). Co-citation was used to assess the popularity and influence of articles in the field [11]. Bibliometrix is mainly used for citation analysis, word co-occurrence analysis and author cooperation network analysis of literature data, so that researchers can better understand the internal relationship and evolution law of literature [12,13]. The literature data were imported into R (4.2.1), and the bibliometrix package was used for scientometric analysis. Finally, some data analysis results were statistically graphed in Graphpad Prism 8.

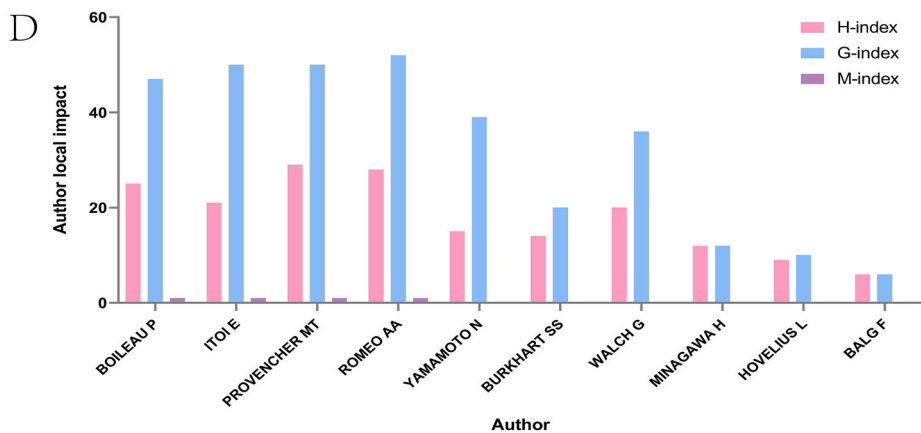
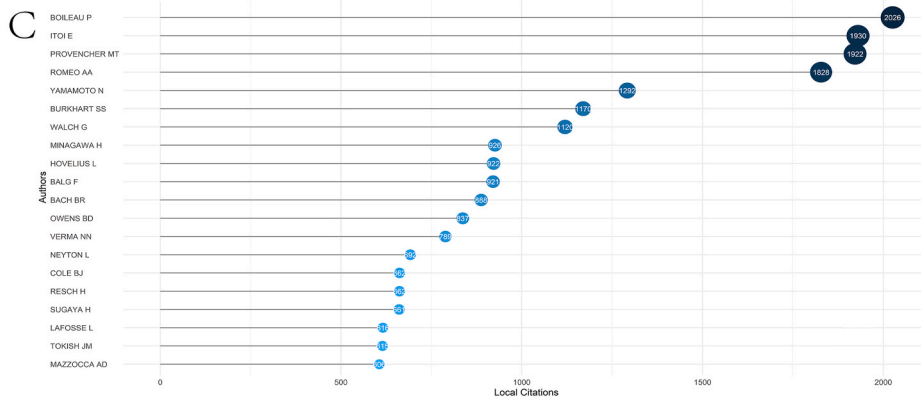
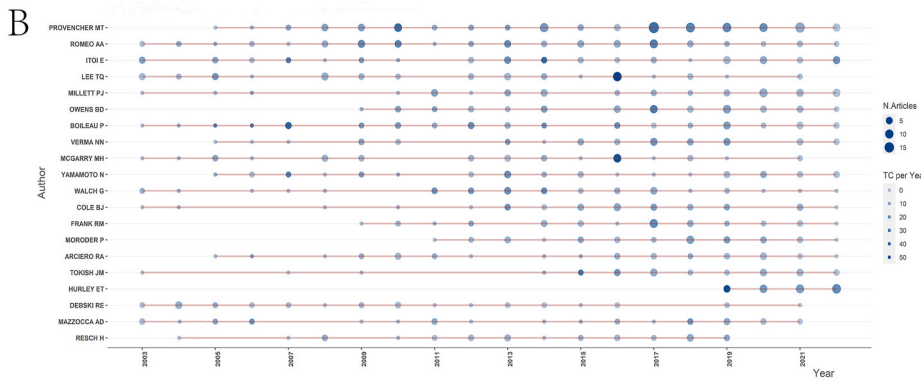
## 3. Results

### 3.1. Overview

According to the search criteria set, there were 3914 publications related to anterior shoulder dislocation that met the criteria in the WOSCC database (Fig. 2A). They came from 411 journals by 10487 authors, in which only 147 authors wrote alone. Most of the publications were the product of cooperation, and 15.41 % of them were international cooperation. These publications contain 4049 author’s keywords and 32830 references, with an average of 20.26 references cited in each. The number of publications on anterior



**Fig. 2.** Overview maps of the literature on anterior shoulder dislocation in the last two decades. **A** Main information of the literature. **B** Annual scientific production of the literature. **C** Document types of the literature.



(caption on next page)



**Fig. 3.** Author analysis maps of the literature on anterior shoulder dislocation in the last two decades. **A** Top 20 authors who contributed the most to the literature. The areas on the chart are not strictly proportional to the values of each entry. **B** Top author's production over time for the top 20 authors who contributed the most to the literature. The smallest dot and its color depth represent the annual average total citations for the current year of the author, and the darker the color, the higher the annual average total citations for the current year. The size of the darkest dot represents the amount of literature produced by the author in that year, and the larger the dot, the greater the amount of literature produced in that year. **C** Top 20 most local cited authors in the literature. The color and size of the blue dot are related to the number in the center of the dot. The larger the number, the larger the dot, the darker the blue, and the more citations. The most local cited, in this study, denotes the number of citations in the current database (i.e. WOSCC). **D** Author local impact of the top 10 most local cited authors.

shoulder dislocation increased at an average annual rate of 5.97 %.

### 3.1.1. Publication analysis

The number of publications of 3914 records was distinguished and counted according to the year of publication (Fig. 2B). In 2003, there were only 7 records related to anterior shoulder dislocation, while by 2021, there were 326 records. Although the number of publications published in 2009, 2011, 2015 and 2022 decreased slightly compared with the previous year, the number of publications per year was still on the rise. Among these publications, there were 3284 articles and 447 review articles, accounting for the majority of records related to anterior shoulder dislocation with a ratio of 83.90 % and 11.42 %, respectively (Fig. 2C). There were also editorial material (124, 3.17 %), letter (53, 1.35 %) and proceeding paper (6, 0.15 %).

### 3.1.2. Author analysis

Among the 10,487 researchers, Provencher MT was the most productive author, contributing to 116 publications, followed by Romeo AA with 66 publications, Itoi E with 56 publications, Millett PJ with 53 publications, and Lee TQ contributed to 52 articles (Fig. 3A). The annual literature output and total citations of these authors have increased in the past decade (Fig. 3B). For example, Provencher MT began to publish his first article in 2005, but more than half of the 116 articles he participated in were completed in recent years. Particularly, in 2017, the number reached 18, accounting for 15.52 % of his total publication number (Supplementary Table 1). The research output of anterior shoulder dislocation shows a clear increasing trend.

