



# A bibliometric and visualized study on global trends of breast augmentation complications, 2011–2021

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**Background:** Women undergo breast augmentation surgery for a variety of reasons, but surgical complications can seriously affect patient outcomes and quality of life, making it a hot research topic. Although a large body of literature exists in this field, a lack of systemic generalization hinders the ability to guide clinical practice. We aimed to identify the current research hotspots and common surgical approaches of breast augmentation and to predict future research hotspots by analyzing the literature of the past 10 years.

**Methods:** All relevant literature on breast augmentation complications were screened in the Web of Science (WoS) platform from 2011 to 2021. We analyzed the research within this field using the software programs VOSviewer and CiteSpace.

**Results:** In total, 2,798 publications were selected. The United States ranked first in the world (1,173 articles), followed by Italy (243 articles), and the United Kingdom (208 articles). Memorial Sloan Kettering Cancer Center was the institution with the most publications, but the academic achievements of Harvard were the most recognized. *Plastic and Reconstructive Surgery* was the most prominent of all journals in terms of both the number and quality of the articles published. Albornoz was the hub author in the co-citation network. Keyword cluster analysis showed that capsular contracture, breast cancer, and postoperative nausea, among others, were the hotspots and trends of research in recent years.

**Conclusions:** This study comprehensively summarized and analyzed the research trends of breast augmentation complications worldwide. Capsular contracture and postoperative nausea are current research hotspots. Periareolar incision and the breast crease incision are the most common incision approaches. Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) is a future research hotspot.

**Keywords:** Breast augmentation; complications; bibliometric analysis; hotspot

Submitted Aug 31, 2022. Accepted for publication Jan 26, 2023. Published online Mar 10, 2023.

doi: 10.21037/gs-22-499

**View this article at:** <https://dx.doi.org/10.21037/gs-22-499>

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## Introduction

As one of the most common plastic surgery procedures worldwide, breast augmentation is performed for a variety of reasons, such as mammary atrophy after breastfeeding and congenital breast dysplasia (1-3). The selection of appropriate incision approaches and breast augmentation methods are the key factors for surgical success (4). For incision approaches, the main considerations are aesthetics, postoperative scar concealment, and ease of surgical operation, and the common breast augmentation incision approaches include the inframammary fold, areola, navel, and axilla (5). For breast augmentation methods, the common approaches include prosthetic implants, autologous fat injection, external tissue expanders, and tissue flaps. Among them, breast augmentation with prosthetic implants has become the primary choice for many women to improve their breast appearance due to the advantages of less trauma, shorter operation time, and faster postoperative recovery (6).

However, as breast augmentation surgery has advanced and patient expectations for surgical outcomes and quality of life have improved, the occurrence of postoperative complications has caused widespread concern (7-9). The main complications of breast implants include sensory dysfunction of the nipple, hematoma, infection, displacement or rupture of the prosthesis, capsular contracture, and aseptic inflammation. Autologous fat injection for breast

augmentation may be complicated by fat liquefaction, fat necrosis, intramammary induration, and cystic degeneration (10,11). To date, numerous articles have reported on breast augmentation surgery and its complications, but no recent studies have analyzed the general trend of postoperative complications after breast augmentation.

Bibliometric analysis is an important component of research evaluation methodology that combines mathematical and statistical methods to provide a quantitative description of the current state of science and technology, research themes, and trend information based on published literature with unique parameters, such as countries, institutions, and authors. We aimed to use bibliometric methods to analyze relevant literature over the past 10 years, identify current research hotspots and common surgical approaches, and so on, and predict future research hotspots.

## Methods

### *Data collection strategy*

The Web of Science (WoS) Core Collection online database was searched using the following search strategy: TS (Title/abstract/author keywords/keywords plus) = (Breast augmentation) OR TS = (Augmentation mammoplasty) OR TS = (Breast implants) OR TS = (Breast fat grafting) AND TS = (Complication) AND Publication Date = (2011-01-01 to 2021-12-13) AND Language = (English). The search strategy and screening process are shown in *Figure 1*.

### *Data collection*

Specialized investigators independently reviewed the literature, collected information, checked references, and allocated staff to handle differences of opinion. The title, keywords, author, institution, and other data are all included in the WoS database. Finally, we conducted bibliometric analysis through VOSviewer (<https://www.vosviewer.com/>), Microsoft Excel 2022 (<https://www.microsoft.com/en-au/microsoft-365/excel>), CiteSpace V (<http://cluster.cis.drexel.edu/~cchen/citespace/>), and other software.

### *Statistical analysis*

After extracting data from WoS, the number of articles and citation trends for breast augmentation complications were first analyzed and then visualized using Excel 2022.

