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Orijinal Makale

Global scientific outputs of tricuspid valve publications: A bibliometric approach

Triküspid kapak yayınlarının global bilimsel verileri: Bibliyometrik yaklaşım

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ABSTRACT

Aim: There is still no bibliometric study summarizing studies on tricuspid valve diseases and their treatment in the literature. This study was aimed to examine this study area in a holistic manner using bibliometric and statistical analyses on published scientific outputs on the tricuspid valve.

Material and Methods: Studies on the tricuspid valve published in the research areas of "Cardiovascular System Cardiology" and "Surgery" between 1980 and 2019 were downloaded using the Web of Science database and analyzed using bibliometric and statistical methods. Spearman's correlation coefficient was used for correlation analysis. Linear regression analysis was performed to predict the number of publications in the coming years.

Results: A total of 2841 publications were found of which 1277 (55.6%) were articles. It was observed that number of articles published on the tricuspid valve had been increasing regularly with a linear trend. The top 2 countries contributing the most to the literature were USA (412), and Germany (145). The top two most active institutions were Mayo Clinic (36) and Columbia University (18). The top three journals with the highest number of publications were Annals of Thoracic Surgery (125), Journal of Thoracic and Cardiovascular Surgery (77), and European Journal of Cardio-Thoracic Surgery (50).

Conclusion: A summary of 1277 articles were presented in this comprehensive bibliometric study on the tricuspid valve, which is a study area with an increasing number of articles being published in the literature.

Keywords: tricuspid valve; tricuspid valve surgery; trend topics; bibliometric analysis; citation analysis

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ÖZ

Amaç: Literatürde halen triküspit kapak hastalıkları ve tedavisi ile ilgili çalışmaları özetleyen bibliyometrik çalışma bulunmamaktadır. Bu çalışma, triküspit kapak üzerine yayınlanmış bilimsel yayınlar üzerinde bibliyometrik ve istatistiksel analizler kullanarak bu çalışma alanını bütünsel bir şekilde incelemeyi amaçlamıştır.

Gereç ve Yöntemler: Triküspit kapak ile ilgili 1980-2019 yılları arasında "Kardiyovasküler Sistem Kardiyolojisi" ve "Cerrahi" araştırma alanlarında yayınlanan çalışmalar Web of Science veri tabanı kullanılarak indirilerek bibliyometrik ve istatistiksel yöntemlerle analiz edildi. Korelasyon analizi için Spearman korelasyon katsayısı kullanıldı. Gelecek yıllardaki yayın sayısını tahmin etmek için lineer regresyon analizi yapıldı.

Bulgular: 1277'si (%55.6) makale olmak üzere toplam 2841 yayın bulundu. Triküspit kapakla ilgili yayınlanan makalelerin sayısının lineer bir eğilimle düzenli olarak arttığı gözlendi. Literatüre en fazla katkı sağlayan ilk 2 ülke ABD (412) ve Almanya (145) oldu. En aktif iki kurum Mayo Clinic (36) ve Columbia Üniversitesi (18) idi. En fazla yayına sahip ilk üç dergi Annals of Thoracic Surgery (125), Journal of Thoracic and Cardiovascular Surgery (77) ve European Journal of Cardio-thoracic Surgery (50) oldu.

Sonuç: Literatürde giderek artan sayıda makalenin yayınlandığı bir çalışma alanı olan triküspit kapak ile ilgili bu kapsamlı bibliyometrik çalışmada 1277 makalenin özeti sunulmuştur.

Anahtar kelimeler; triküspid kapak; triküspid kapak cerrahisi; trend konuları; bibliyometrik analiz; alıntı analizi.

