Original Article

Frontiers and hotspots of 3D technology in prostatectomy from 1999 to 2024: a bibliometric analysis and visualization

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Background: Prostate cancer is a major global health issue. Radical prostatectomy is an effective treatment for prostate cancer. The integration of three-dimensional (3D) technology in prostatectomy offers numerous benefits. We intended to perform a bibliometric analysis of the role of 3D technology in prostatectomy.

Methods: Articles and review articles related to "3D" and "prostatectomy" were retrieved from Web of Science Core Collection. Microsoft Office Excel, CiteSpace, and VOSviewer were utilized for analysis and visualization.

Results: A total of 441 articles were collected. The annual publication volume and journal distribution were illustrated. Visualizations of collaborations among countries/regions, institutions, and authors were provided. Networks of reference co-citations and keyword co-occurrences, along with their respective clusters were plotted.

Conclusions: The number of published papers significantly increased over the last 25 years. The most productive and influential country was the USA, and The University of California System was the most influential institution. The journal with the highest number of publications was *BJU International*. Among all authors in this field, Wijkstra H has published the most papers. Porpiglia F was the most cited author. Previous hot topics included advanced imaging and clinical trials, whereas augmented reality (AR) and robotics are likely to be hot topics in the future.

Keywords: Bibliometric; prostate cancer; prostatectomy; hotspots; robot-assisted surgery

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Introduction

Prostate cancer is one of the major global health issues, being the second most common malignancy and the fifth leading cause of cancer death among men worldwide, also the most common malignancy and the second leading cause of cancer-related death in men in the United States (1,2). Prostatectomy is an effective treatment for prostate cancer (3).

The integration of three-dimensional (3D) technology in prostatectomy offers numerous benefits such as enhanced surgical performance, better visualization, more effective

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training, and increased precision (4). This technology facilitates more efficient surgical tasks, particularly for novice assistants, and aids in the creation of precise 3D prostate models for biopsy planning (5). Intraoperative ultrasonography combined with 3D imaging improves visualization of cancerous areas and critical structures during nerve-sparing procedures (6). The use of combined ultrasound and magnetic resonance imaging (MRI), as well as 3D ultrasound for needle placement, enhances biopsy precision (7). Furthermore, 3D technology is applied in surgical navigation and simulation-based training for robotic surgery, improving skill development (8,9). Additionally, 3D printing is utilized to produce models with a tactile sense for prostatectomy, reducing positive surgical margins and improving suturing accuracy during procedures (10).

The application of 3D technology in adjuvant radiotherapy for prostate cancer has also undergone significant evolution, transforming treatment techniques from two dimensional (2D) planning to 3D conformal radiotherapy (CRT) using computed tomography (CT), which has revolutionized prostate cancer management by enhancing treatment precision and improving patient outcomes. Comparative studies between intensity-modulated radiation therapy (IMRT) and 3D CRT have highlighted the advantages of 3D technology in reducing acute urinary symptoms and optimizing treatment planning for prostate cancer patients (11,12).

Bibliometric analysis is a quantitative method for evaluating scholarly outputs and has been widely adopted across various scientific disciplines. It involves analyzing publication patterns, citations, and collaborations using tools like CiteSpace, VOSviewer, and Bibliometrix, thereby enabling a comprehensive understanding of research trends, impacts, and future directions (13). Bibliometric analysis has been used in various domains, including breast cancer prediction, colorectal cancer liver metastasis management, and gastric cancer prognosis (14-16). Specifically in prostate cancer research, this methodology has been used to identify frequently cited articles, research hotspots, and influential publications in a certain area like brachytherapy and neuroendocrine prostate cancer (17,18). By reviewing and quantitatively assessing scholarly outputs within a defined timeframe, bibliometric analysis offers critical insights to researchers, clinicians, and policymakers (19). As such, bibliometric analysis is an important tool in understanding the research landscape, influencing evidence-based decision-making, and advancing knowledge in medical research.

To date, there were only reviews on the 3D technology in prostatectomy. Most of them only focused on a single specific topic such as 3D surgical guidance, 3D printing models, or 3D virtual models, but hardly provided an overall or dynamic view of this field (20-22). No bibliometric studies have addressed 3D technology in prostatectomy. Therefore, a bibliometric and visual analysis was conducted based on 441 documents.

Highlight box

Key findings
- The number of published papers significantly increased over the last 25 years.

What is known and what is new?
- The integration of three-dimensional technology in prostatectomy offers numerous benefits.
- Previous hot topics included advanced imaging and clinical trials, whereas augmented reality (AR) and robotics are likely to be hot topics in the future.

What is the implication, and what should change now?
- AR and robotics should be further applied in prostatectomy.

Methods

Data source

The literature search was performed on June 5, 2024. The search terms "(3D OR three-dimensional) AND (prostatectomy OR prostatectomies)" were used to search the Web of Science Core Collection (WOSCC) database in the form of title (TI), abstract (AB), and author keywords (DE), to improve search precision and obtain more accurate search results related to our research topic (23,24). The specific query strategy can be found in the Table S1. Only articles and review articles written in English that were published from January 1, 1999 to June 5, 2024 were included in our analysis. The inclusion criteria are used by the need for consistency, reliability, and relevance in the data being analyzed, because these document types typically present comprehensive findings and discussions that are essential for understanding the research landscape. Papers in other languages or other types of publications, including meeting abstract, proceeding paper, editorial material, letter, and early access were excluded. In total, 441 articles were acquired. Two independent authors (J.H. and C.W.) verified the title and abstract of publications. The flow chart of overall research process is shown in *Figure 1*.