Boileau P was the most cited author with 2026 local citations, followed by Itoi E with 1930, Provencher MT with 1922, Romeo AA with 1828, and Yamamoto N with 1292 (Fig. 3C). H-index is usually used to evaluate the academic impact of researchers, and G-index and M-index are used to supplement the evaluation of H-index. By evaluating the impact of the top 10 most local cited authors (Fig. 3D), it can be seen that the H-index of Provencher MT was 29 and M-index was 1.526, both of which were the highest among these authors. Romeo AA has the highest G-index of all the authors, with a G-index of 52. Although authors with a high number of cited articles generally have a high influence, considering some special circumstances, we made specific statistics on the top 10 most local cited authors and these authors' impact indicators (H-index, G-index, M-index, local citations, total citations, and number of publications) (Table 1). It can be concluded that Provencher MT, Romeo AA and Boileau P were the three authors with the highest author impact.

### 3.1.3. Institution analysis

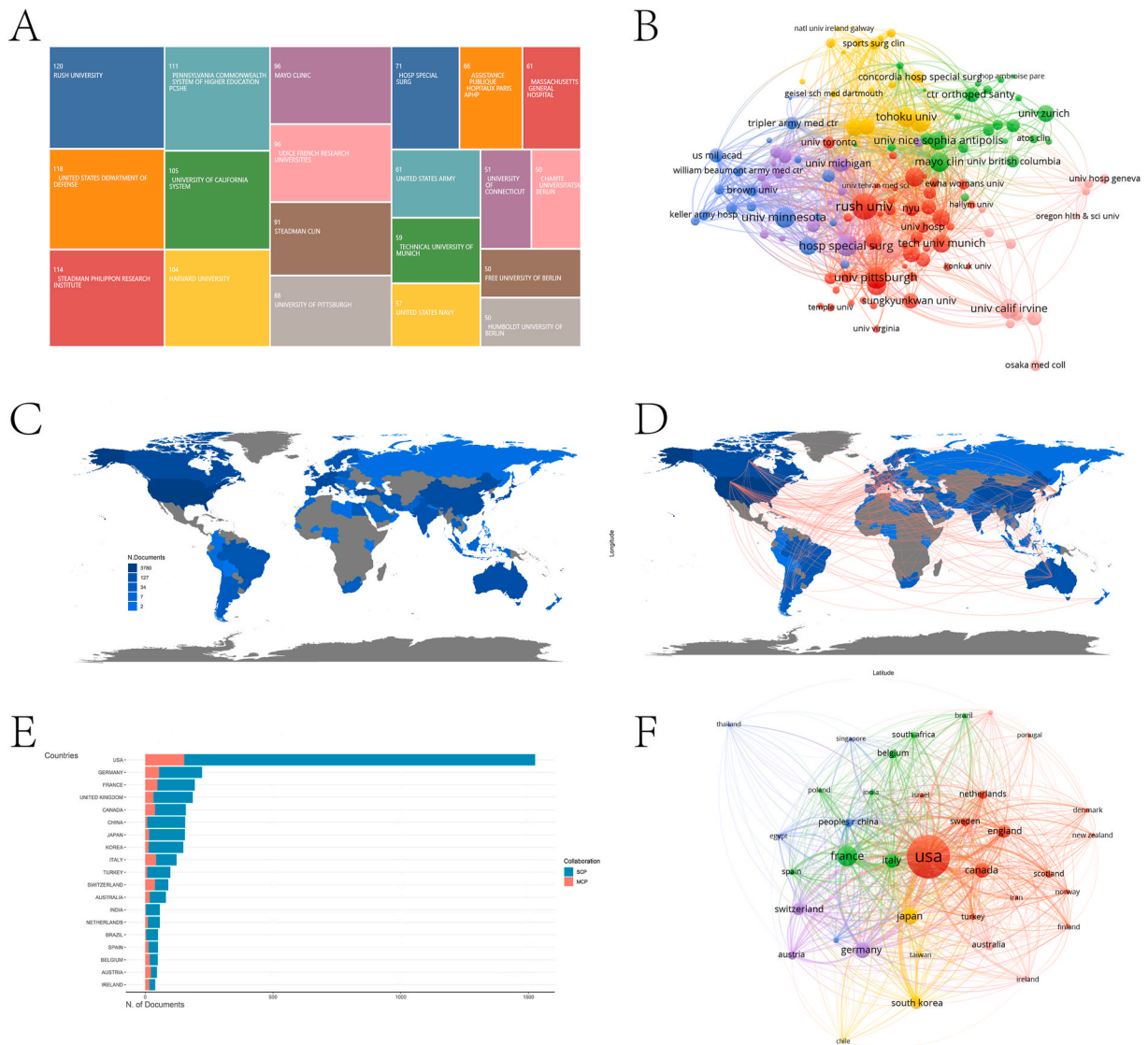
Among the 3266 institutions, Rush University has the largest number of publications with 120, followed by the United States Department of Defense with 118 publications, Steadman Philippon Research Institute contributed with 114 publications, Pennsylvania Commonwealth System of Higher Education Pcshe contributed with 111 publications, and the University of California System contributed with 105 (Fig. 4A).

Rush University was the most frequently cited institution with 2723 citations, followed by the University of Pittsburgh with 1,882, Hospital for Special Surgery with 1809, the University of Connecticut with 1,736, and the University of Minnesota with 1639. (Fig. 4B).

**Table 1**  
Author impact of the top 10 most local cited authors.

Author	H-index	G-index	M-index	Local citations	Total citations	The number of publications
PROVENCHER MT	29	50	1.526	1922	2827	116
ROMEO AA	28	52	1.333	1828	2798	66
BOILEAU P	25	47	1.19	2026	3699	47
LEE TQ	22	41	1.048	549	1749	52
COLE BJ	21	32	1	662	1065	35
ITOI E	21	50	1	1930	2562	56
VERMA NN	21	33	1.105	789	1128	40
MAZZOCCA AD	20	31	0.952	606	1470	31
WALCH G	20	36	0.952	1120	1790	36
MILLETT PJ	19	32	–	598	1100	53

Note: This table mainly uses H-index as the main index to calculate the data of the top 10 authors after statistical analysis of all the authors' data. "Local" refers to WOSCC database.

