Visualization Analysis of Research Progress and Trends in Coronary Heart Disease Cardiac Rehabilitation Based on Bibliometrics

Na Chen[1]

Abstract

Purpose: Extracorporeal shock wave therapy (ESWT) has emerged as a promising non-invasive intervention in cardiovascular disease (CVD) management, with increasing research interest over the past two decades. This study aimed to systematically analyze the research progress, hotspots, and development trends in ESWT for CVD using bibliometric methods, providing a comprehensive overview for subsequent research.

Methods: Literature related to ESWT and CVD was retrieved from the Web of Science Core Collection database, covering the period from 1999 to August 2025. The search strategy was defined as TS=([Shock wave OR Extracorporeal shock wave therapy OR ESWT] AND [Cardiovascular disease OR Coronary artery disease OR Myocardial ischemia OR Heart failure]). After excluding non-English studies, proceeding papers, retracted publications, and early access articles, 465 valid articles were included. Bibliometric analysis was performed using VOSviewer and CiteSpace software, focusing on publication trends, country/institution contributions, author collaborations, journal distributions, keyword co-occurrence, and cited references.

Results: A total of 465 publications involving 3019 authors from 1001 institutions across 55 countries were included, with 15,556 citations from 3104 sources. The annual number of publications has shown a steady growth trend since 2017. The United States (133 documents, 53.3 average citations) was the most influential country, followed by China (82 documents) and Germany (47 documents). Tohoku University (20 documents, 56.1 average citations) and Mayo Clinic (11 documents, 79.7 average citations) were leading institutions. Hiroaki Shimokawa and Hon-Kan Yip (18 documents each) were the most productive authors. Heart Rhythm (15 documents, 44.8 average citations) and Circulation (9 documents, 140.2 average citations) were core journals in this field. High-frequency keywords included "heart failure" (56 times), "coronary artery disease" (44 times), and "mortality" (41 times), with "outcome" being recent burst terms (2023–2025). The top-cited reference was a 2004 study on ESWT improving ischemia-induced myocardial dysfunction in pigs (87 citations).

Conclusion: ESWT for CVD is a rapidly developing research field, with the United States leading in academic influence. Current research focuses on myocardial ischemia, heart failure, and therapeutic efficacy/safety, while future trends may involve exploring mechanisms related to extracorporeal shock wave action and expanding clinical applications in comorbidities.

Keywords: Extracorporeal shock wave therapy, Cardiovascular disease, Bibliometrics, CiteSpace, VOSviewer

Introduction

Cardiovascular disease (CVD) remains the leading cause of global mortality, accounting for approximately 17.79 million deaths annually, with coronary artery disease (CAD) and heart failure (HF) being the most common subtypes [1]. Traditional treatments for CVD, such as percutaneous coronary intervention, coronary artery bypass grafting, and pharmacotherapy, have limitations including invasiveness, high recurrence rates, and poor outcomes in patients with refractory ischemia [2, 3]. In this context, extracorporeal shock wave therapy (ESWT), a non-invasive technique initially used in urology and orthopedics, has gained attention for its potential in CVD management [4,5,6]. ESWT exerts cardiovascular protective effects through multiple mechanisms, including promoting angiogenesis, inhibiting myocardial apoptosis, reducing oxidative stress, and improving myocardial blood perfusion [4,7,8,9]. Early preclinical studies demonstrated that low-energy ESWT could ameliorate ischemia-induced myocardial dysfunction in animal models [4,10], while subsequent clinical trials confirmed its safety and efficacy in patients with severe CAD and refractory angina [11,12]. With the accumulation of research, the application of ESWT in CVD has expanded to include HF, acute myocardial infarction, and even cardiogenic shock [4,13,14].

[1]Department of Internal Medicine, Peking University Hospital, Beijing, China

Address of Correspondence
Dr. Na Chen,
Department of Internal Medicine, Peking University Hospital, Beijing, China.
E-mail: CN09558@pku.edu.cn

Dr. Na Chen

Submitted Date: 25 Mar 2026, Review Date: 02 April 2026, Accepted Date: May 2026 & Published: 30 June 2026

Journal of Regenerative Science | Available on www.jrsonweb.com | DOI:10.13107/jrs.2026.v06.i01.193