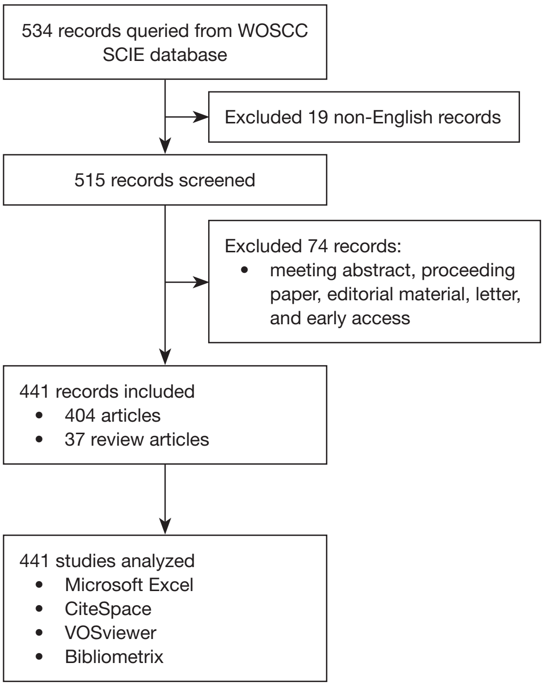

Figure 1 A flow chart of literature screening procedures. WOSCC, Web of Science Core Collection.

Table 1 Main bibliographic information about the included studies

Description	Results
Timespan	1999–2024
Number of journals	157
Number of articles	441
Average years from publication	10.4
Average citations per article	32.87
Number of references	10,271
Number of author's keywords	945
Number of keywords plus	1,101
Number of contributing authors	2,839
Authors of single-authored articles	7
Authors of multi-authored articles	2,832
Number of single-authored articles	7
Articles per author	0.155
Co-authors per article	8.42

Data analysis

Data interpretation and visualization were conducted using Microsoft Office Excel (version 2405), CiteSpace (version 6.3.R2 and 6.3.R3), and VOSviewer (version 1.6.20). These software tools provided comprehensive support for data processing, chart generation, and bibliometric network analysis, thereby ensuring a more detailed and accurate presentation of the results.

CiteSpace is a visualization software tool used for mapping trends and patterns in scientific literature, enabling the analysis of co-citation networks, keyword co-occurrence, and the identification of emerging research fronts, which was used for country/region analysis, institutional analysis, references co-citation analysis and keywords co-occurrence analyzation in this study (25-27). During the analysis, the time slicing was set to 1 year, and g-index k=25 was selected for the threshold, and some synonyms were merged and some irrelevant words were removed (Tables S2,S3).

VOSviewer is a software tool for constructing and visualizing bibliometric networks (28,29). We utilized VOSviewer to visualize networks of co-authorship and author co-citation among the selected articles. The minimum number of documents of an author was set to 2 in the co-authorship analysis, while the minimum number of citations of an author was set to 20 in the co-cited author analysis. Different variations of author names have been merged using thesaurus files (Tables S4,S5).

Bibliometrix is an open-source R package designed for comprehensive science mapping analysis (30). It was used for summary information, year distribution, and journal distribution in our study.

Results

Summary bibliographic information

Table 1 illustrates the comprehensive overview of published literature in the field of 3D technology and prostatectomy from 1999 to 2024. A total of 441 publications were published, with 10.4 years in average from publication, while the average number of citations per article equals to 32.87. A total of 945 author's keywords were included in the analysis. The number of authors contributed to this field is 2,839, of which 7 authors completed their research independently. On average, each author completed 0.155 papers, and each document was written by an average of 8.42 authors. As can be seen from *Figure 2*, it is obvious that

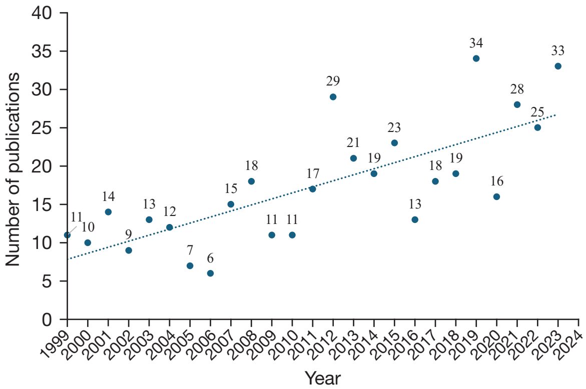

Figure 2 The year distribution of published literature. The dotted line represents the trend of annual publication volume.

the number of publications has fluctuated and generally increased over time, especially after 2010, except for a few years such as 2016, when it declined. The annual growth rate of publications between 1999 and 2023 is 4.68%. Therefore, 3D technology is in the developing stage, and is utilized increasingly in the field of radical prostatectomy.

Country/region and institutional analysis

Papers in this field were published by a total of 45 countries/regions. *Figure 3A* shows the country/region collaborative network between countries/regions. The United States was the country/region with the most papers, followed by Germany and Italy. Centrality measures the strength of a node's connections within the entire network; a node with high centrality means a significant influence over the entire network and has strong intermediary properties, which were marked in magenta circles. The top three countries/regions with high centrality were the United States, Germany, and England. The USA ranked first in the world in both the number of publications and centrality, with a centrality as high as 0.92, which demonstrated its leadership in this field. *Figure 3B* illustrates international cooperation on a world map, and the depth of blue represents the number of publications, and the thickness of the red connecting line represents the intensity of cooperation between countries. As shown in *Figure 3C*, The University of California System, Duke University, and Harvard University ranked in the top three in terms of number of publications among all institutions. The top three institutions with the highest centrality were Universite Paris Cite, Cleveland Clinic Foundation, and Case Western Reserve University.

Journal distribution analysis

The papers were published in a total of 157 journals, of which 11 journals accounted for one-third of the total publications, and the top 10 of them are listed in *Table 2*. The three journals with the highest number of publications include *BJU International*, *European Urology*, and *the International Journal of Radiation Oncology Biology Physics*. Meanwhile, among all journals, the journals with the highest impact factors are *CA-A Cancer Journal for Clinicians*, *Annals of Oncology*, and *the Journal of Clinical Oncology*. Bradford's Law is an empirical rule that a core group of journals in a field contains the majority of significant scientific articles, with the remainder spread out over other journals (31). *Figure 4* shows core journals, depending on the number of articles. The core zone includes only 11 journals, which account for 148 articles, approximately one-third of the total number of articles. These journals may have a stronger interest in 3D technology and prostatectomy, which is an important consideration for potential contributors. A full list of core, middle, and minor journal zones is provided in the Table S6.