Introduction

The tricuspid valve is a multi-component complex structure comprising three leaflets (anterior, posterior, and septal), chordae tendineae, two separate papillary muscles, fibrous tricuspid annulus, and right atrial and right ventricular myocardium.[1,2] The tricuspid valve is located between the right atrium and the right ventricle and prevents the blood pouring from the right atrium to the right ventricle from returning back to the right ventricle. Tricuspid valve diseases, similar to other heart valves, appear in the form of stenosis and/or insufficiency. Although surgical treatment may vary depending on the etiology, it includes annuloplasty techniques performed with ring or suture and replacement therapy.[3,4]

Previously, while heart failure, arrhythmia, and myocardial infarction constituted the center of heart diseases, relatively little attention was given to valvular heart diseases. However, as a result of a strong relationship between age and valvular heart diseases, research on this topic has gained importance due to increasing prevalence of valvular heart diseases with rapidly aging global population.[5] Additionally, the growing treatment options for heart valve diseases over time and the emergence of modern techniques, such as percutaneous valve repair or replacement, have resulted in positive developments in patient treatment.[5] Although there is an increase in the recent treatment options and interest in the subject, there is still no comprehensive bibliometric study summarizing studies on tricuspid valve diseases in the literature.

Bibliometry is the statistical analysis of scientific output, especially articles.[6-9] Due to bibliometric analyses, researchers can save time required for literature review by examining the evaluation of thousands of studies on a subject in a short time.[10] An ample amount of information is revealed via bibliometric analyses, such as the most cited effective studies, the most researched trend topics, effectiveness of authors, institutions and countries, and the collaboration between them.[11,12]

This study was aimed at examining the subject of tricuspid valve using a holistic approach by evaluating scientific outputs on the tricuspid valve published in the research areas of "Cardiovascular System Cardiology" and "Surgery" between 1980 and 2019 via bibliometric and statistical analyses for determining the most effective studies, institutions, current issues, and revealing the cooperation between countries.

Material and Methods

Literature review was performed using the Web of Science (WoS) database by Clarivate Analytics. In WoS, "tricuspid valve*" (tricuspid valve/valves/valvular etc.) was used as the search keyword and only the "title" section of the publications was searched. Among the publications found, only "Cardiovascular System Cardiology" and "Surgery" publications published in this research field between 1980 and 2019 were downloaded

(access date: 10.05.2020) and analyzed bibliometrically. Summary codes for researchers to access similar documents are as follows (search findings may vary depending on different access dates): (title: ("tricuspid valve*") refined by: web of science categories: (Cardiovascular System Cardiology) and (Surgery) timespan: 1980–2019. Indexes: SCI-EXPANDED, SSCI, A & HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI). The VOSviewer (Version 1.6.15) software was used for bibliometric network visualizations.[13] The website (http://lert.co.nz/map/) was used for drawing the world map. The statistical analyses were performed using SPSS (Version 22.0, SPSS Inc., Chicago, IL, USA, License: Hitit University) package program. Normal distribution of the data was evaluated using the Shapiro–Wilk test. Spearman's correlation coefficient was used for determining correlations between the number of articles on tricuspid valve and economic development indicators of the countries (Gross Domestic Product [GDP], Gross Domestic Product per capita [GDP per capita], Gross Domestic Product at purchasing power parity [GDP PPP], and Gross Domestic Product per capita at purchasing power parity [GDP per capita PPP] in accordance with the data distribution.[14] Linear regression analysis was performed to predict the number of publications in the coming years. Statistical significance was accepted as $p < 0.05$. This article does not contain any studies with human participants or animals performed by any of the authors.

Results

From the literature review, it was found that a total of 2841 publications on the tricuspid valve were published between 1980 and 2019 in the field of Cardiovascular System Cardiology and Surgery. Of these, 1277 (55.6%) were Articles, 376 (16.3%) were Meeting Abstracts, 338 (14.7%) were Editorial Materials, 142 (6.1%) were Letters, 90 (3.9%) were Proceedings Paper, and the rest were other types of publications (Note, Review, Book Chapter, Correction, Early Access, Biographical Item, News Item). Bibliometric analyses were conducted on 1277 articles, of which 1165 (91.2%) were written in English and the rest were in French, German, Spanish, Russian, Polish, Turkish, Italian, and Portuguese.