### Highlight box

#### Key findings

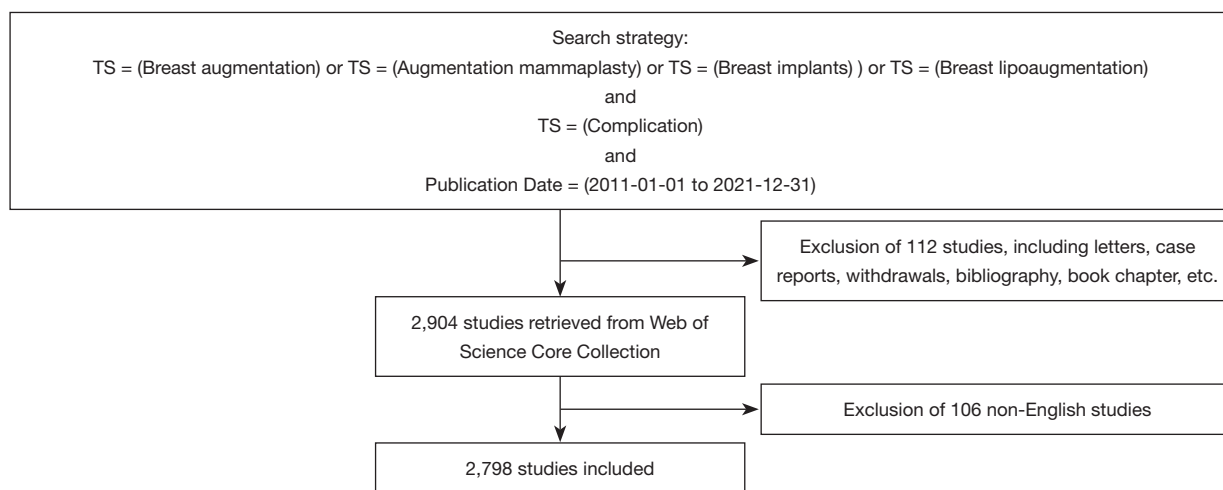
- Capsular contracture and postoperative nausea are current research hotspots. Periareolar incision and breast crease incision are the most common incision sites of breast augmentation surgery. Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) is a future research hotspot.

#### What is known and what is new?

- The issue of complications of breast augmentation surgery is very complex. Postoperative infection and bleeding are common complications.
- We summarized and analyzed the research trend of breast augmentation complications worldwide. We found that BIA-ALCL is a future research hotspot.

#### What is the implication, and what should change now?

- Our study has predicted future research directions. In the future, clinicians should focus on the hot topics of capsular contracture, breast cancer, and postoperative nausea.



**Figure 1** Schematic diagram of the relevant literature screening process. TS, title/abstract/author keywords/keywords plus.

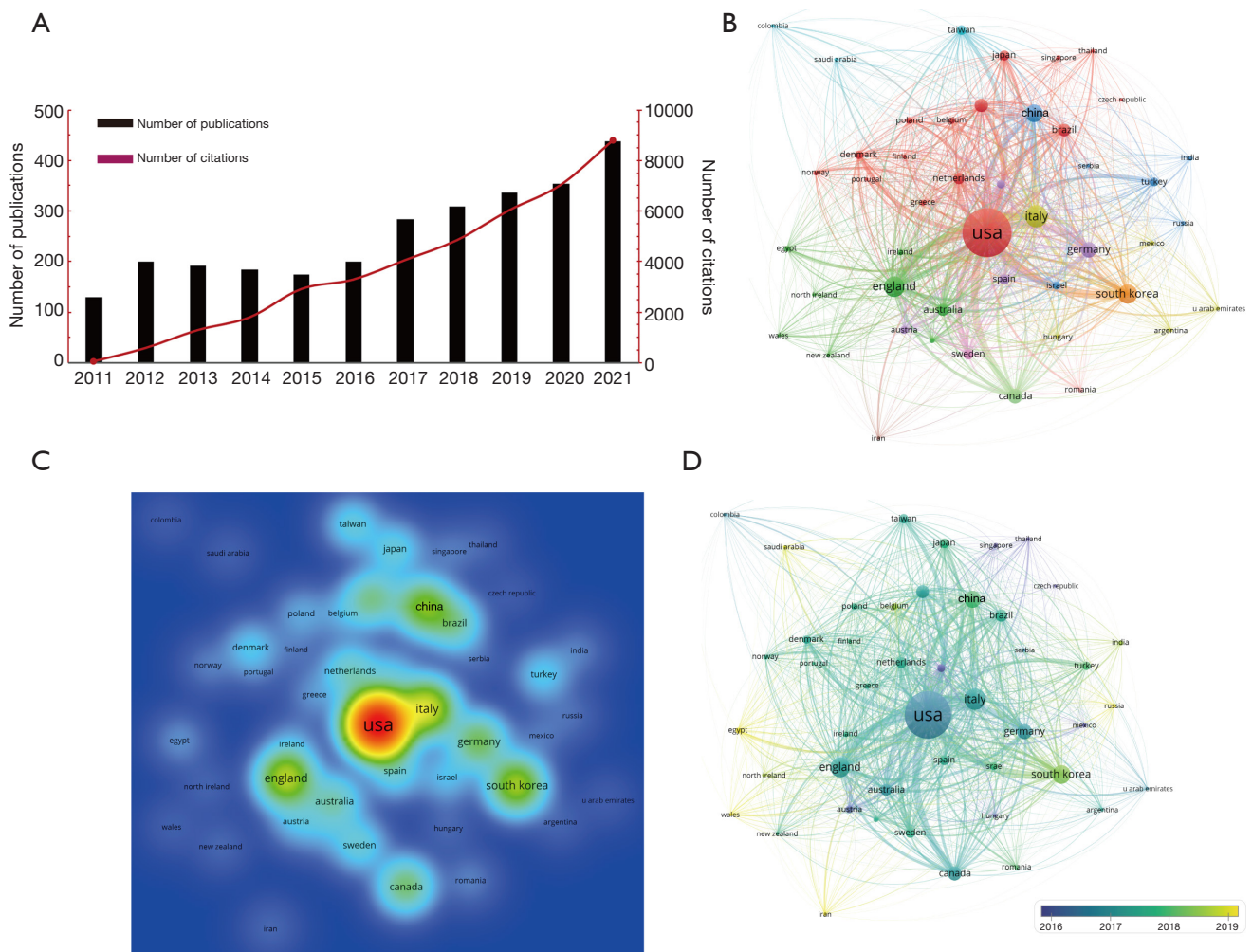
CiteSpace V and VOSviewer were then introduced to perform bibliometric analysis, including national publications and institutional publications, and the analysis methods included coupling analysis, co-citation analysis, and keyword co-occurrence. The latest impact factor (IF; 2021) and partition reference to the latest edition of the Journal Citation Reports (JCR) in 2021 were included.