Authors analysis

Figure 5A shows the collaboration network between different authors. Each color represents a collaboration cluster, and each node represents an author. The collaboration between authors was relatively loose, but there were still several noteworthy clusters. Wijkstra H and Porpiglia F published more than 10 papers, and they each led the two largest clusters. Hricak H, van der Poel HG, and Tewari AK followed closely behind with 8 papers each. Figure S1 shows the six largest clusters of author collaboration networks. *Figure 5B* shows the changes in author activity over time, with the color of the node indicating the approximate period of their research activity. Nodes colored purple signify periods of early activity, while those colored yellow indicate more recent activity. It is evident from the figure that Hricak H was notably active in the early periods, Wijkstra H dominated the 2010s, and more recently, Porpiglia F and van der Poel HG have emerged as highly productive authors. *Figure 5C* shows a co-cited author network, Porpiglia F, Epstein JI, and Ukimura O stand out as highly central authors within the

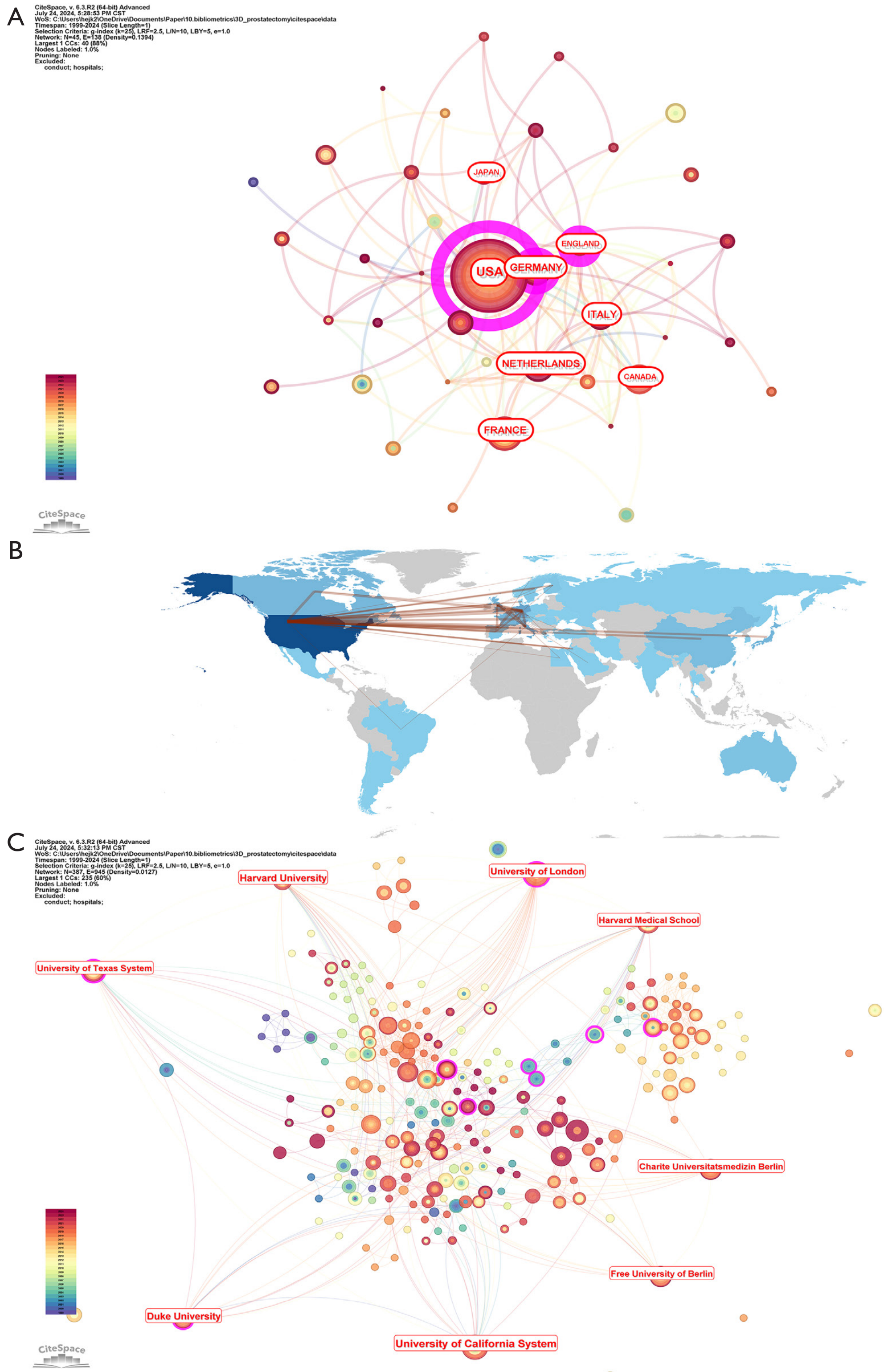

Figure 3 Country/region and institution analysis. (A) The country/region collaborative network visualization. (B) Collaboration world map. The depth of blue represents the number of publications, and the thickness of the red connecting line represents the intensity of cooperation between countries. The color grey indicates no publication in certain country/region. (C) Institutional collaborative network visualization.