Development and Future Trend of Publications

The distribution of articles by years is shown in Figure 1. The results of linear regression analysis used for estimating the number of articles in 2020 and beyond are also shown on Figure 1. According to the results of regression analysis, it was estimated that 75 (CI%: 54–97) and 87 (CI%: 49–124) articles will be published in 2020 and 2028, respectively (Figure 1).

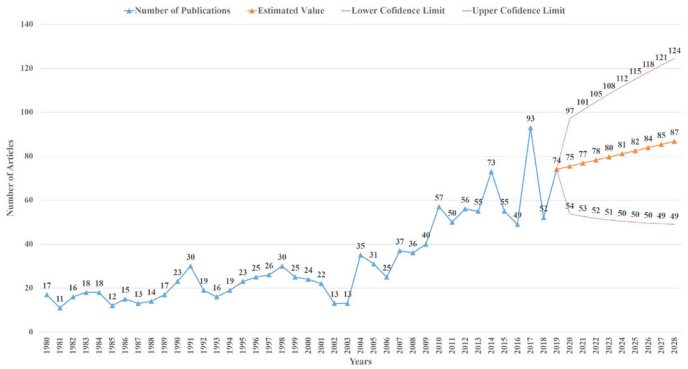

Figure 1. The distribution of articles on tricuspid valve by years and estimates of the number of articles that can be published in the coming years together with the regression curve

Active Countries

Article distribution according to countries of the world is shown in Figure 2. The most productive countries according to the number of articles (producing ≥30 articles) are USA (412), Germany (145), Japan (100), United Kingdom (88), Italy (79), France (73), Canada (70), Turkey (45), Spain (39), India (33), China (33), Netherlands (32), and Switzerland (32). The international collaboration network visualization map among 29 countries that have produced at least 5 articles from 60 countries producing publications on the tricuspid valve and collaborated with each other is shown in Figure 3.

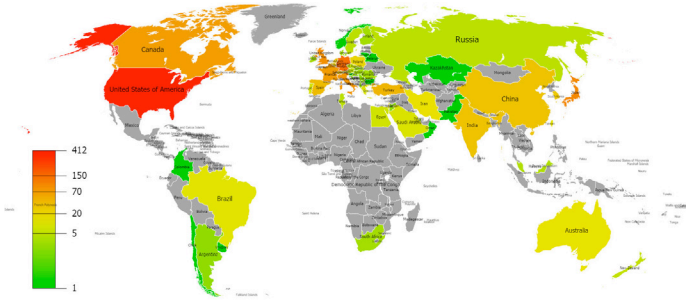

Figure 2. World map showing the distribution of articles on tricuspid valve by country Footnote: In the indicator at the bottom left of the figure, the article productivity of countries increases from green to red.

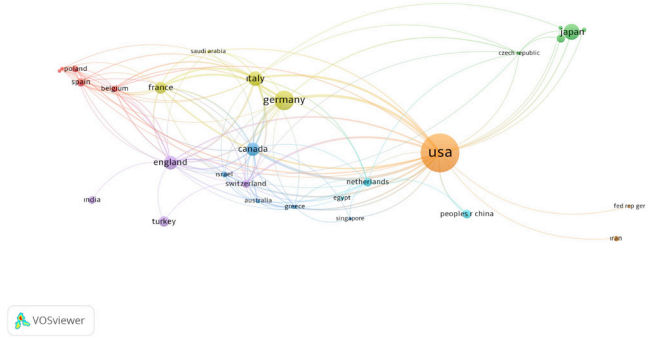

Figure 3. Network visualization map for international collaboration of world countries on tricuspid valve

Footnote: The colors show different clusters. The size of the circle area shows that the number of articles produced is more. The thick lines show that the relationship is strong.

Correlation Analysis

A statistically significant positive correlation was found between the number of articles on the tricuspid valve produced by countries and their GDP ($r = 0.662$, $p < 0.001$), GDP per capita ($r = 0.499$, $p < 0.001$), GDP PPP ($r = 0.605$, $p < 0.001$), and GDP per capita PPP ($r = 0.503$, $p < 0.001$).