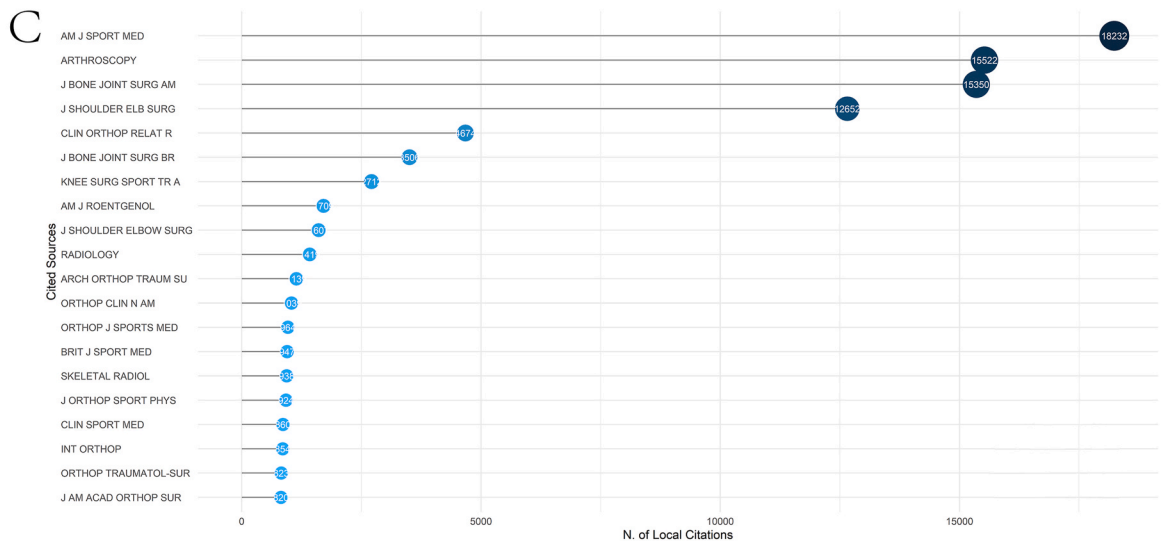
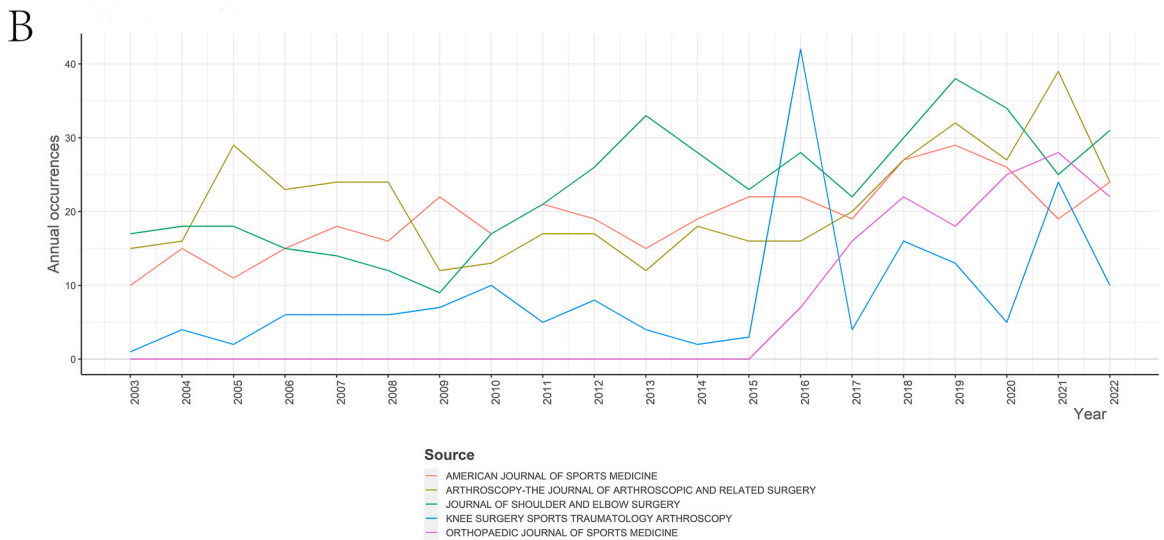
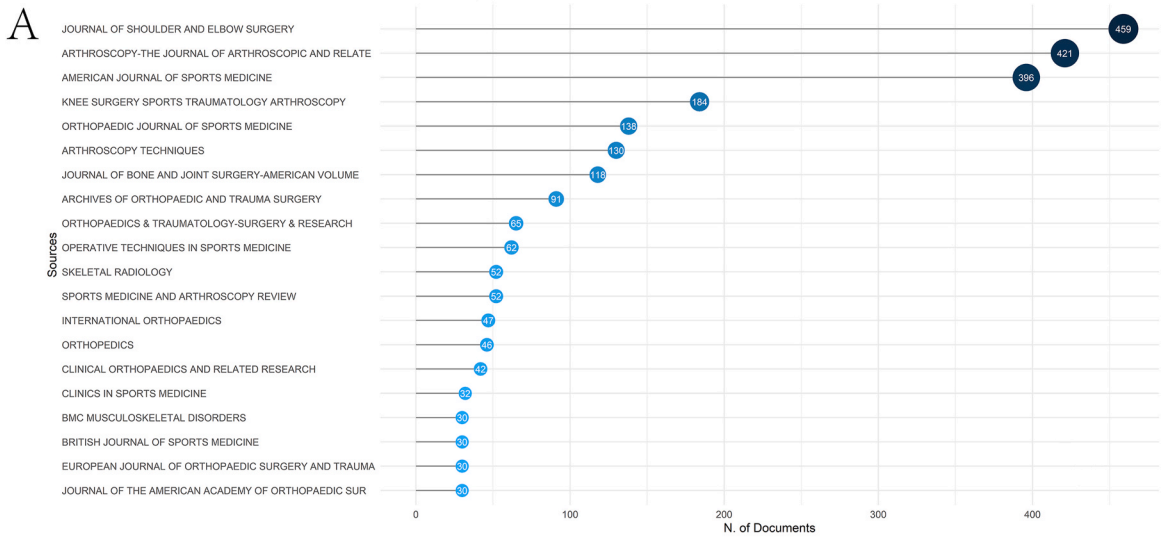


**Fig. 4.** Institution and country/region analysis maps of the literature on anterior shoulder dislocation in the last two decades. **A** Top 20 institutions contributing the most to the literature. **B** Network visualization of institution of the most cited literature. 132 identified the most relevant institutions (minimum number of documents of an organization = 10). The size of the dot is related to the link strength. **C** Country scientific production map of the literature. The depth of the color represents the number of publications in a country or region. The darker the color, the more publications. **D** Country collaboration map of the literature. Every two countries that have a cooperative relationship establish a connection based on the number of times they cooperate, and the more the connection, the more the cooperation. **E** Statistics for corresponding author's country. SCP: single country publications, indicating that the corresponding authors of the publication are from the same country. MCP: multiple country publications, which means that the corresponding authors of the publication come from different countries. **F** National publication map of the most cited literature. 37 identified the most relevant countries (minimum number of documents of a country = 10).