## Results

### *Publishing trends and global contributions*

According to the search results, a total of 2,798 articles related to breast augmentation complications were included in the bibliometric analysis. We conducted a comprehensive quantitative analysis of the included literature from the perspective of volume of publication, author contributions, country distribution, institutional publications, and citations. As to the number of publications (*Figure 2A*), an overall increasing trend in the past 10 years was observed, especially after 2016, the number of papers in this field had increased significantly, the number of publications in 2021 (400–450 articles) was nearly 4 times that of 2011 (120–130 articles). Meanwhile, the citation rate of relevant literature in this field had increased year-on-year with the increase in the number of publications, from nearly zero citations in 2011 to over 9,000 citations in 2021. This phenomenon shows that complications of breast augmentation have become a hot research topic in the last 5 years, and a large number of papers have been published and have attracted wide attention.

In addition, we not only visualized and analyzed the distribution network of publications from all over the world using VOSviewer, but also normalized these results by the correlation intensity method. We set a minimum value of 5 for publications from each country/region, and 46 countries/regions met this criterion (*Figure 2B*). Among them, the United States ranked 1st in the world in the field of complications from breast augmentation (1,173 articles), followed by Italy (243 articles) and the United Kingdom (208 articles), and China had published a total of 155 articles, ranking 5th. The publishing centers of each country/region were visualized more intuitively through the density map (*Figure 2C*). In terms of total citations, the United States (25,454 citations) remained far ahead of other countries, followed by Italy (3,979 citations) and the United Kingdom [3,069], with China ranking 7th [1,384]. As for average citations, the top 3 countries are the United States [21.70], France [19.07], and Canada [16.96]. Italy [16.37] and the UK [14.75] both dropped out of the top 3, whereas China [8.93] ranked 9th (*Table 1*). In addition, in terms of publication year, the United States published the earliest papers in this field [2016–2017], followed by European countries such as the United Kingdom, Germany, and Italy [2017–2018], and finally Asian countries/regions such as China and South Korea (after 2018) (*Figure 2D*). The research in the field of breast augmentation complications can thus be seen to have certain geographical advantages. The United States emerged as the leader in this field, followed by European countries, with China exhibiting substantial room for improvement.



**Figure 2** Articles related to breast augmentation complications published worldwide. (A) Number of publications and citation data of related literature in various countries/regions around the world. (B) The country/region distribution map of publications is analyzed by VOSviewer (network visualization analysis). The larger the circle, the greater the number of publications. The wider the line connecting the circles, the closer the country/region cooperate. (C) VOSviewer plot of the density of publications by country/region. (D) VOSviewer plot of chronological order of countries or regions.

**Institutional distribution analysis**

Judging from the number of papers published by each institution, the top 3 institutions with the largest number of papers were Memorial Sloan Kettering Cancer Center (59 articles), University of Michigan (53 articles), and University of Texas MD Anderson Cancer Center (49 articles). Regarding citations, Memorial Sloan Kettering Cancer Center (2,141 citations) remained at the top, followed by the University of Michigan (2,101 citations), and Harvard University (1,618 citations). Interestingly, although Memorial Sloan Kettering Cancer Center and

the University of Michigan were both in the top 2 in terms of the number of publications and citations, Harvard University [52.19] has the highest average citation rate. Therefore, Harvard University’s research results on breast augmentation complications were deemed the most recognized in the industry. The top 10 institutions with the most publications on breast augmentation complications are shown in *Table 2*.