Active Authors

The most active authors (producing ≥10 articles) on the tricuspid valve were Dearani JA. (16), Mcelhinney DB. (15), Mohr FW. (14), Schaff HV. (13), Anderson RH. (11), Borger MA. (11), Connolly HM. (11), and Danielson GK (10), respectively.

Active Institutions

The top 16 active organizations (producing ≥10 articles) on this subject were Mayo Clinic (36), Columbia University (18), Harvard University (18), University California Los Angeles (18), University Toronto (17), Mayo Clinic Mayo FDN (16), University Leipzig (16), University Michigan (14), Duke University (12), University California San Francisco (12), Emory University (11), Stanford University (11), University Padua (11), Children's Hospitals (10), Hospital for Sick Children (10), and Leiden University(10), respectively.

Active Journals

A total 1277 articles on the tricuspid valve were published in 177 different journals. The first 48 journals producing the most articles from these journals (producing ≥7 articles) and the total citations of journals received are presented in Table 1. The citation network visualization map among these journals is presented in Figure 4.

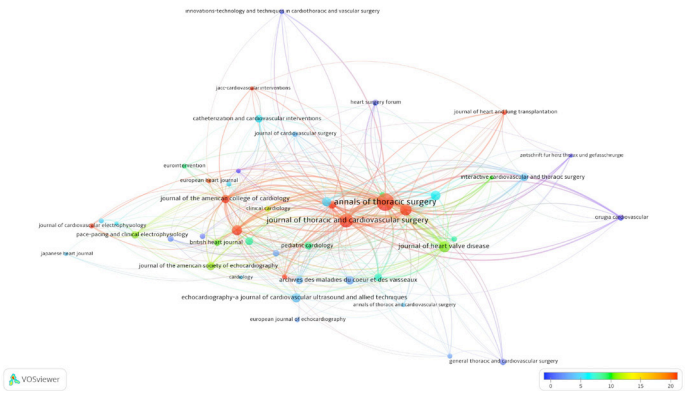

Figure 4. Network visualization map for citation analysis of journals that produce publications on tricuspid valve

Footnote: A color bar was shown in the bottom right corner of the map. The colors show the average number of citations per article published by journals. For example, the average number of citations for blue-colored journals is below 10, while the average number of citations for red-colored journals is over 100, and the journal has a higher impact factor.

Citation Analysis

The first 25 articles receiving the most citations according to the total number of citations among the articles published during 1980–2019 are presented in Table 2. The average number of citations that the articles received annually are shown in the last column of Table 2.

Co-citation Analysis

A total of 10549 articles were cited in the reference section of all the analyzed articles. The articles receiving the most co-citation in the references section (>50 citations) were McCarthy (2004), Nath (2004), Dreyfus (2005), Filsoufi (2005), Tang (2006), Ratnatunga (1998), Carpentier (1974), Mcgrath (1990), and Singh (2006).[3,4,15-21]

Trending Topics

In 1277 articles on the tricuspid valve, 1362 different keywords were used. Of these words, 61 keywords were used in at least 6 different articles. The cluster network visualization map between these keywords is shown in Figure 5. The trend visualization network map and the citation network visualization map are shown in Figure 6 and 7, respectively.

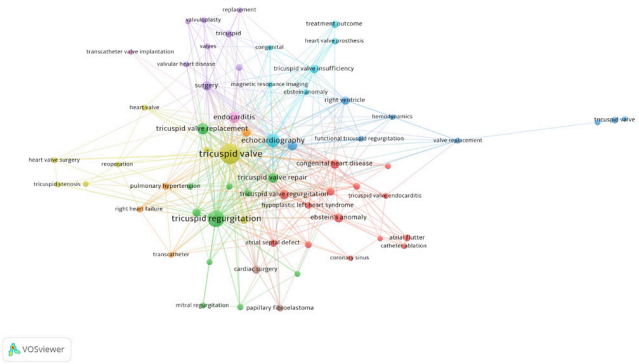

Figure 5. Network visualization map for cluster analysis based on keyword analysis on tricuspid valve