### 3.1.4. Country or region analysis

A total of 71 countries around the world participated in the study of anterior shoulder dislocation. In terms of the number of scientific outputs (Fig. 4C), the United States ranks first with 3780 studies, followed by Germany with 608, France with 586, Canada with 449, Japan with 423, and the United Kingdom with 395 (Supplementary Table 2).

There was also a complex collaborative relationship between countries (Fig. 4D). The United States and France have collaborated 55 times, making them the two countries that collaborate most closely. The United States and Germany, the United States and Canada, the United States and Japan, the United States and Italy, etc., also have a lot of cooperation (Supplementary Table 3). In terms of corresponding author country statistics, the United States ranked first in both Single Country Publications (SCP) and Multiple Country Publications (MCP), followed by Germany and France (Fig. 4E). This also confirms the number of national publications and national cooperation on the other hand.



(caption on next page)

**Fig. 5.** Journal analysis maps of the literature on anterior shoulder dislocation in the last two decades. **A** Top 20 journals with the most publications. **B** Annual publication volume of the top 5 journals with the most publications. That is, journal growth. **C** Top 20 most local cited journals in the field of anterior shoulder dislocation.

In terms of the number of citations of papers published by countries, the United States ranks first with 34,929 citations, followed by France with 6,783, Japan with 4,144, Germany with 3,956, and the United Kingdom with 3489. However, in terms of the average number of citations per publication, France ranked first with an average of 34.96, followed by Japan with 26.74, Switzerland with 25.99, the United States with 22.89, and Italy with 22.17 (Fig. 4F and Supplementary Table 4).

### 3.1.5. Journal analysis

Among the 411 journals, Journal of Shoulder and Elbow Surgery (JSES) has the most publications in this field with 459 in total, followed by Arthroscopy with 421, American Journal of Sports Medicine (AJSM) with 396, Knee Surgery Sports Traumatology Arthroscopy (KSSTA) with 184, and Orthopaedic Journal of Sports Medicine (OJSM) with 138 (Fig. 5A). Fig. 5B shows the annual number of publications on anterior shoulder dislocation in these five journals, showing that the number of publications in these journals has a slight upward trend in the stable period. The annual number of publications of JSES, Arthroscopy, and AJSM have always been high, and the number of publications of KSSTA has surged in 2016. Since 2015, OJSM began to publish relevant literature, and the development momentum in this field was very rapid. Since 2020, the number of papers published in OJSM can even compete with the top three journals.

Among all the journals, AJSM was the most cited journal with 18,232 local citations. Followed by Arthroscopy with 15522, Journal of Bone and Joint Surgery-American Volume (JBJS) with 15,350, JSES with 12,652, and Clinical Orthopaedics and Related Research with 4674 (Fig. 5C).

### 3.1.6. Citation analysis

The most cited literature in the past two decades was "Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair" published by Boileau P in JBJS in 2006. Followed by "Grammont reverse prosthesis: design, rationale, and biomechanics"

**Table 2**

Top 10 most cited publications in the literature on anterior shoulder dislocation in the last two decades.

Title	First author	Published year	Source	DOI	Total citations	Total citations per year	Normalized total citations
Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair	Boileau P	2006	J Bone Joint Surg Am	10.2106/JBJS.E.00817	602	33.44	13.19
Grammont reverse prosthesis: design, rationale, and biomechanics	Boileau P	2005	J Shoulder Elb Surg	10.1016/j.jse.2004.10.006	592	31.16	12.86
The association of scapular kinematics and glenohumeral joint pathologies	Ludewig PM	2009	J Orthop Sport Phys	10.2519/jospt.2009.2808	472	31.47	12.46
The instability severity index score. A simple pre-operative score to select patients for arthroscopic or open shoulder stabilisation	Balg F	2007	J Bone Joint Surg Br	10.1302/0301-620X.89B11.18962	472	27.76	8.87
Glenoid rim morphology in recurrent anterior glenohumeral instability	Sugaya H	2003	J Bone Joint Surg Am	10.2106/00004623-200305000-00016	452	21.52	9.77
Comparison of the subjective shoulder value and the Constant score	Gilbart MK	2007	J Shoulder Elb Surg	10.1016/j.jse.2007.02.123	414	24.35	7.78
Results of modified Latarjet reconstruction in patients with anteroinferior instability and significant bone loss	Burkhart SS	2007	Arthroscopy	10.1016/j.arthro.2007.08.009	357	21.00	6.71
Contact between the glenoid and the humeral head in abduction, external rotation, and horizontal extension: a new concept of glenoid track	Yamamoto N	2007	J Shoulder Elb Surg	10.1016/j.jse.2006.12.012	350	20.59	6.57
Evolving concept of bipolar bone loss and the Hill-Sachs lesion: from "engaging/non-engaging" lesion to "on-track/off-track" lesion	Di Giacomo G	2014	Arthroscopy	10.1016/j.arthro.2013.10.004	305	30.50	11.55
Reverse shoulder arthroplasty for the treatment of three- and four-part fractures of the proximal humerus in the elderly: a prospective review of 43 cases with a short-term follow-up	Bufquin T	2007	J Bone Joint Surg Br	10.1302/0301-620X.89B4.18435	298	17.53	5.60

published by Boileau P in 2005, and “The association of scapular kinematics and glenohumeral joint pathologies” published by Ludewig PM in 2009 (Table 2 and Supplementary Fig. 1).