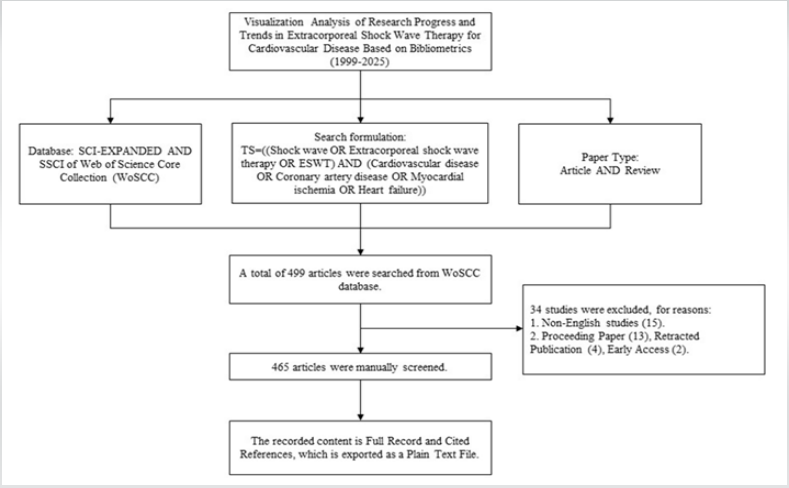

Figure 1: The literature search and screening flowchart.

However, despite the growing body of literature, a comprehensive overview of the research landscape, including publication trends, core contributors, and emerging hotspots, remains lacking. Bibliometric analysis, a quantitative method for evaluating academic literature, can systematically characterize research progress and identify key directions by analyzing publication volume, author/institution collaborations, keyword co-occurrence, and citation patterns [15]. This study aimed to fill this gap by conducting a bibliometric analysis of ESWT-related CVD research from 1999 to 2025, providing a data-driven foundation for future studies.

Methods

Literature retrieval and screening

The Web of Science Core Collection (WoSCC), including SCI-EXPANDED and SSCI databases, was selected as the data source due to its comprehensive coverage of high-quality academic literature in the medical and life sciences. The search period was set from 1999 to August 2025, and the document types were limited to "Article" and "Review" to ensure research depth and reliability. The search strategy was constructed using the following topic terms (TS): TS=([Shock wave OR Extracorporeal shock wave therapy OR ESWT] AND [Cardiovascular disease OR Coronary artery disease OR Myocardial ischemia OR Heart failure]). Literature screening followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines [16]. Initial retrieval yielded 499 articles; excluded 34 articles, including 15 non-English studies, 13 proceeding papers, 4 retracted publications, and 2 early access articles; manually screened the remaining 465 articles to ensure relevance to ESWT and CVD, resulting in 465 valid articles for final analysis. The full record and cited references of included articles were exported as plain text files for subsequent bibliometric analysis. The literature screening process is shown in Fig. 1.

Research tools and analysis indicators

Two widely used bibliometric software tools were employed. VOSviewer (version 1.6.20): Used to construct visual maps of country/institution collaboration, author co-authorship, journal co-citation, and keyword co-occurrence, with node size representing publication volume/citation frequency and connection thickness indicating collaboration strength or co-occurrence intensity [17,18]. CiteSpace (version 6.3.R1) used to analyze keyword clustering, burst terms, and timeline evolution, identifying research hotspots and emerging trends [19]. Key analysis indicators included basic quantitative indicators: Publication volume, number of authors/institutions/countries, and citation frequency; Collaborative indicators: Country/institution/author

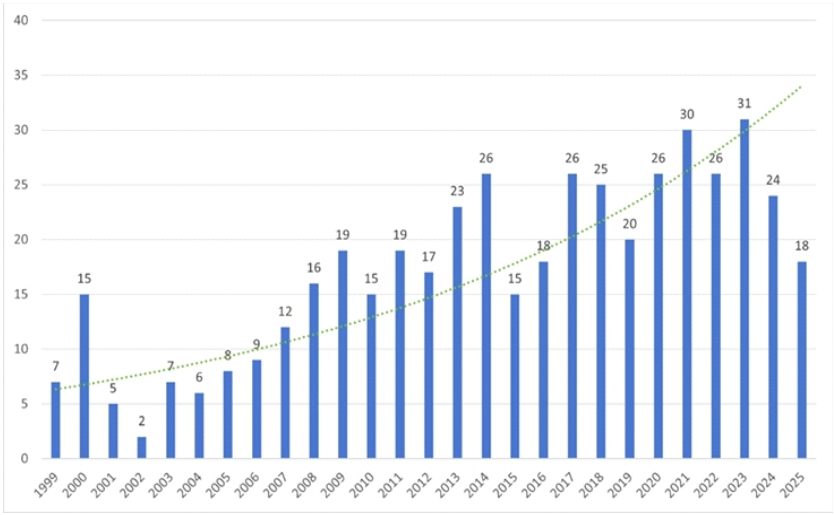

Figure 2: Publication trends in the field of extracorporeal shock wave therapy for cardiovascular disease (1999–2025).