Footnote: The colors indicate the clusters, the size of the circle area indicates that the number of articles produced is greater, and the thickness of the lines indicates the strength of relationship

Table 1. Most active journals on tricuspid valve

Journals	RC	C	AC	Journals	RC	C	AC
Annals of Thoracic Surgery	125	2676	21.4	Zeitschrift Fur Kardiologie	13	31	2.4
Journal of Thoracic and Cardiovascular Surgery	77	2942	38.2	Acta Cardiologica	12	19	1.6
European Journal of Cardio-Thoracic Surgery	50	1043	20.9	Journal of Cardiovascular Surgery	12	47	3.9
Journal of Heart Valve Disease	48	527	11.0	Clinical Cardiology	11	136	12.4
American Journal of Cardiology	41	1488	36.3	Circulation Journal	11	90	8.2
Journal of Cardiac Surgery	36	233	6.5	European Heart Journal	10	190	19.0
Texas Heart Institute Journal	34	171	5.0	Eurointervention	10	88	8.8
Echocardiography-A Journal of Cardiovascular Ultrasound and Allied Techniques	31	134	4.3	Journal of Cardiovascular Electrophysiology	10	206	20.6
Archives Des Maladies Du Coeur Et Des Vaisseaux	29	89	3.1	Journal of Interventional Cardiac Electrophysiology	10	50	5.0
Journal of the American College of Cardiology	27	1530	56.7	American Heart Journal	9	212	23.6
Journal of the American Society of Echocardiography	25	284	11.4	Annals of Cardiothoracic Surgery	9	83	9.2
Cardiology in the Young	24	96	4.0	Catheterization and Cardiovascular Diagnosis	9	47	5.2
Pediatric Cardiology	24	207	8.6	European Journal of Echocardiography	9	27	3.0
Interactive Cardiovascular and Thoracic Surgery	24	103	4.3	Journal of Cardiothoracic Surgery	9	28	3.1
Catheterization and Cardiovascular Interventions	23	134	5.8	Journal of Heart and Lung Transplantation	9	193	21.4
Thoracic and Cardiovascular Surgeon	23	177	7.7	Innovations-Technology and Techniques in Cardiothoracic and Vascular Surgery	9	11	1.2
Circulation	22	1673	76.0	Interventions in Structural, Valvular, and Congenital Heart Disease	8	0	0.0
International Journal of Cardiology	22	185	8.4	Annals of Thoracic and Cardiovascular Surgery	7	31	4.4
Pace-Pacing and Clinical Electrophysiology	21	237	11.3	Cardiology	7	33	4.7
British Heart Journal	16	169	10.6	Europace	7	39	5.6
Journal of Cardiothoracic and Vascular Anesthesia	16	52	3.3	Heart Lung and Circulation	7	72	10.3
General Thoracic and Cardiovascular Surgery	15	25	1.7	Jacc-Cardiovascular Interventions	7	237	33.9
Cirugia Cardiovascular	14	4	0.3	Japanese Heart Journal	7	32	4.6
Heart Surgery Forum	13	12	0.9	Zeitschrift Fur Herz Thorax Und Gefasschirurgie	7	3	0.4

RC: Record Count, C: Number of Citation, AC: Average Citation Per Document

Table 2. Top 25 most cited articles according to total citations on tricuspid valve