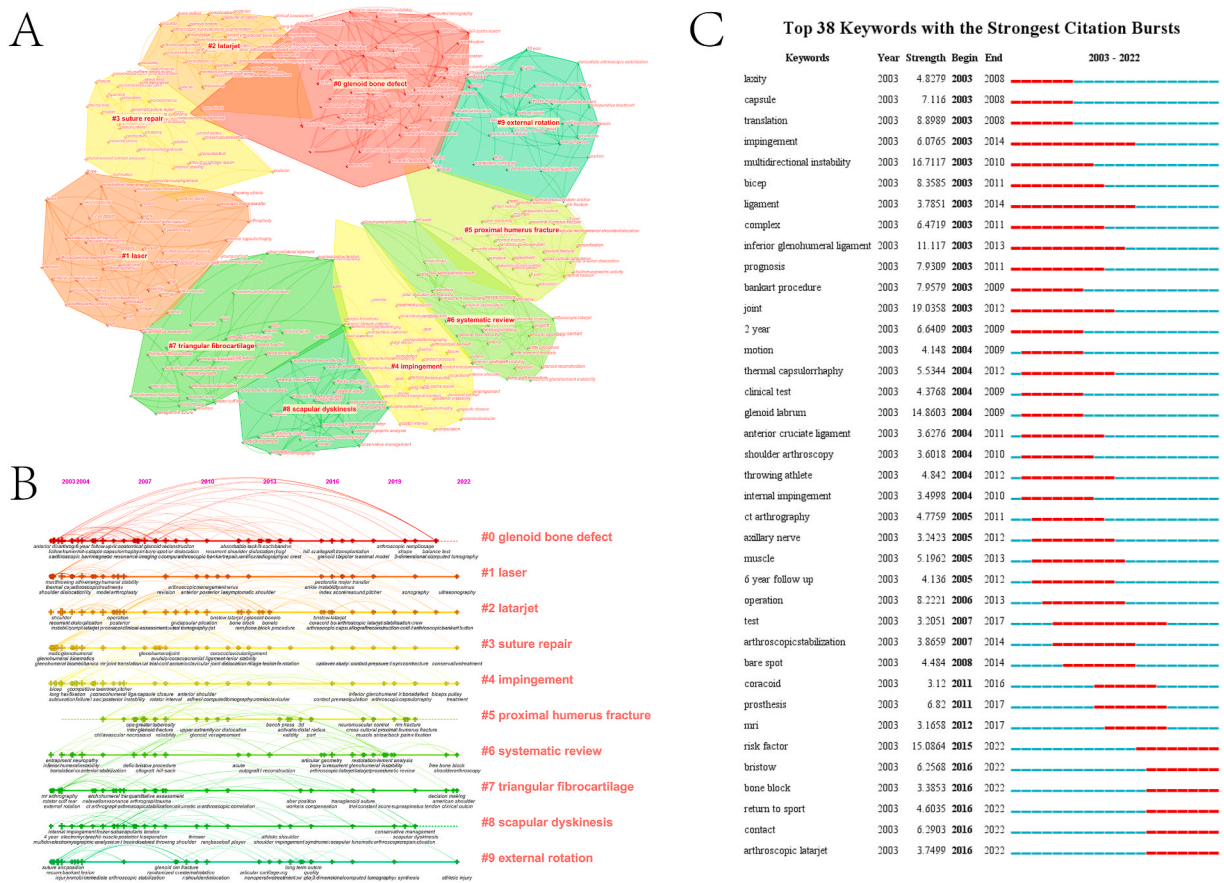
### 3.2. Keyword analysis

In the CiteSpace analysis results, the anterior shoulder dislocation network was divided into 22 co-citation clusters. These clusters were labeled by index terms from their own citers.

#### 3.2.1. Keyword cluster analysis and timeline analysis

Keyword cluster analysis shows the overall situation of keywords. The results show a total of the top 10 largest clusters of the keyword co-occurrence network, and each cluster was composed of multiple closely related keywords. The analysis of Modularity Q was 0.7638, which was greater than 0.3, indicating the structure of the clustering result is significant. The Mean Silhouette of this analysis was 0.8248, which was greater than 0.7, indicating the clustering result is credible. The label corresponding to the largest cluster was “Glenoid bone defect”, followed by “Laser”, “Latarjet”, “Suture repair”, and “Impingement” (Fig. 6A).

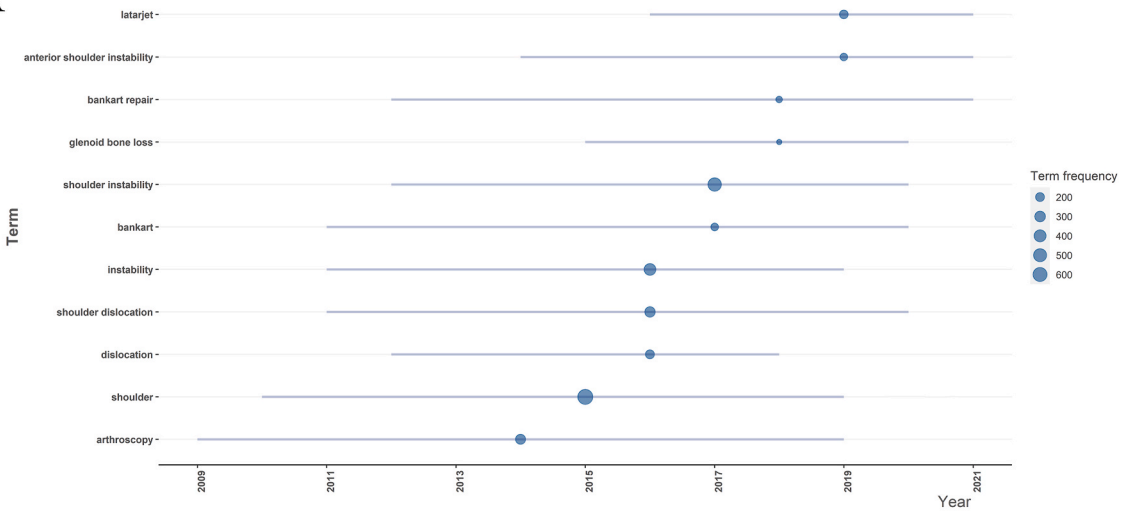
The timeline map shows the specific longitudinal trends of the keywords in each cluster (Fig. 6B). The largest keyword cluster “Glenoid bone defect” and related keywords appeared in 2003 or even earlier, in which the word “Hill-sachs” was more central, but this cluster of keywords did not appear after 2021. Keywords cluster “Laser”, “Latarjet”, “Suture repair”, “Impingement”, “Systematic review”, “Triangular fibrocartilage” and “External rotation” are still under discussion in the past three years, among which “latarjet” and “suture repair” have relatively high exposure.