In addition, to study the cooperative relationship of various institutions in complications of breast augmentation, we used VOSviewer software to analyze the top 84 institutions that published the most papers, and

the institutions that published a minimum of 10 papers were included and expressed in the form of a network map according to the year of publication (Figure 3A). It can be seen from the figure that Harvard University conducted the earliest research in this field, with publications mainly concentrated in 2015, followed by Memorial Sloan Kettering Cancer Center in 2016, University of Texas MD Anderson Cancer Center, Stanford University, and the Mayo clinic with papers predominantly published after 2018.

### Journal distribution analysis

To further explore popular journals of breast augmentation

**Table 1** Countries with the most publications about breast augmentation complications (top 10)

Country	Publications	Citations	Average citation rate
USA	1,173	25,454	21.70
Italy	243	3,979	16.37
England	208	3,069	14.75
South Korea	188	1,122	5.97
China	155	1,384	8.93
Germany	119	1,502	12.62
Canada	108	1,832	16.96
France	91	1,735	19.07
Brazil	82	904	11.02
Austria	73	1,156	15.84

**Table 2** Institutions with the most publications about breast augmentation complications (top 10)

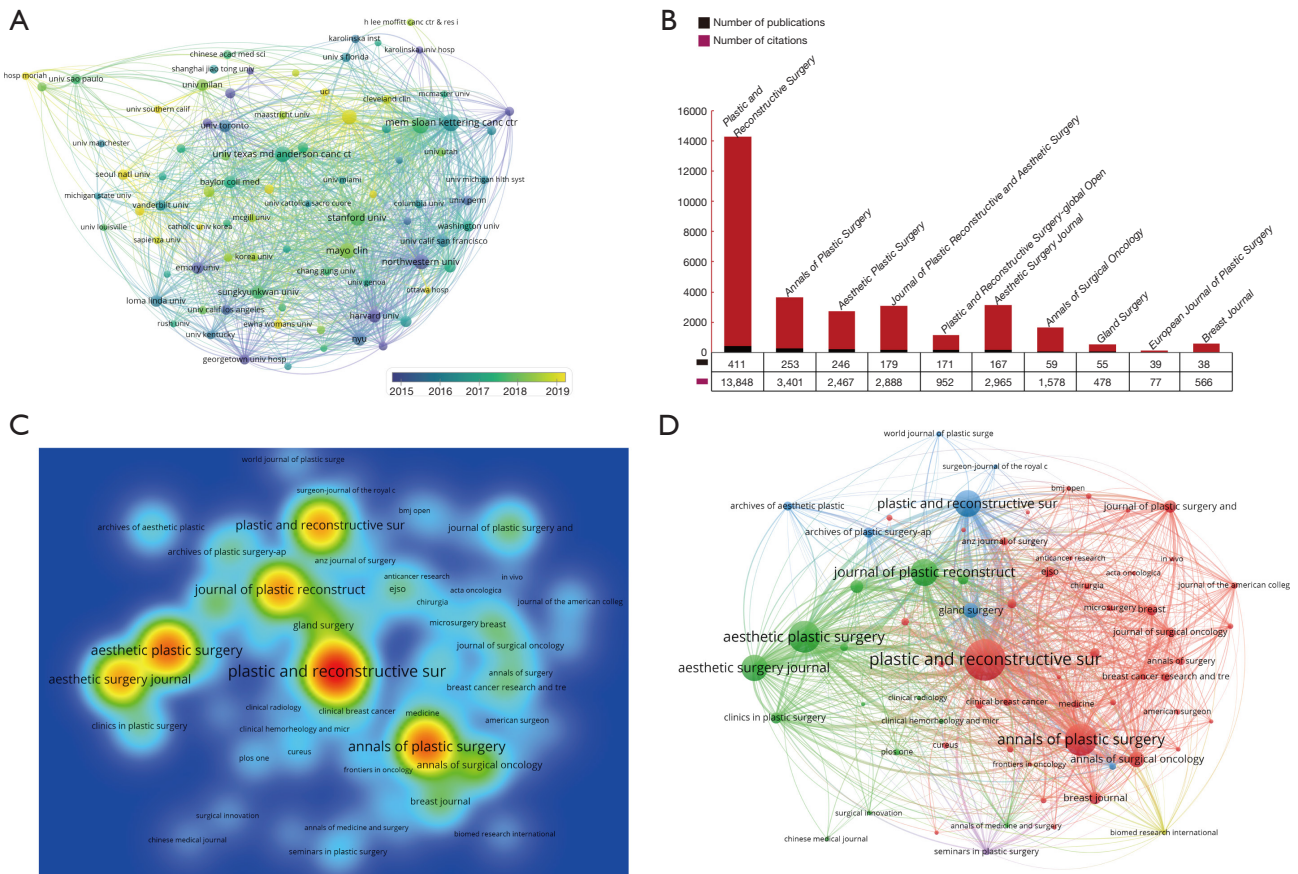
Institutions	Publications	Citations	Average citation rate
Memorial Sloan Kettering Cancer Center	59	2,141	36.29
University of Michigan	53	2,101	39.64
University of Texas MD Anderson Cancer Center	49	1,590	32.45
Stanford University	48	555	11.56
Mayo Clinic	47	693	14.74
Harvard Medical School	43	579	13.47
Northwestern University	42	1,273	30.31
New York University	33	827	25.06
Sungkyunkwan University	33	337	10.21
Harvard University	31	1,618	52.19