No	Article	Author	Journal	PY	TC	AC
1	Radiofrequency ablation of the inferior vena-cava - tricuspid-valve isthmus in common atrial-flutter	Cosio, FG. et al.	American Journal of Cardiology	1993	433	15.46
2	Tricuspid valve repair: Durability and risk factors for failure	McCarthy, PM. et al.	Journal of Thoracic and Cardiovascular Surgery	2004	371	21.82
3	Double-outlet right ventricle and overriding tricuspid valve reflect disturbances of looping, myocardialization, endocardial cushion differentiation, and apoptosis in TGF-beta(2)-knockout mice	Bartram, U. et al.	Circulation	2001	214	10.7
4	A new reconstructive operation for ebsteins-anomaly of the tricuspid-valve	Carpentier, A. et al.	Journal of Thoracic and Cardiovascular Surgery	1988	193	5.85
5	Tricuspid valve repair with an annuloplasty ring results in improved long-term outcomes	Tang, Gilbert HL. et al.	Circulation	2006	186	12.4
6	Tricuspid valve tethering predicts residual tricuspid regurgitation after tricuspid annuloplasty	Fukuda, S. et al.	Circulation	2005	177	11.06
7	Conduction block in the inferior vena caval tricuspid valve isthmus: Association with outcome of radiofrequency ablation of type I atrial flutter	Schwartzman, D. et al.	Journal of the American College of Cardiology	1996	162	6.48
8	The tricuspid-valve annulus - study of size and motion in normal subjects and in patients with tricuspid regurgitation	TEI, C. et al.	Circulation	1982	161	4.13
9	Severe symptomatic tricuspid valve regurgitation due to permanent pacemaker or implantable cardioverter-defibrillator leads	Lin, G. et al.	Journal of the American College of Cardiology	2005	152	9.5
10	Surgical management of secondary tricuspid valve regurgitation: Annulus, commissure, or leaflet procedure?	Navia, JL.et al.	Journal of Thoracic and Cardiovascular Surgery	2010	140	12.73
11	Long-term outcomes of tricuspid valve replacement in the current era	Filsoufi, F. et al.	Annals of Thoracic Surgery	2005	137	8.56
12	Long-term results of tricuspid-valve replacement and the problem of prosthetic valve thrombosis	Thorburn, CW. et al.	American Journal of Cardiology	1983	134	3.53
13	Formation of the tricuspid-valve in the human heart	Lamers, WH. et al.	Circulation	1995	132	5.08
14	Progressive tricuspid valve disease in patients with congenitally corrected transposition of the great arteries	Prieto, LR. et al.	Circulation	1998	127	5.52
15	The architecture of the atrial musculature between the orifice of the inferior caval vein and the tricuspid valve: The anatomy of the isthmus	Cabrera, JA. et al.	Journal of Cardiovascular Electrophysiology	1998	126	5.48
16	Percutaneous tricuspid valve replacement in congenital and acquired heart disease	Roberts, PA.et al.	Journal of the American College of Cardiology	2011	124	12.4
17	Tricuspid-valve disease with significant tricuspid insufficiency in the fetus - diagnosis and outcome	Hornberger, LK. et al.	Journal of the American College of Cardiology	1991	124	4.13
18	Determinants of functional tricuspid regurgitation in incomplete tricuspid-valve closure - doppler color-flow study of 109 patients	Sagıe, A. et al.	Journal of the American College of Cardiology	1994	122	4.52
19	The cone reconstruction of the tricuspid valve in Ebstein's anomaly. The operation: early and midterm results	da Silva, JP. et al.	Journal of Thoracic and Cardiovascular Surgery	2007	118	8.43
20	Tricuspid valve surgery: The past 10 years from the Nationwide Inpatient Sample (NIS) database	Vassileva, CM.et al.	Journal of Thoracic and Cardiovascular Surgery	2012	115	12.78
21	Tricuspid valve surgery: a thirty-year assessment of early and late outcome	Guenther, T. et al.	European Journal of Cardio-Thoracic Surgery	2008	110	8.46
22	First-in-human transcatheter tricuspid valve repair in a patient with severely regurgitant tricuspid valve	Schofer, J. et al.	Journal of the American College of Cardiology	2015	109	18.17
23	Midterm outcomes of tricuspid valve repair versus replacement for organic tricuspid disease	Singh, Steve K. et al.	Annals of Thoracic Surgery	2006	108	7.2
24	Can two-dimensional echocardiography and doppler color flow mapping identify the need for tricuspid-valve repair	Chopra, HK. et al.	Journal of the American College of Cardiology	1989	106	3.31
25	Is tricuspid-valve repair necessary	Duran, CMG. et al.	Journal of Thoracic and Cardiovascular Surgery	1980	105	2.56