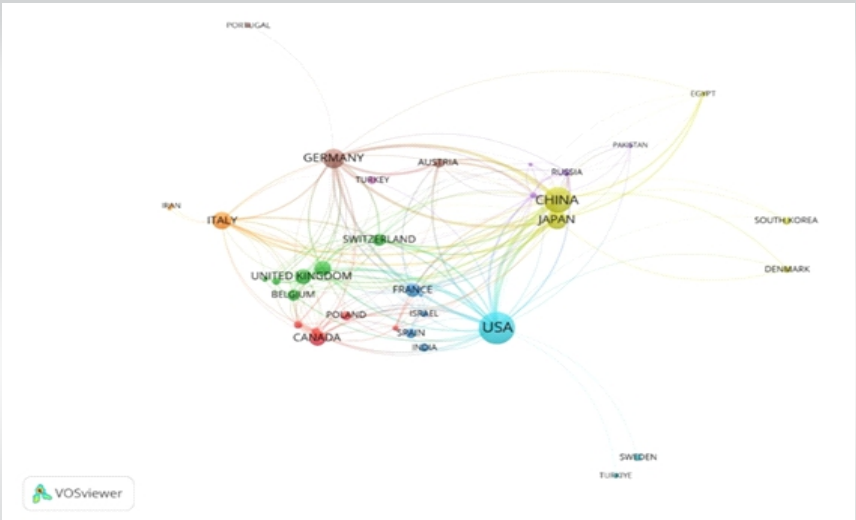

Figure 3: Co-occurrence map of top 30 countries. It shows the number of publications and the correlation between different countries in the field of extracorporeal shock wave therapy for cardiovascular disease. Each node in the figure represents a country. Larger size presents a higher number of publications. The connection between each node represents the correlation degree. Thicker connection presents closer collaboration.

Figure 4: Publication volume and collaboration among the top 30 countries. The sizes of circles represent the number of publications, and the lines represent collaboration between each other. Larger circles indicate a larger number of publications and thicker lines represent closer collaboration.

collaboration networks; Content indicators: High-frequency keywords, keyword clustering, burst terms, and core cited references/journals.

Results

Basic quantitative information

A total of 465 valid articles were included, involving 3019 authors from 1001 institutions across 55 countries. These articles were published in 226 journals and received 15,556 citations from 3104 sources, with an average of 33.5 citations per article. The number of authors per article ranged from 1 to 18, with a median of 6 authors, reflecting the interdisciplinary and collaborative nature of ESWT-CVD research.

Publication volume information

As shown in Fig. 1, the annual number of publications in the field of ESWT for CVD showed a gradual upward trend from 1999 to 2025. 1999–2006 (Initial stage): Fewer than 10 publications/year, with only 2 articles in 2002, indicating that ESWT was in the early exploratory phase for CVD; 2007–2012 (Growth stage): Publication volume increased steadily, reaching 15–20 articles/year after 2008, driven by positive preclinical results; 2013–2025 (Mature stage): Rapid growth, with 25–30 articles/year after 2017, and 31 articles in 2023 (data for 2025 includes only January-August) (Fig. 2). This surge is attributed to the publication of large-scale clinical trials and mechanism studies.

Country contributions and collaborations

Publication quantity and citation frequency

Table 1 lists the top 5 countries in terms of publication volume and citation impact. The United States (USA) ranked first with 133 documents and an average citation frequency of 53.3, followed by China (82 documents, 14.3 average citations) and Germany (47 documents, 33.1 average citations). Japan (43 documents, 43.5 average citations) and Italy (38 documents, 21.4 average citations) also contributed significantly.

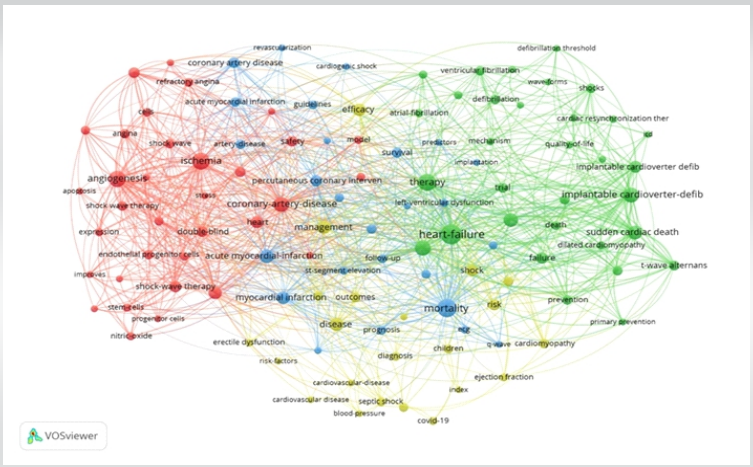

Figure 5: Keyword co-occurrence network. It indicates the frequency and collinear relationship of keywords. The sizes of circles can indicate the frequency of keywords. Thicker curve lines represent higher co-occurrence strength.