complications, we conducted a journal distribution analysis and listed the top 10 journals with the most publications (Figure 3B). As can be seen from the figure, the top 3 journals with the most publications were *Plastic and Reconstructive Surgery (PRS)*; 411 publications), *Annals of Plastic Surgery (AnPS)*; 253 publications), and *Aesthetic Plastic Surgery (APS)*; 246 publications). Among them, the journal with the highest number of citations was *PRS* (13,848 citations), followed by *AnPS* (3,401 citations), and *Aesthetic Surgery Journal* (2,965 citations). Therefore, *PRS* far exceeded other journals in terms of the total number of published articles and total citations, which indicates that the journal prefers research on breast augmentation complications and is a good choice for researchers in this field to publish articles.

Then, to understand the internal connection between the various citing journals, we performed a literature co-citation analysis and visualized it (Figure 3C, 3D). With the criterion of 5 citations as the minimum threshold for inclusion, a total of 66 journals were included. The figure intuitively shows that *APS*, *AnPS*, and *PRS* are the centers of the heat map. These journals have many connections with other related journals, explaining why they have become so popular in the field of breast augmentation complications in recent years.

### Author distribution analysis

To investigate the authors who contributed most to breast augmentation complications research, we used CiteSpace to perform a co-citation network visualization analysis of



**Figure 3** Publication of articles on breast augmentation complications in different journals and institutions. (A) VOSviewer analysis of the schematic diagram of the cooperation between organizations. (B) Top 10 journals in the world with the highest number of publications. (C) VOSviewer analysis of the distribution of references cited by publications (density map). (D) VOSviewer analysis of the reference distribution of publications (web visualization analysis).

the authors of the top 10 most cited articles in this field (Figure 4A). The analysis results showed that Alborno *et al.* (12) in PRS in 2013 was the hub node of the co-citation network, followed by Sigalove *et al.* (13) in PRS in 2017. Subsequently, to conduct a more in-depth analysis of the changes in the research direction of breast augmentation complications, we used CiteSpace software to analyze the burst detection function of the 25 most frequently cited papers. The analysis revealed no significant change in the citation frequency of the literature over the past 10 years (Figure 4B). Finally, a timeline clustering display was used to analyze the author’s publishing trends in recent years [2006–2020] (Figure 4C). We found that acellular dermal matrix (ADM) and capsular contracture were the main topics in 2013–2016, and in recent years [2016–2020], the main focuses were current state and nipple-sparing mastectomy.

The 10 articles most cited on breast augmentation complications are shown in Table 3.

**Keyword co-occurrence cluster analysis**

Keywords can help us to quickly discover publications that symbolize a central theme. Therefore, keyword co-occurrence cluster analysis in breast augmentation complications can help researchers to fully understand the hot topics, research orientation, and internal connections in this field. We used VOSviewer to analyze keywords with a threshold of at least 10 occurrences in all literature titles and abstracts. The results showed that a total of 355 keywords were included in the statistical analysis. According to the keyword network visualization analysis (Figure 5A), the highest frequencies included complications, outcomes,



**Figure 4** Mapping of references in studies on breast augmentation complications. (A) CiteSpace analysis of co-citation network of references on breast augmentation complications. Red spots in the figure indicate burst references. (B) CiteSpace analysis of the publications with the strongest citation bursts (top 25). (C) Timeline visualization of references from 2006 to 2020.

augmentation, cancer, capsular contracture, and ADM. Subsequently, we performed a burst detection function analysis on the 25 most frequently occurring keywords with CiteSpace, and the results showed that no keyword citations had changed significantly over the past decade (Figure 5B). Finally, the timeline-based keyword clustering analysis showed that capsular contracture, breast cancer, ADM, fat grafting, deep inferior epigastric perforator (DIEP) flap, mastopexy, vascular access, postoperative nausea, and so on, had been hot keywords in recent years and had high academic value in breast augmentation complications as well as providing application guidance for future medical research (Figure 5C).

**Discussion**

Our analysis revealed that breast augmentation complications are a popular topic in relevant journals, and the number of articles published in this field has been on the rise over the past 10 years. Country-wise, the United States was the leader in the field, far outpacing other countries in terms of publications and average citation rate. For institutions, the Memorial Sloan Kettering Cancer Center and the University of Michigan had the highest number of publications and citations. Finally, we found that capsular contracture, breast cancer, and postoperative nausea have represented the hot research areas for breast augmentation complications in recent years.