PY: Publication year, TC: Total citation, AC: Average citations per year

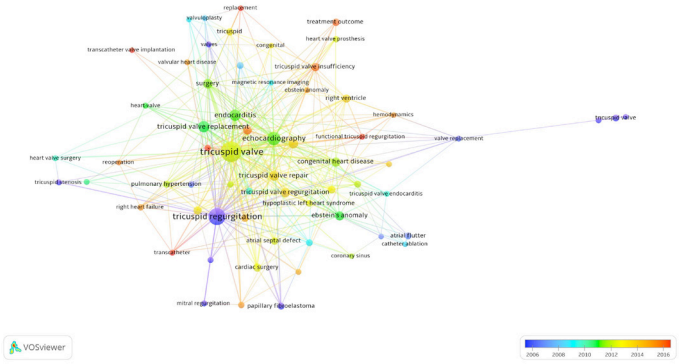

Figure 6. Network visualization map showing trend keyword analysis results on tricuspid valve

Footnote: A color bar was shown in the bottom right corner of the map. Indicator shows current articles from blue to red, the size of the circle area indicates that the number of articles produced is greater.

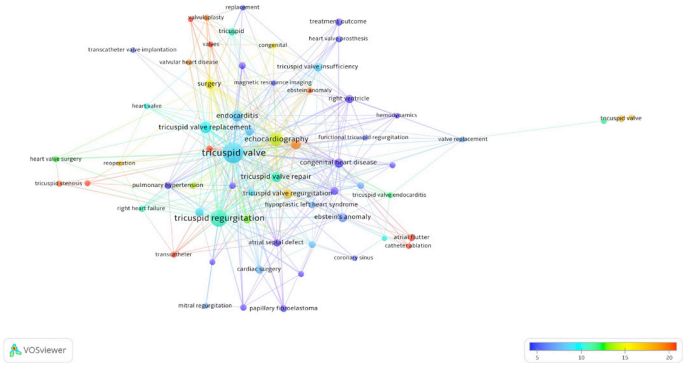

Figure 7. Network visualization map showing the most cited keyword analysis results on tricuspid valve

Footnote: A color bar was shown in the bottom right corner of the map. The number of citations from blue to red (blue-green-yellow-red) increases, the size of the circle area indicates that the number of articles produced is greater.

Discussion

According to our results, it was observed that the number of articles on the tricuspid valve has increased with a linear trend in the recent years. The number of articles, which was around 20 in the beginning, started to increase after 2004. More than 50 articles have been published each year in recent years. The highest number of articles was published in 2017 (93 articles). Additionally, results of the regression analysis indicated that this increasing trend will continue in the future.

When the publication distributions of the world countries were examined, it was often observed that developed or economically powerful countries were more effective in publication production. Among the top 20 countries in publication productivity, only 3 were underdeveloped or developing countries: Turkey, India, and China. These countries have large economies. Many studies in the literature have reported the relation between the economic size of countries and the productivity of academic articles.[6-9] In our study, a moderately significant correlation was found between article productivity and four different indicators of economic development level. The correlation value we found for the tricuspid valve was lower than those found in other medical subjects (spinal cord injury, legal medicine, and celiac disease) [7-9] in the literature. When the co-authorship collaboration of countries was examined, it seems that cooperation based on geographically proximal countries is effective in the production of articles (France-Italy-Germany-Saudi Arabia, Spain-Portugal-Belgium-Poland, Japan-South Korea-Taiwan-Brazil). However, countries within the same work clusters with no geographic proximity (China-Egypt-Netherlands) have also collaborated. Some studies in the literature state that geographical proximity is effective in publication production.[6-8]

The journals with the most publications were determined as Annals of Thoracic Surgery, Journal of Thoracic and Cardiovascular Surgery, European Journal of Cardio-Thoracic Surgery, Journal of Heart Valve Disease, American Journal of Cardiology, Journal of Cardiac Surgery, Texas Heart Institute Journal, and Echocardiography-A Journal of Cardiovascular Ultrasound and Allied Techniques. Authors wanting to produce publications on the tricuspid valve can consider these journals as a priority. When the citation network visualization map (Figure 4) analyses of the journals were evaluated, the most effective journals according to the average citation numbers per article they publish were Circulation, Journal of the American College of Cardiology, Journal of Thoracic and Cardiovascular Surgery, American Journal of Cardiology, JACC: Cardiovascular Interventions, American Heart Journal, Journal of Heart and Lung Transplantation, Annals of Thoracic Surgery, European Journal of Cardio-Thoracic Surgery, Journal of Cardiovascular Electrophysiology, and European Heart Journal, in that order. Hence, researchers wanting their articles to be read and cited more are recommended to consider these journals first.