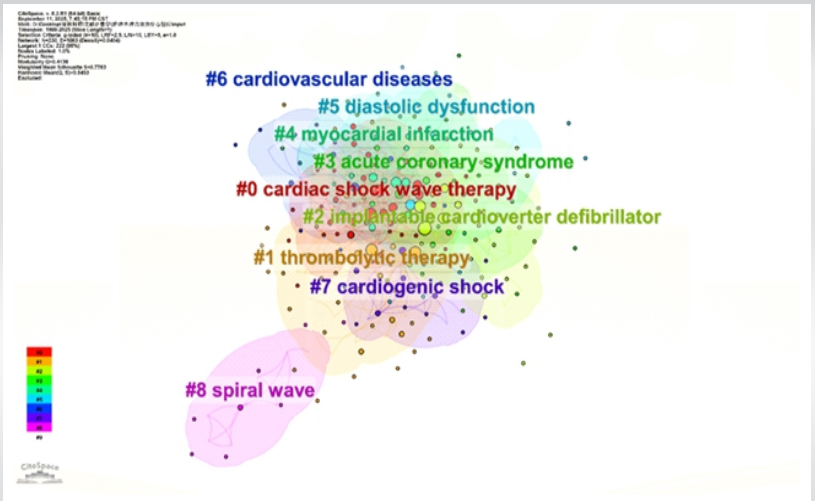

Figure 6: Clustering map of keywords in the field of extracorporeal shock wave therapy for cardiovascular disease. A total of 9 clusters were formed, namely # 0 cardiac shock wave therapy, # 1 thrombolytic therapy, #2 implantable cardioverter defibrillator, # 3 acute coronary syndrome, # 4 myocardial infarction, # 5 diastolic dysfunction, # 6 cardiovascular diseases, # 7 cardiogenic shock, and # 8 spiral wave.

Country collaboration networks

The country co-occurrence map (Fig. 3) shows that the USA, China, and Germany form the core of international collaboration, with thicker connections indicating closer academic exchanges. Fig. 4 maps geographical distributions and collaborations. For example, the USA has strong collaborations with Japan and Germany, while China primarily collaborates with neighboring countries such as South Korea and Singapore.

Author contributions

Table 2 lists the top 5 authors in terms of publication volume. Hiroaki Shimokawa (Japan) and Hon-Kan Yip tied for first with 18 documents each. The work of Shimokawa H's team focused on ESWT-induced

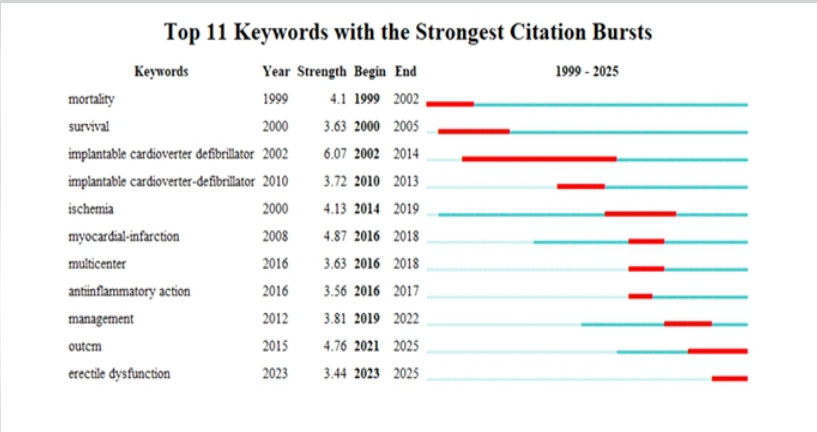

Figure 7: Top 11 keywords with the strongest citation bursts. The intensity and time of keyword bursts in the field of extracorporeal shock wave therapy for cardiovascular disease from 1999 to 2025 were expressed. The red line indicates the length of time the keyword has been highlighted.

angiogenesis and myocardial ischemia improvement [10, 11, 20], while Hon-Kan Yip's team specialized in ESWT for myocardial function recovery [21]. Kenta Ito (Japan) ranked third with 17 documents and the highest average citation frequency (53.6), primarily contributing to mechanism studies on ESWT and left ventricular remodeling [22].

Journal contributions

Table 3 lists the top 5 journals in terms of publication volume. Heart rhythm ranked first with 15 documents, focusing on ESWT-related arrhythmia management. Journal of Cardiovascular Electrophysiology and International Journal of Cardiology ranked second and third with 13 documents each, covering topics such as ESWT for myocardial ischemia and HF. Notably, Circulation had the highest average citation frequency (140.2) despite publishing only 9 documents, reflecting its role as a top journal in cardiovascular research and its recognition of ESWT's clinical value.