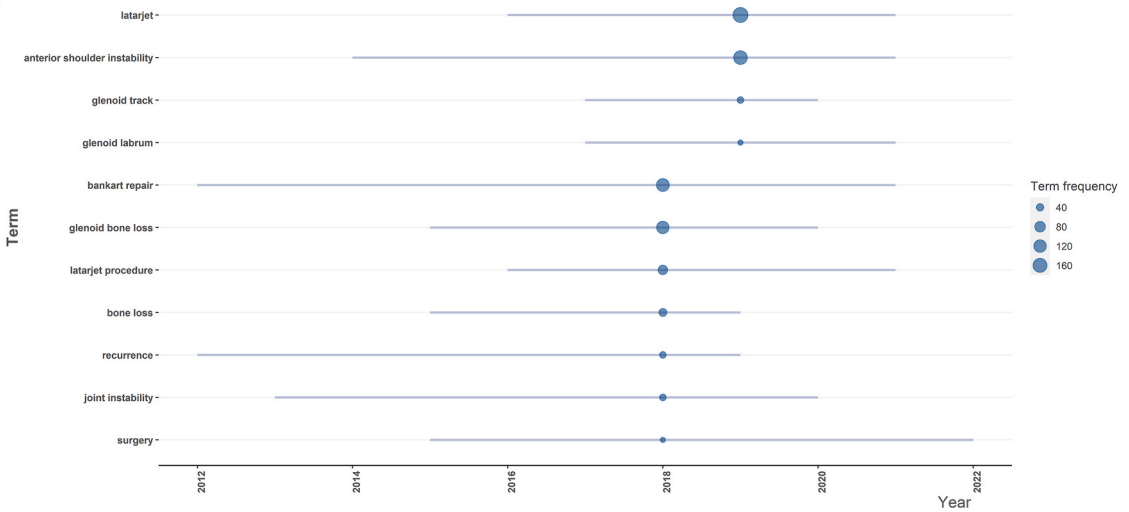
**Fig. 6.** Keyword analysis maps of the literature on anterior shoulder dislocation in the last two decades. **A** Keyword cluster map. The warmth of the color represents the distance of time. The warmer the color, the closer the time. The number is related to the keywords contained in the cluster. The smaller the number, the more keywords included, the more important the cluster topic, and the more popular the topic. **B** Keyword timeline map. The position of the point represents the time of occurrence of a keyword in this cluster, and the size of the point represents the centrality of the keyword. Timeline of Keywords can directly observe the first article of a kind of keywords, hot trend and cooling trend of keywords, centrality keywords and so on. **C** Burst detection of keywords in the literature. Top 38 keywords with the strongest citation bursts (gamma = 1.0). The red lines represent the specific time period when the keyword became a research hotspot, and the blue lines represent the absence of the keyword.



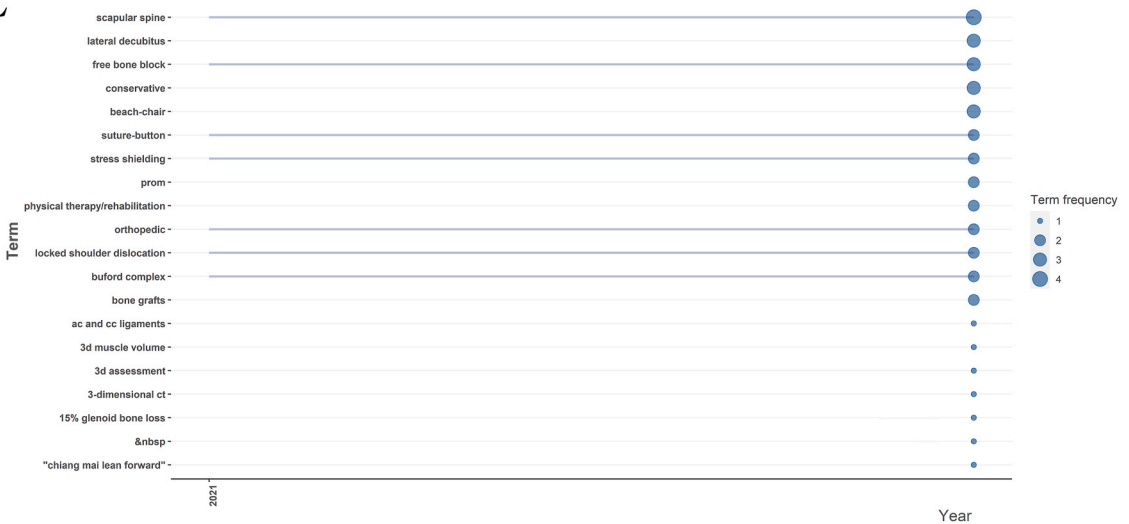
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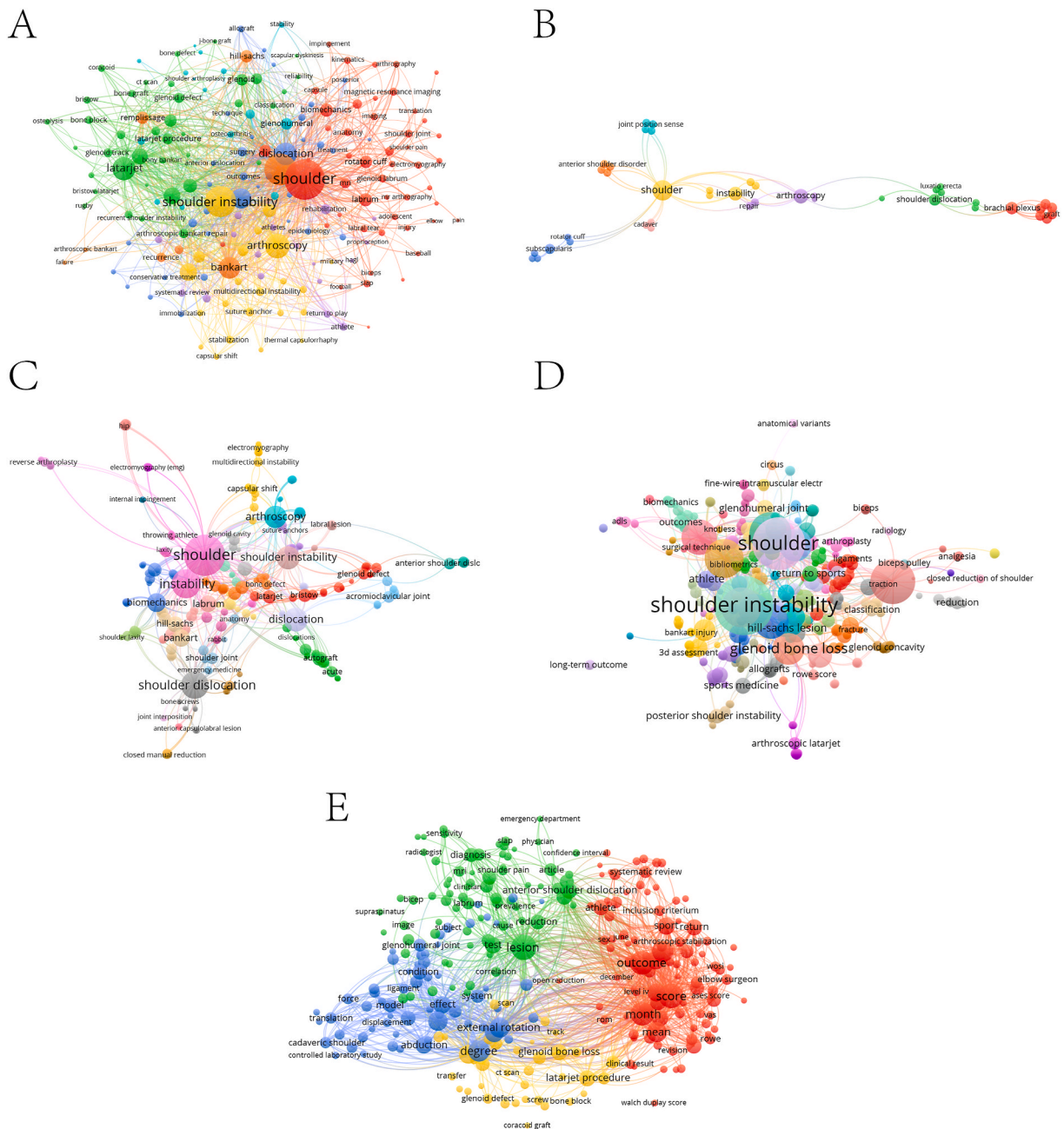