Table 2 The top 10 journals with most publications from 1999 to 2024

Rank	Journal	Count (%)	IF	JCR quartile	Publisher
1	*BJU International*	25 (5.67)	3.7	Q1	Wiley
2	*European Urology*	22 (4.99)	25.3	Q1	Elsevier
3	*International Journal of Radiation Oncology Biology Physics*	15 (3.40)	6.4	Q1	Elsevier
4	*Urology*	14 (3.17)	2.1	Q2	Elsevier
5	*Journal of Endourology*	13 (2.95)	2.9	Q1	Mary Ann Liebert
6	*Radiotherapy and Oncology*	13 (2.95)	4.9	Q1	Elsevier
7	*American Journal of Roentgenology*	10 (2.27)	4.7	Q1	American Roentgen Ray Society
8	*Radiology*	10 (2.27)	12.1	Q1	Radiological Society of North America
9	*International Journal of Urology*	9 (2.04)	1.8	Q3	Wiley
10	*World Journal of Urology*	9 (2.04)	2.8	Q2	Springer

IF, the 2023 impact factor obtained from Journal Citation Reports; JCR, Journal Citation Reports.

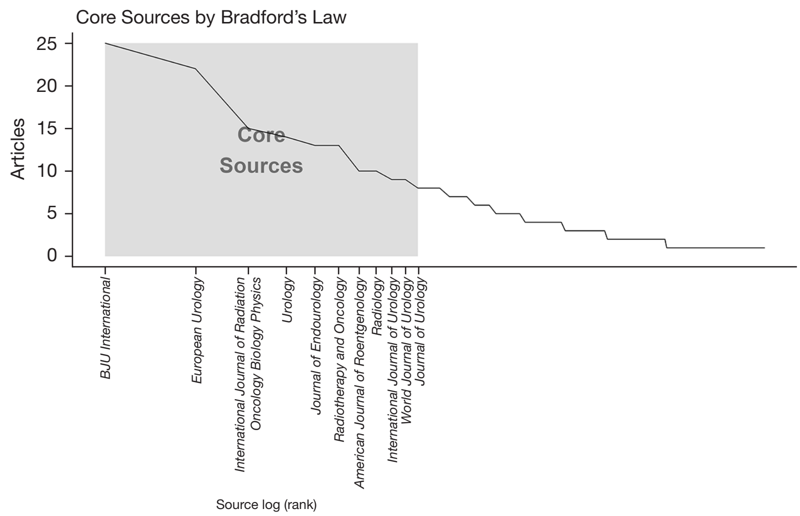

Figure 4 Core journals based on Bradford's Law.

network, each having been cited more than 80 times.

References co-citation analysis

A total of 833 references were included in the analysis. There were 11 articles with citations greater than or equal to 10 times, listed in *Table 3*. The network diagram of co-cited articles can be seen in *Figure 6A*, where earlier cited articles are colored purple or blue, while the latest cited articles are colored red or orange, and articles with citations greater than 10 times are tagged on the diagram. *Figure 6B* shows the top 10 clusters of co-cited references, the largest cluster was "surgical planning", followed by "radical prostatectomy" and "visible prostate cancer". And their silhouettes were all greater than 0.85, which indicated the validity of the clusters (32). The top 25 references with strong citation bursts are shown in *Figure 7*.

Keywords co-occurrence analysis

A total of 517 keywords were included in the analysis. Keywords network can be seen in *Figure 8A*, and keywords