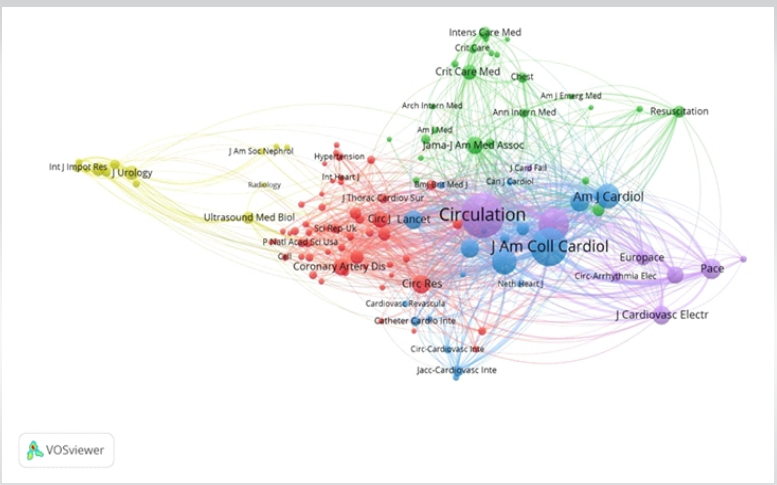

Figure 9: Journal co-citation network. The number and relationship of cited journals in the field of extracorporeal shock wave therapy for cardiovascular disease were expressed. The circles represent the cited journals. Larger sizes of circles mean more citations. Thicker connections represent a stronger correlation between the cited journals.

Institution contributions

Table 4 lists the top 10 institutions in terms of publication volume. Tohoku University (Japan) ranked first with 20 documents and an average citation frequency of 56.1, followed by Chang Gung University (China, 19 documents, 21.1 average citations) and China Medical University (China, 16 documents, 13.7 average citations). Notably, Mayo Clinic (USA) had the highest average citation frequency (79.7) among top institutions, despite publishing only 11 documents, reflecting its high academic influence in clinical translation research.

Keyword analysis

Keyword co-occurrence

Fig. 5 shows the co-occurrence network of the top high-frequency keywords (occurrence frequency ≥20 times). The node size represents the occurrence frequency, and the line thickness represents the co-occurrence strength. Table 5 lists the top 5 keywords by frequency and centrality. "Heart failure" (56 times) and "coronary artery disease" (44 times) were the most frequent keywords, reflecting the primary application areas of ESWT in CVD. "Mortality" (41 times) and "acute myocardial infarction" (40 times) were also prominent, indicating a focus on clinical outcomes and acute CVD management. In terms of centrality, "heart failure," "mortality," and "acute myocardial infarction" all had a centrality of 0.25, making them core nodes in the keyword network and key bridges connecting different research topics.

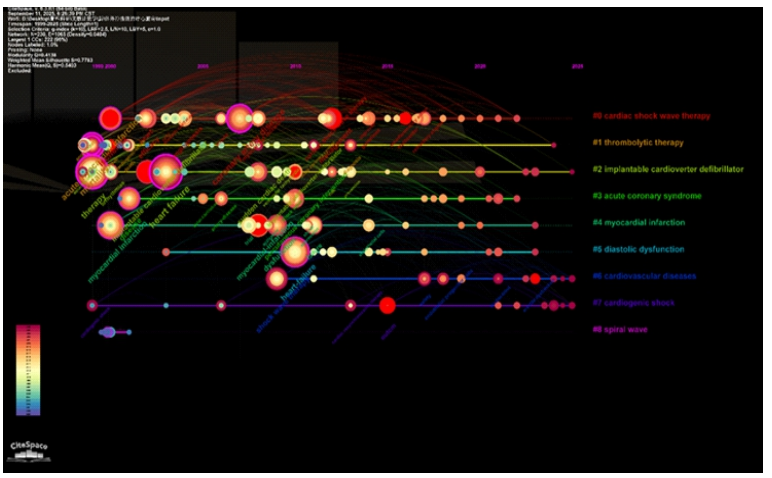

Figure 8: Keyword evolution timeline from 1999 to 2025. The time distribution of keywords in this field is presented. Different colors indicated different clusters. Each circle represents a keyword, corresponding to its respective year in sequence and arranged chronologically. The connection between different circles represents the degree of correlation between keywords.