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**Fig. 7.** Topic trend analysis maps of the literature on anterior shoulder dislocation in the last two decades. **A** Trend topics from 2002 to 2022. The line segment represents the time when the term of the topic appeared. The size of the dot represents the frequency of occurrence of the term, and the larger the dot, the higher the frequency. **B** Trend topics from 2018 to 2022. **C** Trend topics for 2022.



**Fig. 8.** Keyword co-occurrence analysis maps of the literature on anterior shoulder dislocation. Depending on the item, the same color indicates a certain relevance, while a larger circle indicates that it is a key research question in the field. The distance between the two circles indicates the relevance between the two circles. If the relevance is stronger, the distance is shorter, and if the relevance is weaker, the distance is further. **A** Co-occurrence map of author keywords in the past two decades. 289 identified the most relevant keywords (minimum number of occurrences of a keyword = 10). **B** Co-occurrence map of author keywords in 2003. 77 identified the most relevant keywords (minimum number of occurrences of a keyword = 1). **C** Co-occurrence map of author keywords in 2012. 343 identified the most relevant keywords (minimum number of occurrences of a keyword = 1). **D** Co-occurrence map of author keywords in 2022. 570 identified the most relevant keywords (minimum number of occurrences of a keyword = 1). **E** Co-occurrence map of terms in the past two decades. 451 identified the most relevant keywords (minimum number of occurrences of a term = 50).



### 3.2.2. Keyword burst detection analysis

Through keyword burst detection analysis, it can be clearly seen that the years with high keyword occurrence rate and their current hot trend. Ranking the most frequently cited keywords according to their time of appearance, for example, “Laxity” appeared in 2003, but disappeared after 2008. “Impingement” also appeared in 2003, but lost its popularity after 2014. Although the six keywords of “Risk factor, Bristow, Bone block, Return to sport, Contact, Arthroscopic Latarjet” only appeared in the last seven years, they were still hot keywords in 2022, and the citation frequency was also high (Fig. 6C). These words were likely to continue to be hot keywords with high citation frequency in the next few years.

### 3.3. Topic trend analysis

Trend analysis refers to the observation or prediction of future development trends from existing data. According to the analysis results of the trend topics, “Shoulder”, “Shoulder instability” and “Instability” appeared most frequently in the last two decade. Although the frequency of “Latarjet”, “Anterior shoulder instability” and “Bankart repair” was not high, they appear recently (Fig. 7A). The analysis of the five years from 2018 to 2022 shows that the high-frequency topics have become “Latarjet”, “Anterior shoulder instability”, “Bankart repair”, “Glenoid bone loss” and “Latarjet procedure” (Fig. 7B). If we analyze the 2022 terms separately, “Scapular spine”, “Lateral decubitus”, “Free bone block”, “Conservative” and “Beach-chair” appear relatively frequently. Among them, “Lateral decubitus”, “Conservative”, and “Beach-chair” were even the most recent high-frequency keywords in 2022 (Fig. 7C).

### 3.4. Co-occurrence analysis

#### 3.4.1. keyword co-occurrence

The 184 author keywords with the highest frequency in the literature on anterior shoulder dislocation in the past two decades could be summarized into 7 clusters. “Shoulder” (TLS = 1849), “Instability” (TLS = 1150), “Shoulder instability” (TLS = 1107), “Arthroscopy” (TLS = 690), and “Latarjet” (TLS = 624) were the top five keywords for TLS (Fig. 8A).

The decadal variation of these author keywords was analyzed. The results showed the 77 most frequent keywords in 2003, “Shoulder” (TLS = 25), “Shoulder instability” (TLS = 14), “Arthroscopy” (TLS = 12), “Instability” (TLS = 11), and “Brachial plexus” (TLS = 9) were the top five keywords had the highest link strength (Fig. 8B). In 2012, among the 343 keywords with the highest frequency, top five keywords with the highest link strength were “Shoulder” (TLS = 143), “Instability” (TLS = 68), “Shoulder dislocation” (TLS = 63), “Dislocation” (TLS = 46), and “Shoulder instability” (TLS = 45) (Fig. 8C). Among the 570 most frequently used keywords in 2022, the top five keywords with the highest link strength were “Shoulder instability” (TLS = 223), “Shoulder” (TLS = 177), “Shoulder dislocation” (TLS = 130), “Instability” (TLS = 113), and “Latarjet” (TLS = 100) (Fig. 8D).

#### 3.4.2. Term co-occurrence

In the co-occurrence section, we also analyzed the co-occurrence of terms in the literature related to anterior shoulder dislocation in the past two decades. Among the 451 most frequently used terms, “Anterior translation” was the most relevant with a correlation of 4.68, followed by “Glenohumeral translation” with a correlation of 4.54, “Controlled laboratory study” with a correlation of 4.28, “Cadaveric shoulder” with a correlation of 4.20, and “Translation” with a correlation of 3.88 (Fig. 8E).

### 3.5. Bibliographic coupling analysis

There are three main aspects of bibliographic coupling analysis, including journal, institution and country. Among the 63 journals with the highest link strength included in the journal coupling analysis, the AJSM ranked first with a TLS of 640,113 (Supplementary Fig. 2A). Among the 132 institutions with the highest link strength that included in the journal’s coupling analysis, Rush University ranked first with a TLS of 254183 (Supplementary Fig. 2B). Among the 37 countries that included in the analysis of country coupling, the United States ranked first in this analysis with a TLS of 2,107,865 (Supplementary Fig. 2C).

### 3.6. Co-citation analysis

The results of co-citation analysis mainly included two parts: journal and reference.

The results of co-citation analysis of the most cited 179 journals showed that American Journal of Sports Medicine had the highest link strength, with a TLS of 600052 (Supplementary Fig. 3A). Finally, the results of co-citation analysis of the 311 most cited references were interpreted, and the reference with the highest TLS was “Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs: significance of the inverted-pear glenoid and the humeral engaging Hill-Sachs lesion” published in Arthroscopy by Burkhart SS in 2000 (DOI: 10.1053/jars. 2000.17715). Its specific TLS was 13,851 (Supplementary Fig. 3B).