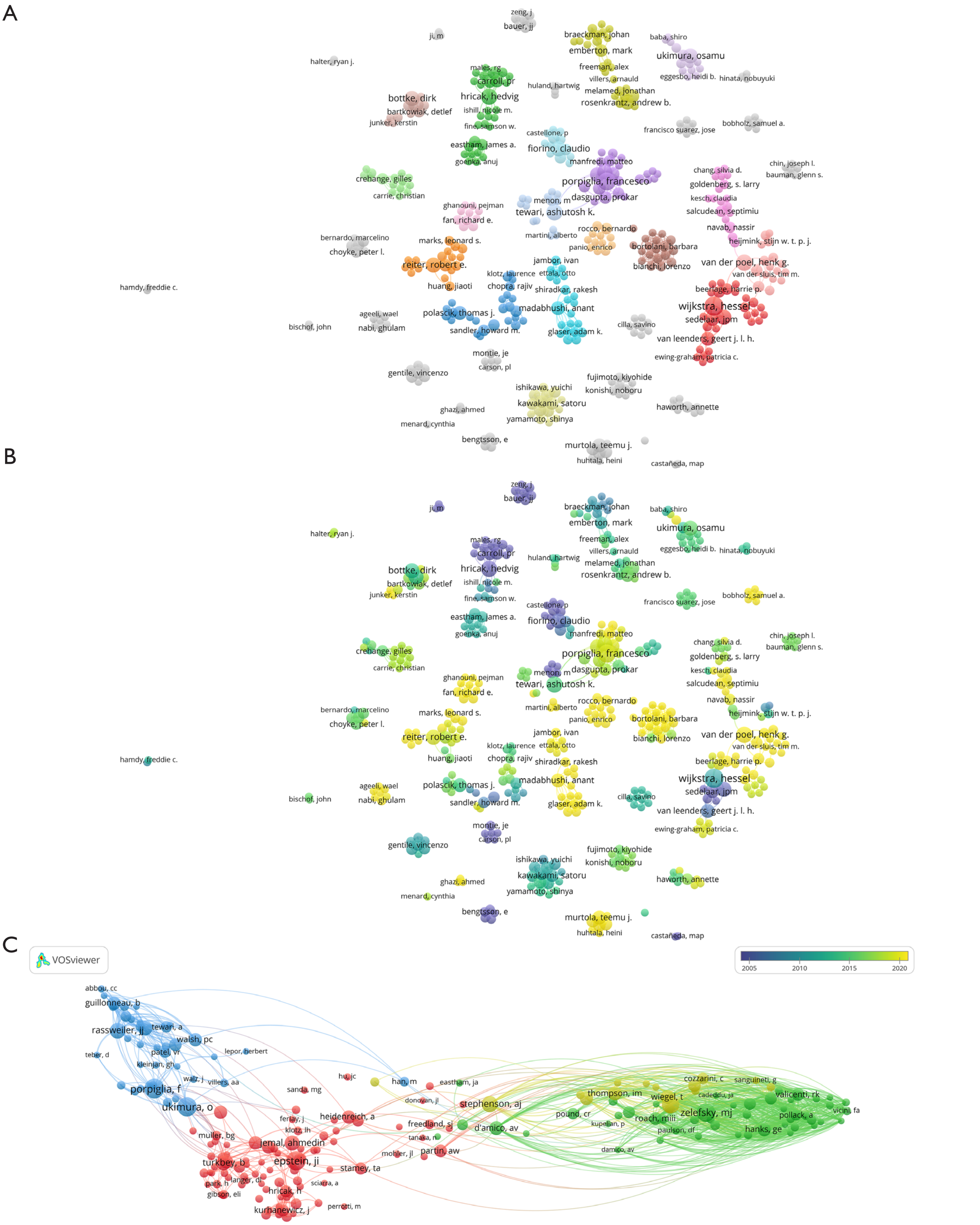

Figure 5 Author analysis. (A) Author collaborative network visualization. (B) Author collaborative network visualization with time overlay. (C) Co-cited author network visualization.

Table 3 References cited more than 10 times

Rank	Citation	Author [year]	Title	Journal
1	20	Weinreb JC [2016]	PI-RADS Prostate Imaging-Reporting and Data System: 2015, Version 2	*European Urology*
2	14	Bolla M [2005]	Postoperative radiotherapy after radical prostatectomy: a randomised controlled trial [EORTC trial 22911]	*The Lancet*
3	14	Mottet N [2021]	EAU-EANM-ESTRO-ESUR-SIOG Guidelines on Prostate Cancer-2020 Update. Part 1: Screening, Diagnosis, and Local Treatment with Curative Intent	*European Urology*
4	12	Thompson IM [2006]	Adjuvant radiotherapy for pathologically advanced prostate cancer: a randomized clinical trial	*The Journal of the American Medical Association*
5	12	Porpiglia F [2019]	Three-dimensional Elastic Augmented-reality Robot-assisted Radical Prostatectomy Using Hyperaccuracy Three-dimensional Reconstruction Technology: A Step Further in the Identification of Capsular Involvement	*European Urology*
6	11	Wiegel T [2009]	Phase III postoperative adjuvant radiotherapy after radical prostatectomy compared with radical prostatectomy alone in pT3 prostate cancer with postoperative undetectable prostate-specific antigen: ARO 96-02/AUO AP 09/95	*Journal of Clinical Oncology*
7	11	Porpiglia F [2018]	Development and validation of 3D printed virtual models for robot-assisted radical prostatectomy and partial nephrectomy: urologists' and patients' perception	*World Journal of Urology*
8	10	Barentsz JO [2012]	ESUR prostate MR guidelines 2012	*European Radiology*
9	10	Porpiglia F [2018]	Augmented Reality Robot-assisted Radical Prostatectomy: Preliminary Experience	*Urology*
10	10	Mottet N [2017]	EAU-ESTRO-SIOG Guidelines on Prostate Cancer. Part 1: Screening, Diagnosis, and Local Treatment with Curative Intent	*European Urology*
11	10	Turkbey B [2019]	Prostate Imaging Reporting and Data System Version 2.1: 2019 Update of Prostate Imaging Reporting and Data System Version 2	*European Urology*

with a frequency of occurrence greater than 14 were tagged, among which the top three keywords with the highest frequency of occurrence were "prostate cancer", "cancer" and "radical prostatectomy". There were 8 keywords with centrality greater than or equal to 0.1, the top three of them were "radical prostatectomy", "cancer" and "prostate cancer". The 10 largest clusters are shown in *Figure 8B*, where the largest cluster was "salvage radiotherapy", followed by "correlating pathology" and "contrast ultrasonography". Given that all the silhouettes exceed 0.65, the rationality of the clusters was apparent. A total of 14 keywords were detected with bursts, as shown in *Figure 9*. These bursts are mostly related to radiotherapy and robot-assisted surgery, as well as new diagnosis and localization methods. The three most recent bursts were "robot-assisted radical prostatectomy", "robot-assisted surgery", and "augmented reality", indicating the wide application of robotics.

Discussion

General information

Multiple different software packages were employed to demonstrate a comprehensive overview of the development of 3D technology in prostatectomy over the last 25 years, with general information, leading countries/regions, institutions, journals, authors, hotspots and trends. The number of published articles is generally on the rise. However, further development is needed in the field of 3D technology as applied to prostatectomy, and increased participation from researchers should be actively encouraged. The United States and Germany together have contributed 233 papers, representing over half of the total publications in this area. In the centrality analysis, the United States, England, and Germany have relatively high centrality values, with the USA demonstrating significantly higher centrality compared to other countries. Interestingly,