**Table 3** Publications with the most citations about breast augmentation complications (top 10)

Title	Journal	IF	Publication year	Total citations
Trends and variation in use of breast reconstruction in patients with breast cancer undergoing mastectomy in the United States	<i>Journal of Clinical Oncology</i>	50.717	2014	276
A meta-analysis of human acellular dermis and submuscular tissue expander breast reconstruction	<i>Plastic and Reconstructive Surgery</i>	5.169	2012	242
An 8-year experience of direct-to-implant immediate breast reconstruction using human acellular dermal matrix (AlloDerm)	<i>Plastic and Reconstructive Surgery</i>	5.169	2011	240
Breast reconstruction following nipple-sparing mastectomy: predictors of complications, reconstruction outcomes, and 5-year trends	<i>Plastic and Reconstructive Surgery</i>	5.169	2014	211
Retrospective review of 331 consecutive immediate single-stage implant reconstructions with acellular dermal matrix: indications, complications, trends, and costs	<i>Plastic and Reconstructive Surgery</i>	5.169	2011	207
A systematic review and meta-analysis of complications associated with acellular dermal matrix-assisted breast reconstruction	<i>Annals of Plastic Surgery</i>	1.763	2012	202
Comparison of implant-based immediate breast reconstruction with and without acellular dermal matrix	<i>Plastic and Reconstructive Surgery</i>	5.169	2011	196
Intraoperative Perfusion techniques can accurately predict mastectomy skin flap necrosis in breast reconstruction: results of a prospective trial	<i>Plastic and Reconstructive Surgery</i>	5.169	2012	193
Brava and autologous fat transfer is a safe and effective breast augmentation alternative: results of a 6-year, 81-patient, prospective multicenter study	<i>Plastic and Reconstructive Surgery</i>	5.169	2012	191
Acellular dermis-assisted prosthetic breast reconstruction: a systematic and critical review of efficacy and associated morbidity	<i>Plastic and Reconstructive Surgery</i>	5.169	2011	186

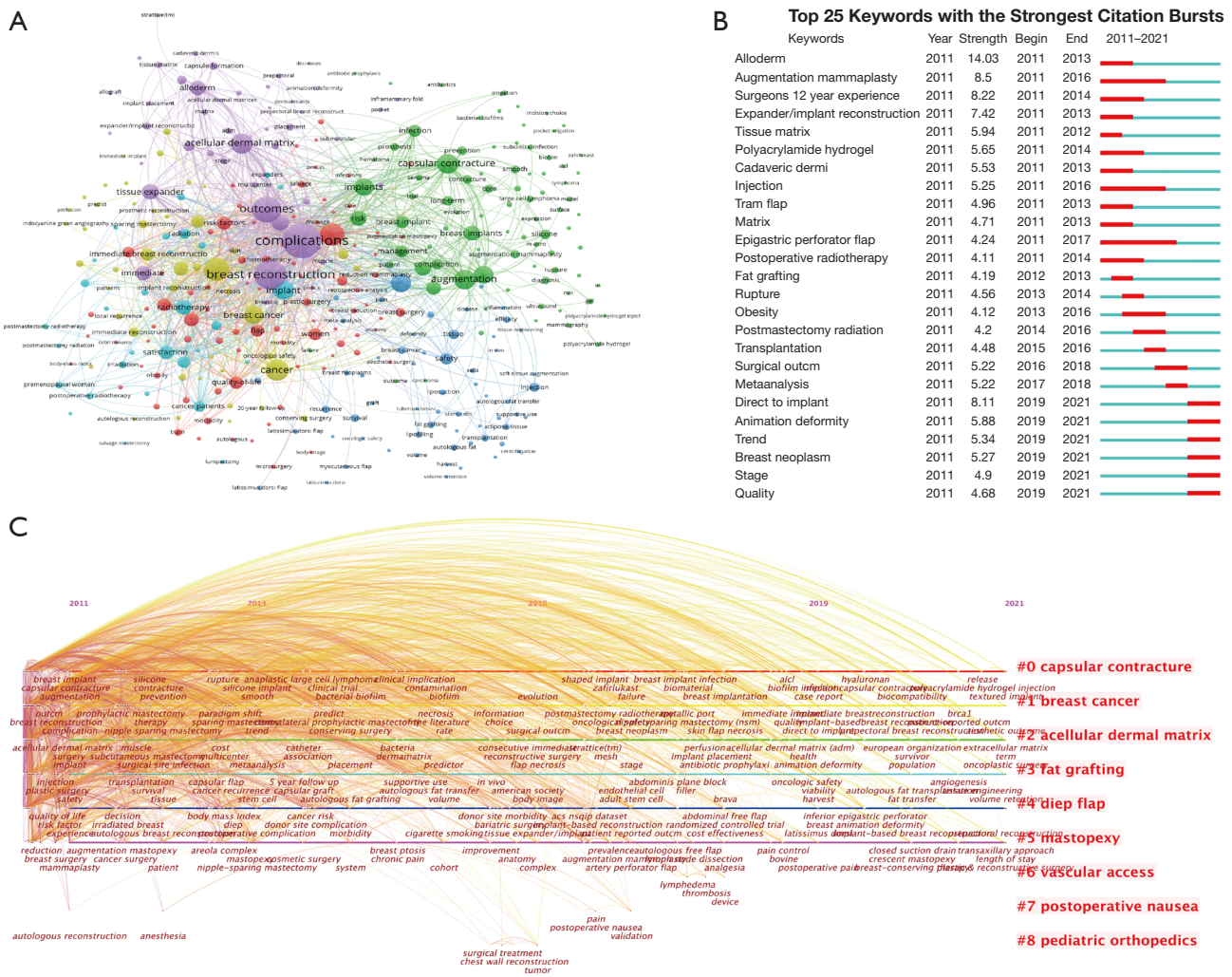
IF, impact factor.