## 4. Discussion

### 4.1. Research status of global publications

According to the analysis results of the literature downloaded from the WOSCC database, it can be seen that the overall number of publications is considerable, and the overall growth rate is basically stable. Among the related journals of anterior shoulder

dislocation, OJSM has a considerable development trend in the field of anterior shoulder dislocation, and may become the leading journal in this field in the future. But it will take some time. The United States not only ranked first in the country/region type analysis results, but also had highly ranked authors (e.g. Provencher MT), institutions (e.g. Rush University), and journals (e.g. AJSM). It shows that the United States has a certain status in this field. On the other hand, the United States also has a relative advantage in cooperation, with a large number of cooperative projects and a high level of output.

Clustering the keywords allowed us to see changes in themes at each stage. In the results of keyword cluster and timeline analysis, there were five largest cluster labels, among which “Laser, Latarjet, Suture repair” were all related to the surgical treatment of anterior shoulder dislocation. When performing the keyword burst detection analysis, the results show that among the six keywords that appeared in recent years and still hot now, “Bristow” and “Arthroscopic Latarjet” are related to surgical treatment, “Return to sport” is related to prognosis. From the results of the co-occurrence analysis of the author keywords, it can be seen that, “Arthroscopy” and “Latarjet” as surgical treatment related words appeared in the five high-frequency keywords in the past two decades. “Latarjet” is also one of the five high-frequency keywords for 2022. In addition, in the results of topic trend analysis, among the five high-frequency topic words in the past five years, “Latarjet, Bankart repair, Latarjet procedure” were related to surgical treatment. In 2022, “Lateral decubitus, Conservative, Beach-chair” were related to treatment among the five high-frequency topic words. Treatment is obviously the research hotspot in this field, especially surgical treatment, and its popularity may not decline in the next few years. It can be seen that the research focus and trend of anterior shoulder dislocation in the next few years may continue to be on surgical treatment.

#### 4.2. Hotspots and frontiers

In view of the research trends and hotspots of the above analysis, we briefly describe the latest research progress of surgical treatment of anterior shoulder dislocation.

Bankart repair, the classical surgical method, is commonly used in patients with minor injuries and low motor needs, but the recurrence rate of dislocation is controversial [14,15]. Currently, there is no Bankart report with higher value.

Latarjet and Bristow are more suitable for patients with higher exercise requirements, and can obtain better shoulder stability after surgery, but there may be a series of defects such as bone resorption and bone nonunion [16–18]. In order to overcome these shortcomings, Chinese Unique Inlay Bristow (Cuistow), which combines the mortise and tenon structure of traditional Chinese architecture with the Bristow procedure, has been developed in 2022 [19]. Cuistow significantly increased the contact area between the graft and the glenoid, and improved the bone healing rate [19,20]. A novel individualized flexible arthroscopic suture button fixation Latarjet technique, named “LU-tarjet”, was also reported in 2022 [21]. The LU-tarjet does not require either cutting the coracoacromial ligament or reshaping the contact surface between the coracoid process and glenoid process. In addition, the triangular curved coracoid process can easily pass through the subscapularis muscle and make better contact with the glenoid, resulting in less bone absorption and better bone remodeling [21].

The literature published in 2021 showed that compared with Latarjet, the postoperative functional score of glenoid reconstruction with free bone grafting techniques was better [22]. This surgical procedure can be used as a revision after the failure of the Latarje and Bristow procedure or as a repair when the bone defect is huge. As for the choice of free bone graft, autogenous iliac crest is more common, but the complication rate is higher [23,24]. Meanwhile, studies using allograft distal tibia, autogenous distal clavicle, and autologous scapular spine as grafts have also been reported [25–27]. However, recent studies have shown that autologous scapular spine is not suitable for patients with large bone defects [28].

Remplissage combined with Bankart procedure does not require bony reconstruction and is suitable for patients with subcritical glenoid bone loss with high exercise demand [29,30]. However, its treatment is still controversial.

In conclusion, in the field of anterior shoulder dislocation, while improving the surgical treatment, various postoperative complications are still urgent problems to be solved. In addition, the corresponding surgical indications, the learning curve after the improvement of surgical methods, the biomechanical research of surgical methods, the safety after the improvement of surgical methods, and the long-term follow-up are also issues that cannot be ignored in future research.

### 5. Strengths and limitations

According to the literature data we have consulted, our study is the first article that uses bibliometrics to conduct detailed statistics and analysis from a macro perspective and implements a large number of visualization in the field of anterior shoulder dislocation. However, we acknowledge that this article still has some limitations. Firstly, the publications involved in this study were only retrieved in one database, WOSCC, which may not be perfect from a lateral perspective. Secondly, as of January 2, 2023, the WOSCC database may not have fully updated the literature published in 2022, and the data in 2022 May be partially missing, which may not be complete from a longitudinal perspective. Last but not least, some publications of higher scientific quality may not have been included in the visualization chart because they were published more recently, had fewer citations, and were not seen by the majority of researchers.

### 6. Conclusions

This study summarizes the literature on anterior shoulder dislocation in the past two decades. The research on anterior shoulder dislocation has been advancing continuously, and the research outcomes and the number of publications have continued to rise every year. From a global perspective, the United States has made great contributions in the field of anterior shoulder dislocation, and with

its large research base, it will still be in a leading position in the future. The research topic of anterior shoulder dislocation has gradually changed from the mechanism of the disease to the direction related to surgery. It is foreseeable that the surgical treatment of anterior shoulder dislocation will still be the focus of exploration in this field in the future.

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## Consent for publication

Not applicable.

## Ethics statement

Review or approval by an ethics committee was not needed for this study because this manuscript does not involve any animal or human related experiments.

## Data availability statement

Data will be made available on request.

## CRediT authorship contribution statement

**Jingyue Su:** Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Software, Visualization, Writing – review & editing. **Hongfu Jin:** Formal analysis, Methodology, Writing – review & editing. **Siyu Chen:** Investigation, Validation, Writing – review & editing. **Xuying Sun:** Formal analysis, Investigation, Writing – review & editing. **Shanshan Gao:** Formal analysis, Investigation, Writing – review & editing. **Zhengxiang Huang:** Data curation. **Shengwu Yang:** Data curation. **Zhenhan Deng:** Conceptualization, Funding acquisition, Resources, Supervision, Validation, Writing – review & editing, Data curation, Methodology, Project administration.

## Declaration of competing interest

The authors declare no conflict of interest.

## Appendix A Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e32488>.

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