Keyword clustering

Fig. 6 shows the keyword clustering map, with 9 distinct clusters identified:

- #0 Cardiac shock wave therapy: Focuses on the technical optimization and delivery of ESWT for cardiac applications
- #1 Thrombolytic therapy: Explores the combination of

Table 1: The top five countries in the field of extracorporeal shock wave therapy for cardiovascular disease

Rank	Country	Documents	Citations	Average citation frequency
1	USA	133	7084	53.3
2	China	82	1171	14.3
3	Germany	47	1555	33.1
4	Japan	43	1869	43.5
5	Italy	38	812	21.4

USA: The United States of America, China: The People's Republic of China, Germany: Federal Republic of Germany, Italy: The Republic of Italy

ESWT with thrombolysis in acute myocardial infarction

- #2 Implantable cardioverter defibrillator (ICD): Investigates ESWT's impact on ICD thresholds and arrhythmia management
- #3 Acute coronary syndrome (ACS): Studies ESWT's role in ACS-related myocardial ischemia
- #4 Myocardial infarction: Focuses on ESWT's effects on post-infarction remodeling and function
- #5 Diastolic dysfunction: Explores ESWT for diastolic HF
- #6 Cardiovascular diseases: General research on ESWT's application in broader CVD
- #7 Cardiogenic shock: Investigates ESWT as a supportive therapy for cardiogenic shock
- #8 Spiral wave: Studies the electrophysiological mechanisms of ESWT in arrhythmia.

These clusters cover technical, clinical, and mechanism-related topics, reflecting the multidisciplinary nature of the field.

Keyword burst dynamics

Fig. 7 shows the top 11 keywords with the strongest citation bursts. The earliest burst term was "mortality" (1999–2002, strength = 4.1), reflecting early attention to ESWT's impact on survival. "Implantable cardioverter defibrillator" had two burst periods (2002–2014, strength = 6.07; 2010–2013, strength = 3.72), indicating long-term interest in ESWT-ICD interactions. Recent burst terms (2021–2025) included "outcome" (strength = 4.76), suggesting a shift toward real-world clinical outcomes and ESWT's application in CVD comorbidities.

Keyword timeline evolution

Fig. 8 shows the timeline evolution of keywords, reflecting the dynamic changes in research hotspots. From 1999 to 2008, keywords such as "myocardial infarction," "acute coronary syndrome," and "thrombolytic therapy" were prominent. This period focused on fundamental aspects of CVDs and their primary treatment methods, highlighting research on the diagnosis and initial therapeutic interventions for severe cardiac events. Between 2009 and 2019, new keywords such as "diastolic dysfunction," "implantable cardioverter - defibrillator," and "cardiovascular diseases" emerged. The research scope expanded to include the long-term management of heart conditions, the use of advanced medical devices, and a broader view of cardiovascular health. After 2020, "cardiac shock wave therapy," "spiral wave," and "cardiogenic shock" became more noticeable. This indicated a shift toward exploring novel therapeutic approaches, the study of complex cardiac physiological phenomena, and the management of life-threatening cardiac conditions.

Table 2: The top five authors in the field of extracorporeal shock wave therapy for cardiovascular disease

Rank	Author	Documents	Citations	Average citation frequency
1	Shimokawa, Hiroaki	18	913	50.7
2	Yip, Hon-Kan	18	389	21.6
3	Ito, Kenta	17	911	53.6
4	Sun, Cheuk-Kwan	12	356	29.7
5	Sheu, Jiunn-Jye	12	292	24.3

Table 3: The top five journals in the field of extracorporeal shock wave therapy for cardiovascular disease

Rank	Journal	Documents	Citations	Average citation frequency
1	Heart rhythm	15	672	44.8
2	Journal of Cardiovascular Electrophysiology	13	527	40.5
3	International Journal of Cardiology	13	217	16.7
4	Europace	12	272	22.7
5	Circulation	9	1262	140.2

Cited reference and journal analysis

Top cited references

Table 6 lists the top 5 cited references in the field. The most cited reference was a 2004 study by Nishida et al. published in Circulation, which demonstrated that ESWT markedly ameliorates ischemia-induced myocardial dysfunction in pigs, laying the foundation for preclinical research [10]. The second most cited

Table 4: The top ten institutions in the field of extracorporeal shock wave therapy for cardiovascular disease

Rank	Institution	Documents	Citations	Average citation frequency
1	Tohoku University	20	1122	56.1
2	Chang Gung University	19	401	21.1
3	China Medical University	16	219	13.7
4	Kaohsiung Chang Gung Memorial Hospital	14	298	21.3
5	Mayo Clinic	11	877	79.7
6	Asia University	11	157	14.3
7	Kunming Medical University	11	139	12.6
8	I-Shou University	10	300	30
9	Chinese Academy of Medical Sciences	9	121	13.4
10	Columbia University in the City of New York	8	473	59.1

reference was a 2006 clinical study by the same group, which confirmed ESWT's efficacy in patients with severe CAD [11]. These two studies are considered landmark works in ESWT-CVD research, establishing the scientific basis for subsequent clinical trials [22, 23].

Cited journal network

Fig. 9 shows the co-citation network of the top-cited journals. Nodes with larger sizes represent journals with more citations, and thicker lines represent stronger co-citation relationships. The journal co-citation network shows that Circulation, Journal of the American College of Cardiology (JACC), and European Heart Journal form the core of cited journals, with strong correlations indicating that ESWT research is closely aligned with mainstream cardiovascular research directions.