Breast augmentation is a plastic surgery procedure that reconstructs the shape and structure of female breasts for a variety of reasons in the pursuit of health and beauty (14). Breast augmentation surgery is not only suitable for women who simply seek beauty, but also for patients who have had their breasts removed due to various diseases, which is conducive to simultaneous physical and mental recovery (15-17). Therefore, in recent years, breast augmentation surgery has become increasingly popular among women and has become one of the most common types of plastic surgery. However, the appearance of complications after breast augmentation seriously affects the quality of life of patients after surgery, which is a major problem for plastic surgeons and patients (18). For example, breast implant-associated anaplastic large cell lymphoma (BIA-ALCL), is a rare T-cell, CD-30<sup>+</sup>/ALK lymphoma. About 573 cases of BIA-ALCL have been reported worldwide, and most of the patients have been implanted with textured prostheses, so it is widely believed that inflammation induced by prosthesis

implantation is an important cause of BIA-ALCL, and this complication has received more and more attention from the academic community in recent years (19).

In terms of the surgical approach to breast augmentation, the most common surgical incisions currently include the axillary crease incision, the periareolar incision, and the breast crease incision, of which the axillary crease incision and the periareolar incision have good concealment and are the most common incisions. The common materials for breast augmentation include autologous fat transplantation, allogeneic material injection and implant filling, among which implant filling is the most common. In addition, the implants can be divided into teardrop and disc type according to the shape, and glossy and coarse surface type according to the material, and the appropriate implant type should be pre-operatively selected according to the patient's own situation and needs before surgery. Postoperative bleeding and hematoma, periosteal contracture, nerve damage, infection, and implant granuloma are common





**Figure 5** Keyword mapping in studies on breast augmentation complications. (A) Network visualization of keywords based on VOSviewer. (B) The top 25 keywords with the strongest citation bursts based on CiteSpace. (C) Keyword timeline visualization [2011–2021].

postoperative complications of breast augmentation, with infection and postoperative bleeding being the most common. For example, ADM, originally used in burns, has been used in augmentation in recent years due to its good histocompatibility; literature has increasingly shown support of the prosthesis as it can reduce the incidence of immune rejection and reduce the risk of envelope contracture, and is currently one of the key areas of research (20). In general, there are various surgical procedures and implant options for breast augmentation, and the use of different treatment strategies for different patients to reduce complications is a key topic of research. Therefore, how to avoid and solve postoperative complications after breast augmentation has become a hot topic of research in recent years, and the

number of articles in related fields has continued to increase (Figure 2A).

In the 1960s, bibliometric analysis was used by Pritchard in non-medical fields firstly and has since been used in medical area. It helps researchers to quickly locate their areas of interest and analyze important research findings and hot topics (21). A bibliometric analysis according to published numbers and paper citations in breast augmentation complications in the past 10 years found that the number of papers published in the past decade showed an overall increasing trend, although the number of papers published slightly declined between 2012 and 2015 (Figure 2A). In 2021, the number of relevant literature publications reached nearly 4 times that of a decade ago,

and the citation rate of relevant literature also increased. Therefore, in the past 5 years, more and more patients have received breast augmentation surgery, and the complications of breast augmentation have received extensive attention from surgeons. How to solve and avoid these complications has become a hot topic of research.

In addition to the increase in the number of published articles, we also analyzed the quality of published journals (*Table 3*). The results showed that 9 articles were from journals in JCR Zones 1 and 2, with IF >5 scores and the top 6 citations were more than 200 times, which also indicates that breast augmentation complications are a hot topic in journals, and have been widely recognized by the academic community. In terms of journal distribution, PRS was far ahead of other journals in publication volume and citation volume (*Figure 3B*), and 8 of the top 10 most cited papers are published in PRS (*Table 3*). This shows that PRS is not only friendly to articles relating to breast augmentation complications, but is strict on the quality of articles, so the articles of the journal have a high citation and reference value for researchers who wish to study and further their education in this field.