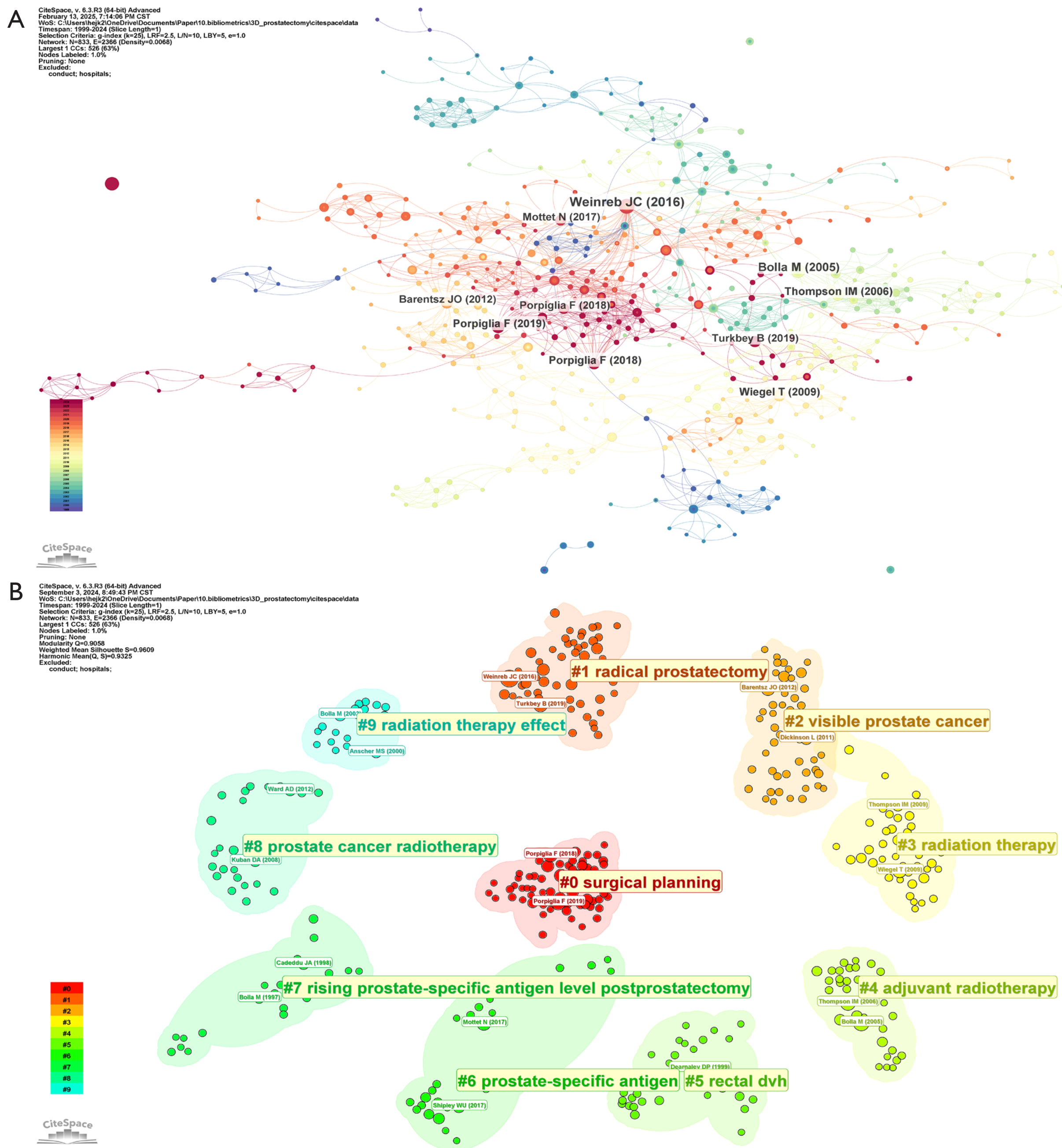

Figure 6 Co-cited references analysis. (A) Co-cited references network visualization. (B) The top 10 clusters of co-cited references.

our institutional analysis revealed that American research institutions lead in terms of the number of published articles, while both European and American institutions dominate the top positions in centrality. On the contrary, the Asia-Pacific region and South American countries are not active enough in international cooperation, and African countries have very few publications, probably due to lack of resources. This demonstrates the creativity and leadership of the American and European institutions in this field, but also shows the urgent need for other countries to join in the collaboration. It is recommended to carry out more cross-institutional cooperation projects or promote cooperation through policy support and financial investment. The top 5 most productive authors were Wijkstra H, Porpiglia F,

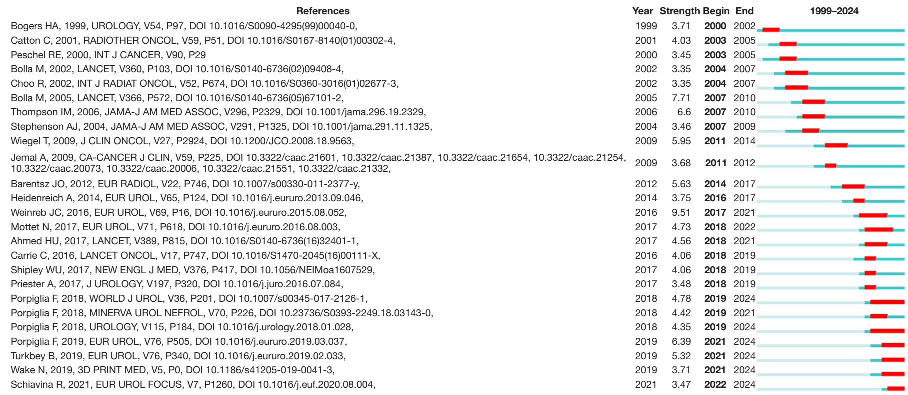

Figure 7 The top 25 references with strong citation bursts.