Discussion

This bibliometric analysis systematically characterizes the development of ESWT for CVD over the past 26 years. The steady growth in publication volume reflects the field's transition from preclinical exploration to clinical application. ESWT's ability to promote angiogenesis and improve myocardial perfusion has been validated in preclinical and clinical studies [4, 9, 12, 13, 21]. The USA leads in academic influence, driven by institutions such as Mayo Clinic and Columbia University, which focus on clinical translation and large-scale trials. China ranks second in publication volume but has lower average citations, indicating a need to improve research quality and international collaboration. Japanese institutions and authors have made foundational contributions to preclinical mechanisms, while European countries excel in the technical innovation of ESWT devices. Based on keyword burst analysis, future research directions may include: The burst of "outcome" (2021–2025) suggests a shift from randomized controlled trials (RCTs) to real-world data, focusing on long-term efficacy and safety in diverse patient populations; further studies on ESWT-induced signaling pathways may identify new therapeutic targets [24].

Shock wave therapy exerts effects on CVDs through mechanical, biochemical, and biological mechanisms. Mechanically, high-energy pressure pulses from shock waves generate stress on local tissues, stripping calcium ions from calcified plaques and breaking up thrombi through cavitation. Biochemically, it upregulates vascular endothelial growth factor and basic fibroblast growth factor, promoting angiogenesis and nitric oxide synthesis to enhance vasodilation and blood perfusion [4, 9, 10]. Biologically, it reduces arterial wall inflammation by inhibiting inflammatory mediator release, regulates cardiomyocyte apoptosis to lower cell death, and stabilizes atherosclerotic plaques by promoting smooth muscle cell proliferation and reducing compensatory hyperplasia [4, 5, 7]. For specific diseases, it protects against myocardial ischemia-reperfusion injury by mitigating oxidative stress and inflammatory responses and stimulates cardiomyocyte proliferation to aid myocardial regeneration post-infarction [4, 8, 9]. Clinically, shock wave therapy shows efficacy across multiple cardiovascular conditions. In coronary heart disease, ESWT improves myocardial perfusion, alleviates angina, and enhances exercise tolerance, even replacing some interventional procedures for stenosis, and it breaks calcified plaques, reducing balloon expansion risks and improving stent implantation stability [11, 12, 21]. In HF, it reduces myocardial fibrosis/hypertrophy, boosts contractile function, and extends patient survival [4, 14, 23]. Overall, shock wave therapy demonstrates promising prospects, though further research is needed to clarify mechanisms, optimize parameters, and validate long-term safety through large-scale trials.

Table 5: The top five keywords in frequency and centrality in the field of extracorporeal shock wave therapy for cardiovascular disease

Rank	Keyword	Count	Keyword	Centrality
1	Heart failure	56	Heart failure	0.25
2	Coronary artery disease	44	Mortality	0.25
3	Mortality	41	Acute myocardial infarction	0.25
4	Acute myocardial infarction	40	Therapy	0.21
5	Ischemia	39	Coronary artery disease	0.2

Limitations

This study has several limitations. Only WoSCC was used, excluding literature from other databases, which may lead to incomplete coverage; non-English studies were excluded, potentially missing relevant research from non-English-speaking countries; VOSviewer and CiteSpace rely on parameter settings, which may introduce subjective bias; citation frequency is influenced by publication time and journal impact factor, favoring older articles and high-IF journals.

Conclusion

This bibliometric analysis provides a comprehensive overview of ESWT research for CVD from 1999 to 2025. The field has experienced steady growth, with the USA leading in academic influence, and research focusing on myocardial ischemia, HF, and clinical outcomes. Emerging trends include real-world outcome studies, comorbidity management, and deeper mechanism exploration. Future research should prioritize high-quality RCTs, international collaborations, and mechanism-based innovations to further validate ESWT's role in CVD management.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

1.World Health Organization. Cardiovascular Diseases (CVDs); 2025. Available from: https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds) [last accessed on July 22, 2025].

2.Benjamin EJ, Muntner P, Alonso A, Bittencourt MS, Callaway CW, Carson AP, et al. Heart disease and stroke statistics-2019 update: A report from the American heart association. Circulation 2019;139:e56-528.

3.Maglietta G, Ardissino M, Malagoli Tagliazucchi G, Disisto C, Merlini PA, Crocamo A, et al. Long-term outcomes after early-onset myocardial infarction. J Am Coll Cardiol 2019;74:2113-5.

4.Dibben GO, Faulkner J, Oldridge N, Rees K, Thompson DR, Zwisler AD, et al. Exercise-based cardiac rehabilitation for coronary heart disease: A meta-analysis. Eur Heart J 2023;44:452-69.