We further compared the publication situation between countries/regions based on the total global publication volume to understand the different contributions of different countries/regions to the field of breast augmentation complications (*Table 1, Figure 2B,2C*). We found that the United States far surpassed other countries as to the average citation rate [21.70] and the number of publications [1,173]. In addition, the United States was at the center of this research field, and the citations of literature in various countries were based on the achievements of American authors. There is no doubt that the United States is absolutely leading in this field. Although France had not published many papers, the average citation rate [19.07] was second only to the United States [21.70], indicating that France's research results in this field are generally recognized by the industry. However, the number of published papers [155] and the average citation rate [8.93] in China were both in the middle and lower stages, meaning that Chinese research of augmentation complications is still at an early stage, as further study and in-depth research are needed from countries such as the United States and France. Interestingly, we found that the number of publications on breast augmentation complications was somewhat related to geography and ethnicity, with predominantly Caucasian countries such as Europe and the United States having a significantly higher number of publications and average

citation rates than Asian countries/regions such as China and South Korea, which is perhaps related to the aesthetic view of Europeans and Americans that large breasts are beautiful. However, China has a large population base, the number of women with breast cancer is also increasing year by year, and the number of patients who need breast augmentation after breast cancer is also increasing [22]. Consequently, a huge market will emerge in the coming decades. Therefore, China needs to pay attention to the research in breast augmentation complications and increase scientific research investment in this field to be prepared for the possible explosion of breast augmentation demand in the future.

As to institutional distribution analysis, we found that 9 of the top 10 universities with the most articles on breast augmentation complications were located in the United States and only 1 was in South Korea (*Table 2*). Although Memorial Sloan Kettering Cancer Center and the University of Michigan had the highest number of publications and citations, the highest average citation rate was Harvard University [52.19], which was much higher than the former 2 [36.29, 39.64]. In addition, we analyzed the results of cooperation between various institutions through VOSviewer and found that Harvard University was also the first institution to publish articles in breast augmentation complications (*Figure 3A*). This means that Harvard University is a pioneer in breast augmentation complications, both in years of publication and in the average citation rate, and is a leader in the field with a small number, but sophisticated, publications and generally recognized research results. In contrast, Memorial Sloan Kettering Cancer Center and the University of Michigan have a high volume of articles but low citation rates, therefore, researchers at these institutions need to continue to improve the quality of their research. In terms of author distribution, Albornoz from the United States and Sigalove from Canada published the highest quality articles at the critical nodes of the citations of the literature (*Figure 4A*). It is worth noting that representative works of the 2 authors were published in 2013 and 2017, respectively. Although these articles are relatively old, they are still constantly cited in the literature, which reflects the irreplaceable and outstanding contributions of the two authors in this field. Salzberg *et al.* (22) found that direct implantation of the human ADM into the breast also reduced overall long-term complication rates, particularly capsular contractures. However, a meta-analysis by Kim *et al.* (23) showed that the implantation of human ADM increases the probability of

postoperative complications compared with conventional submuscular dilator/implant reconstruction.

Finally, a cluster analysis of keywords was performed in the titles and abstracts of these publications to summarize the popular topics in breast augmentation complications in recent years. According to the cluster analysis of the literature timeline (Figure 4C), current state and nipple-sparing mastectomy were the most interesting directions for researchers in recent years. Time axis clustering analysis of keywords (Figure 5C) indicated that capsular contracture, breast cancer, postoperative nausea, and so on represented the hot research directions of breast augmentation complications in recent years. Many researchers have tried different methods to avoid the occurrence of similar complications. In summary, current state and nipple-sparing mastectomy, capsular contracture, breast cancer, and postoperative nausea have been hot research areas in recent years and researchers should focus their future research efforts to these areas.

All the literature in this study came from the WoS database, which contains relevant literature on breast augmentation complications in the last 10 years, and comprehensively analyzes the current trend of development. However, this study still had some limitations, for example, we only analyzed English-language literature; a significant proportion of Chinese authors would have published their research results in Chinese core journals, which may be one of the reasons for the low contribution of Chinese authors in breast augmentation complications in this study. Therefore, in the follow-up literature, we will combine multilingual research results and comprehensively analyze the literature in the field of breast augmentation complications to obtain more comprehensive and objective analysis results.

## Conclusions

In summary, this study analyzed the global literature in the field of breast augmentation complications over the past 10 years, which can be used to generally predict future research directions. We found that capsular contracture, breast cancer, and postoperative nausea are currently the most popular topics. Periareolar incision and the breast crease incision are the most common incisions. We predict that BIA-ALCL will become a hot spot for future research.

## Acknowledgments

*Funding:* This work was supported by the East Hospital

Affiliated to Tongji University Introduced Talent Research Startup Fund (grant number DFRC2019008) and the Featured Clinical Discipline Project of Shanghai Pudong (grant number PWYts2021-07).

## Footnote

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <https://gs.amegroups.com/article/view/10.21037/gc-22-499/coif>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This article does not contain any studies with human participants or animals performed by any of the authors.

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(English Language Editor: J. Jones)

**Cite this article as:** Zhang H, Jia L, Guo R, Xiong J, Jiang H. A bibliometric and visualized study on global trends of breast augmentation complications, 2011–2021. *Gland Surg* 2023;12(3):354-365. doi: 10.21037/gS-22-499