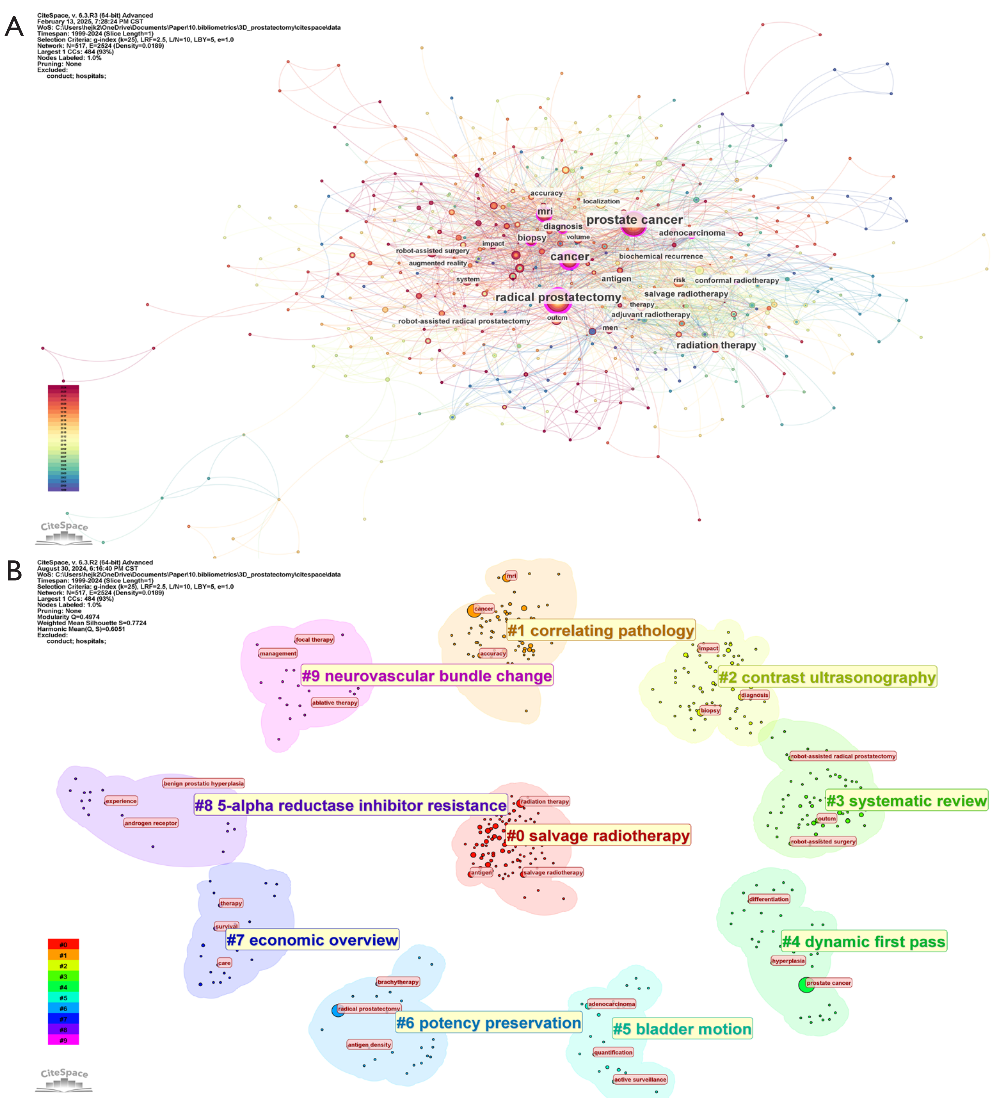

Figure 8 Keywords analysis. (A) Keywords network visualization. (B) The top 10 clusters of keywords.

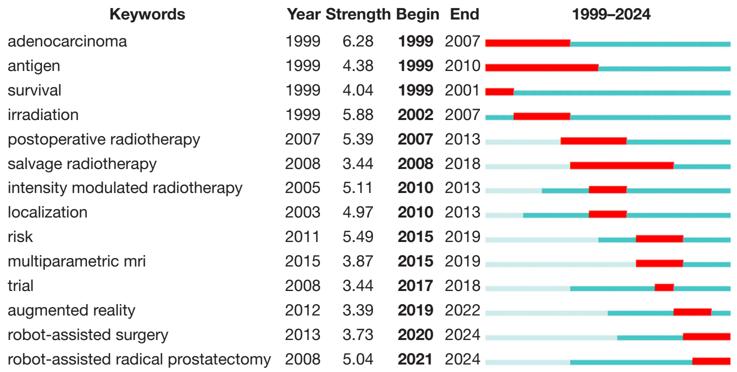

Figure 9 The top 14 keywords with strong bursts.

Hricak H, van der Poel HG, and Tewari AK; the top 5 most cited authors were Porpiglia F, Epstein JI, Ukimura O, Zelefsky MJ, and Bolla M; and the top 5 most productive journals were *BJU International*, *European Urology*, *International Journal of Radiation Oncology Biology Physics*, *Urology*, and *Journal of Endourology*.

Identification of hotspots and future frontiers

Prostate Imaging-Reporting and Data System (PI-RADS) is a scoring system which aimed to standardize the acquisition, interpretation, and reporting of prostate multiparametric MRI to improve the detection and management of clinically significant prostate cancer. In the analysis of co-cited references, "PI-RADS Prostate Imaging-Reporting and Data System: 2015, Version 2" published by Jeffrey C. Weinreb *et al.* had the highest citation count. The paper introduced PI-RADS Version 2, for greater performance and ease of use (33). Other highly cited literature are related to guidelines (34-36), adjuvant radiotherapy (37-39), and new computer technology (deep learning and 3D printing) (40,41).

Clustering analysis can reveal the knowledge framework of a specific field. The co-citation reference network generated was divided into 18 distinct clusters, yet only the 10 largest were displayed in our analysis. The largest and central cluster in this diagram is related to surgical planning, highlighting the recent advances in surgical techniques and their planning. This cluster's position and connections suggest it serves as a bridge between older methods of treatment and the integration of newer, more precise surgical technologies, possibly influenced by developments in imaging and robotics. Cluster #1 (surgical planning) is the largest citation cluster, which shows the wide application of 3D technology in preoperative planning, including 3D models, AR (augmented reality) and other advanced technologies, probably because the technology provides accurate anatomical structure and intuitiveness. The use of 3D printed models has been shown to improve the psychological preparedness and comprehension of their condition of patients undergoing prostatectomy (42,43). The implementation of AR in conjunction with 3D printing further enhances surgical planning, which can be particularly beneficial in complex cases, especially in prostatectomy (22). And the surgical planning process also play a crucial role in the training of surgical residents, by minimizing the learning curve associated with laparoscopic prostatectomy (44). Notably, cluster #3 (radiation therapy), #4 (adjuvant radiotherapy), and #8 (prostate cancer radiotherapy) indicates a robust concentration of research on surgical and radiation treatments for prostate cancer, underscoring the ongoing debate and investigation into the efficacy, outcomes, and technological advancements in these areas. The role of multimodal approaches in the treatment of prostate cancer is shown in combining surgery with adjuvant radiotherapy, particularly in patients exhibiting adverse pathological features post-surgery. 3D-CRT enables clinicians to deliver higher radiation doses to the tumor while protecting adjacent organs at risk, and the precision of 3D imaging techniques helps better treatment planning and execution, which is essential for optimal therapeutic outcomes (45).