5.Shi Y, Xu H, Dong J. Exercise-based cardiac rehabilitation for patients undergoing coronary artery operation: A systematic review and meta-analysis based on current randomized controlled trials. Int J Surg 2025;111:2708-21.

6.Piepoli MF, Corrà U, Adamopoulos S, Benzer W, Bjarnason-Wehrens B, Cupples M, et al. Secondary prevention in the clinical management of patients with cardiovascular diseases. Core components, standards and outcome measures for referral and delivery: A policy statement from the cardiac rehabilitation section of the European Association for cardiovascular prevention & rehabilitation. Endorsed by the committee for practice guidelines of the European Society of Cardiology. Eur J Prev Cardiol 2014;21:664-81.

7.Balady GJ, Ades PA, Bittner VA, Franklin BA, Gordon NF, Thomas RJ, et al. Referral, enrollment, and delivery of cardiac rehabilitation/secondary prevention programs at clinical centers and beyond: A presidential advisory from the American Heart Association. Circulation 2011;124:2951-60.

8.Takroni MA, Thow M, Ellis B, Seenan C. Home-based versus outpatient-based cardiac rehabilitation post-coronary artery bypass graft surgery: A randomized controlled trial. J Cardiovasc Nurs 2022;37:274-80.

9.Luijk A, Mortensen SR, Hamborg TG, Zangger G, Ahler JR, Christensen J, et al. The effectiveness of digital health interventions for the maintenance of physical activity following cardiac rehabilitation: A systematic review and meta-analysis. Digit Health 2024;10:20552076241286641.

10.Ninkov A, Frank JR, Maggio LA. Bibliometrics: Methods for studying academic publishing. Perspect Med Educ 2022;11:173-6.

11.van Eck NJ, Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics 2010;84:523-38.

12.Zhang J, Zhang J, Jin J, Jiang X, Yang L, Fan S, et al. Artificial intelligence applied in cardiovascular disease: A bibliometric and visual analysis. Front Cardiovasc Med 2024;11:1323918.

13.Yeung AW. A revisit to the specification of sub-datasets and corresponding coverage timespans when using Web of Science Core Collection. Heliyon 2023;9:e21527.

14.Chen C. CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. J Am Soc

Inform Sci Technol 2006;57:359-77.
15.Lavie CJ, Arena R, Swift DL, Johannsen NM, Sui X, Lee DC, et al. Exercise and the cardiovascular system: Clinical science and cardiovascular outcomes. Circ Res 2015;117:207-19.
16.Lavie CJ, Laukkanen JA, Nath KA. Cardiorespiratory fitness and mayo clinic proceedings. Mayo Clin Proc 2025;100:402-4.
17.Dibben G, Faulkner J, Oldridge N, Rees K, Thompson DR, Zwisler AD, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev 2021;11:CD001800.
18.Grace SL, Taylor RS, Gaalema DE, Redfern J, Kotseva K, Ghisi G. Cardiac rehabilitation: A global perspective on where we have come and where we must go. JACC Adv 2023;2:100412.
19.Redfern J, Gallagher R, O'Neil A, Grace SL, Bauman A, Jennings G, et al. Historical context of cardiac rehabilitation: Learning from the past to move to the future. Front Cardiovasc Med 2022;9:842567.
20.Taylor RS, Brown A, Ebrahim S, Jolliffe J, Noorani H, Rees K, et al. Exercise-based rehabilitation for patients with coronary heart disease: Systematic review and meta-analysis of randomized controlled trials. Am J Med 2004;116:682-92.
21.Heran BS, Chen JM, Ebrahim S, Moxham T, Oldridge N, Rees K, et al. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database Syst Rev 2011;7:CD001800.
22.Leon AS, Franklin BA, Costa F, Balady GJ, Berra KA, Stewart KJ, et al. Cardiac rehabilitation and secondary prevention of coronary heart disease: An American Heart Association scientific statement from the council on clinical cardiology (subcommittee on exercise, cardiac rehabilitation, and prevention) and the council on nutrition, physical activity, and metabolism (subcommittee on physical activity), in collaboration with the American association of Cardiovascular and Pulmonary Rehabilitation. Circulation 2005;111:369-76.
23.Clark AM, Hartling L, Vandermeer B, McAlister FA. Meta-analysis: Secondary prevention programs for patients with coronary artery disease. Ann Intern Med 2005;143:659-72.
24.Suaya JA, Shepard DS, Normand SL, Ades PA, Prottas J, Stason WB. Use of cardiac rehabilitation by Medicare beneficiaries after myocardial infarction or coronary bypass surgery. Circulation 2007;116:1653-62.

Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Chen N | Visualization Analysis of Research Progress and Trends in Coronary Heart Disease Cardiac Rehabilitation Based on Bibliometrics | Journal of Regenerative Science | Jun-Jun 2026; 6(1): 14-21.