When the analyzed articles were evaluated by the total number of citations they received, the most cited study was "Radiofrequency ablation of the inferior vena cava- tricuspid

valve isthmus in common atrial flutter" by Cosio et al. published in the American Journal of Cardiology (1993). [22] The next most influential study was "Tricuspid valve repair: Durability and risk factors for failure" by McCarthy et al. published in the Journal of Thoracic and Cardiovascular Surgery (2004)3. When the studies were evaluated according to the average number of citations per year, the most effective article was "Outcomes after current transcatheter tricuspid valve intervention mid-term results from the international trivalve registry" by Taramasso et al. published in the journal JACC: Cardiovascular Interventions (2019).[23] The second most effective study was by Zack, et al. titled "National trends and outcomes in isolated tricuspid valve surgery" published in Journal of the American College of Cardiology (2017).[23] Apart from these studies, studies by Hahn et al. (2017), McCarthy et al. (2004), and Schofer et al. (2015) were also remarkable.[3,25,26] According to the co-citation numbers of all analyzed articles, the most effective studies were by McCarthy (2004), Nath (2004), Dreyfus (2005), Filsoufi (2005), Tang (2006), Ratnatunga (1998), Carpentier (1974), Mcgrath (1990), and Singh (2006).[3,4,15-21] Hence, researchers and clinicians interested in this subject can be suggested to read these publications first.

When the results of keyword analysis were evaluated, it was observed that clusters in nine different colors were formed as a result of the cluster analysis. According to the results of trend analysis, the keywords studied in recent years were as follows: replacement, treatment outcomes, transcatheter valve implantation, reoperation, functional tricuspid regurgitation, tricuspid valve insufficiency, hemodynamics, heart failure, right heart failure, reoperation, ebstein's anomaly, tricuspid annuloplasty, and three-dimensional echocardiography. The most cited keywords were as follows: valve surgery, valvuloplasty, outcomes, tricuspid valve stenosis, transcatheter, atrial flutter, catheter ablation, valve repair, ebstein's anomaly, and survival.

As a result of the literature review, we did not find any bibliometric studies on the tricuspid valve. To the best of our knowledge, this comprehensive study is the first bibliometric study on the tricuspid valve. The study by Usman et al. (2017) for determining the most effective articles on valvular heart disease was the only study found in the existing literature.[5] However, said the above-mentioned study focused only on identifying the top 100 studies receiving the most citations. Considering the presence of keyword analysis, trend topic analysis, correlation and regression analysis in addition to citation analysis in our study, we can say that this study is much more comprehensive than the above-mentioned study.

Some limitations of our study were that we could not access publications before 1980 from the WoS database as there were no studies conducted before 1980. The second limitation was that indexes such as PubMed, Google Scholar, and Scopus were not used in the literature review and only the WoS database was preferred. This is because a citation analysis cannot be done using the PubMed database. Furthermore, the WoS database indexes articles published in more effective journals as compared to other databases.[7,27] According to bibliometric analyses made in recent years, WoS has been preferred more widely.[9-12]

Conclusion

In this comprehensive bibliometric study on the tricuspid valve, wherein an increasing trend is observed in the number of articles published, a summary of 1277 articles published between 1980 and 2019 was presented. This article will be a useful resource for clinicians and scientists for referring to global outputs on the tricuspid valve. This study can also aid researchers in planning new studies on the tricuspid valve by examining the outputs of the keyword and citation analyses.

Declaration of conflict of interest

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