To further support our findings, burst analyses can reveal hot spots over time. This analysis highlights the emergence and decline of research interests, providing a longitudinal view of the shifting scientific focus within this field. Each keyword's burst, indicated by the red segments on the bars, represents a period of intense activity or interest, reflecting major changes in research directions or clinical practices. Among the references that still have citation bursts in 2024, several are related to 3D printing models and augmented reality (AR) (41,46-49), and one is related to the update of PI-RADS (50). Therefore, the imaging grading system for prostate cancer is still evolving, and 3D printing and 3D reconstruction in surgical planning may be the main 3D technologies in this research field in recent years, while AR technology may become a new hot spot in the future.

The burst analysis of keywords also vividly illustrates the field's adaptive response to new scientific knowledge and technological advancements. Starting from the late 90s to the early 2000s, the research emphasis was on understanding fundamental concepts such as adenocarcinoma, antigens, and survival. This period marked an earnest effort to unravel the basic pathological and prognostic factors associated with prostate cancer, setting a foundational knowledge base. As the field progressed from 2002 to 2013, there was a notable trend towards more sophisticated treatment modalities, including irradiation, postoperative radiotherapy, and intensity modulated radiotherapy. This shift was characterized by significant advancements in how prostate cancer was treated, with a growing emphasis on precision and personalized therapeutic approaches that aimed to maximize efficacy while minimizing adverse effects. Concurrently, from 2010 to 2019, there was a surge in the integration of advanced imaging and trial-based evidence into clinical practice, marked by the rise of keywords such as localization and multiparametric MRI. This period saw substantial improvements in diagnostic and treatment planning strategies, fueled by technological advancements and a push towards evidence-based practices. The most recent phase, spanning from 2018 to 2024, has been defined by the groundbreaking integration of AR and robotics into surgical procedures, highlighted by the adoption of robot-assisted surgery. One of the applications of AR in robotic-assisted radical prostatectomy is its use in guiding intraoperative frozen section analysis. By employing AR, surgeons can visualize the real-time location of the tumor in relation to surrounding tissues, which helps in making immediate decisions about the area of tissue removal (51). This capability not only enhances the accuracy of the procedure but also minimizes the risk of leaving residual cancerous tissue, which is critical for improving oncological outcomes (52). The improved precision provided by AR and robotic technologies can reduce the occurrence of postoperative complications, which are often costly and can prolong admission time (53). These developments suggest a focus on enhancing precision, reducing invasiveness, and potentially improving patient outcomes through advanced technology. In summary, 3D technology has strong advantages in the following aspects: display of anatomical structures, surgical planning, intraoperative guidance, medical education, and auxiliary treatment.

Comparison to adjacent fields

3D technology is widely used in other surgeries. In the field of cardio-thoracic disease, 3D printing significantly improves surgical planning and precision, thereby improving patient outcomes during complex surgeries (54). A bibliometric study on plastic surgery found that 3D printing, AR, and virtual reality have broad prospects in surgical training and planning; in addition, computer numerical control processing of 3D models has the advantage of higher processing accuracy (55). In the field of liver cancer resection, 3D technology receiving increasing attention; 3D printing, 3D CT and 3D reconstruction is the mainstream of current research, and AR may trend in the future (56). Compared with other fields, research on prostatectomy is also related to information technology, but less in the field of materials science.

Advantages and limitations

The study utilized WOSCC database, a highly authoritative and widely recognized database, ensuring the reliability and accuracy of research results through high-quality literature data. This also maintained consistency as well as comparability of our study and avoided inconsistent format and duplicate record issues. Furthermore, by highlighting the current research frontiers and trends, as well as highly productive researchers and institutions, the study can help scholars better plan future research directions and help them find potential collaborators, thereby enhancing the applicability and impact of its findings.

However, the study faces several limitations. First, the data source is limited to a single database, which does not fully cover all articles in this field. In future studies, after data standardization and deduplication, we will integrate data from multiple databases (such as Scopus, PubMed, and Google Scholar) to capture a wider range of relevant literature. Second, the inclusion is restricted to English-language original articles and review articles, thereby overlooking significant literature in other languages, and also excluded letters or meeting papers with possibly latest findings. Third, only a subset of literature representing the research frontier in this year was included. Last, recent literature might not receive sufficient attention due to its recent publication and the consequent lack of citations. For instance, AI is developing rapidly with high value, and it has a wide application potential; however, the keyword "artificial intelligence" first appeared in the year 2020 and received less attention due to its novelty.

Conclusions

This study is a bibliometric analysis of application of 3D technology in prostatectomy, providing research trend changes and hot topics in this field. The number of published papers significantly increased over the last 25 years, reaching a peak in 2019. Most influential countries, institutions, and authors were identified, as were hotspots and the latest trends of research, such as robot-assisted surgery and AR. Institutions in the United States and Europe dominate this field and lead most of the collaboration, while emerging economies such as China still need to strengthen international cooperation. Our study illustrated the development trends and main contributors of 3D technology in prostatectomy, which may provide a reference for researchers, research institutions, medical facilities, and policy makers.

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None.

Footnote

Peer Review File: Available at https://gs.amegroups.com/article/view/10.21037/gs-2024-483/prf

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://gs.amegroups.com/article/view/10.21037/gs-2024-483/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.

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