Review Article

A Bibliometric Perspective on Central Serous Chorioretinopathy: The Top 100 Most Citated Manuscripts

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ABSTRACT

Purpose: To investigate 100 most cited manuscripts according to a bibliometric perspective via the Visualization of Similarities (VOS) viewer to learn about the trends of CSC in the past 20 years.

Study Design: Bibliometric analysis.

Place and Duration of Study: Sakarya University Training and Research Hospital, Turkey.

Methods: The bibliometric database of the Web of Knowledge was used and keywords 'central serous chorioretinopathy' and 'serous choroidopathy' and 'CSCR' were entered into the search area. The retrieved manuscripts were arranged according to the number of total citations since publication to identify the 100 most-cited manuscripts. They were investigated for the total number of citations, type and name of the journal, year of publication, names of the first authors, country of origin, type of study and main topic. The Visualization of Similarities (VOS) viewer was used to establish and visualize the bibliometric networks in this study.

Results: The search retrieved 2069 results. Majority of the 100 most-cited manuscripts were published in the leading ophthalmology journals (96%). They were written by 477 authors. Spaide RF, Yannuzzi LA, and Eandi CM were the top three authors. The most frequently publishing country was USA (27%) and the most productive institutions were identified in USA and Holland. The most common topics were imaging (41%), such as optical coherence tomography (21%) and optical coherence tomography angiography (2%). Eleven of the 100 most-cited manuscripts were published in 2015.

Conclusion: Bibliometric analysis showed that CSC is an important topic and the most cited manuscripts are published in leading ophthalmology journals.

Key Words: Bibliometry, Central Serous Retinopathy, Visualization of Similarities.

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INTRODUCTION

Central Serous Chorioretinopathy (CSC)is observed to be a relatively common chorioretinal disease in ophthalmology practice.[1,2] Males are more commonly affected than females. The disease is diagnosed by symptoms of decreased or distorted vision and causes a worsening of quality of life.[3]Albert von Graefe first identified CSC in 1866 as 'relapsing central luetic retinitis.[2] Maumenee used fluorescein angiography to understand the mechanism of CSC and found leakage in RPE layer.[4] Gass called the disease as idiopathic CSC and reported that it occurs due to increased permeability of the choriocapillaris secondary to rise of hydrostatic pressure.[5] Increased choroidal permeability was identified with the results of Indocyanine Green Angiography (ICGA) and Optical Coherence Tomography (OCT).[6] Today, CSC has an

unclearetio-pathogenesis and is characterized by dysfunction of retinal pigment epithelium, increased choroidal permeability, accumulation of sub-retinal fluid and detachment of neurosensory retina.[7]

Bibliometric analyses are quantitative methods to investigate large number of studies with statistical and mathematical techniques in specific areas.[8] In previous studies, the most-cited articles on vitrectomy,[9] intra-vitreal injections[10] retinal detachment,[11] age-related macular degeneration[12] and diabetic retinopathy[13] were investigated with a bibliometric perspective. Similar investigations were performed in other ophthalmology areas as well.[14–16] Purpose of this study was to investigate literature with the 100 most cited manuscripts according to a bibliometric perspective via VOS viewer to learn about the trends of CSC in the past 20 years.

METHODS

The study was exempted from the ethics approval of the local institutional review board, since it contained the use of only publicly available data. An extensive search of the bibliometric databases of the Institute for Scientific Information (ISI) Web of Knowledge was used with the medical librarian for the prospective cross-sectional study. Keywords such as 'central serous chorioretinopathy' and 'serous choroidopathy' and 'CSCR' were entered into the search area and the results in the title of the manuscripts were included in the study. All data were analyzed according to the PRISMA protocol (Systematic Reviews and Meta-Analyses protocol).

All peer-reviewed journals, not only ophthalmology journals, were searched from 2000 to the date of the search (March 23, 2023). All types of manuscripts were included in the study if they were associated with the topic of CSC. These manuscripts were organized by the total number of citations since publication and the 100 most-cited manuscripts were identified and analyzed for citations, type of publishing journal, publication year, names of first authors, country of origin, type of study and the main topic. The types of studies were investigated such as human studies, animal studies, reviews, laboratory studies and case reports.

Bibliometric analysis was performed with the Visualization of Similarities (VOS) viewer program (version 1.6.19, Leiden University, The Netherlands) in this study. This program provides users with a detailed relationship of bibliometric information between citations, authors, countries and organizations.

RESULTS

Bibliometric search retrieved 2069manuscripts.The most frequently publishing country was USA (17.5%). Other countries were Japan (10.0%), India (9.9%), South Korea (9.2%), Italy (8.7%), China (8.5%), Germany (7.2%) and Turkey (6.3%). When searching the total number of publications per year, a regular increase was observed from 22 publications in 2002 to 220 publications in 2022 (Figure 1).

When the 100 most-cited manuscripts were observed, the mean number of citations was 137.22 ± 98.4, with a range from63 to 670. Most of these were published in ophthalmology journals (96%), other journals were general medicine (2.0%), genetics (1.0%) and multidisciplinary sciences (1.0%).The ophthalmology journals were Retina-The Journal of Retinal and Vitreous Diseases (23%), Ophthalmology (22%), American Journal of Ophthalmology (16%), British Journal of Ophthalmology (5.0%), Investigation of Ophthalmology and Visual Science and Eye (each one 4.0%). All manuscripts were published in English language. The types of manuscripts were; 86 articles, 12 reviews, and 2 editorial material. All 86 articles were human studies.

Table 1: *The top 10 authors in the 100 most-cited manuscripts.*

Rank	Author Name	Number of Articles
1.	Spaide RF	13
2.	Yannuzzi LA	11
3.	Eandi CM	7
4.	Freund KB	7
5.	Boon CJF	6
6.	Iida T	6
7.	Lai TYY	6
8.	Behar-Cohen F	5
9.	Chan WM	5
10.	Hoyng CB	5

The most-cited manuscripts were written by 477 authors. Only two manuscripts were written by a single author. Five manuscripts were published by the group authors (Central serous chorioretinopathy case, Macula Society CSC collaborative, Res Educ COMM, VICI Trial investigators, Website COMM). Spaide RF, Yannuzzi LA, and Eandi CM were the top three authors in terms of articles published in the 100 most-

cited manuscripts. Table 1 shows the top ten authors in terms of articles published in the 100 most-cited manuscripts. Figure 2 shows the relationship between the authors.

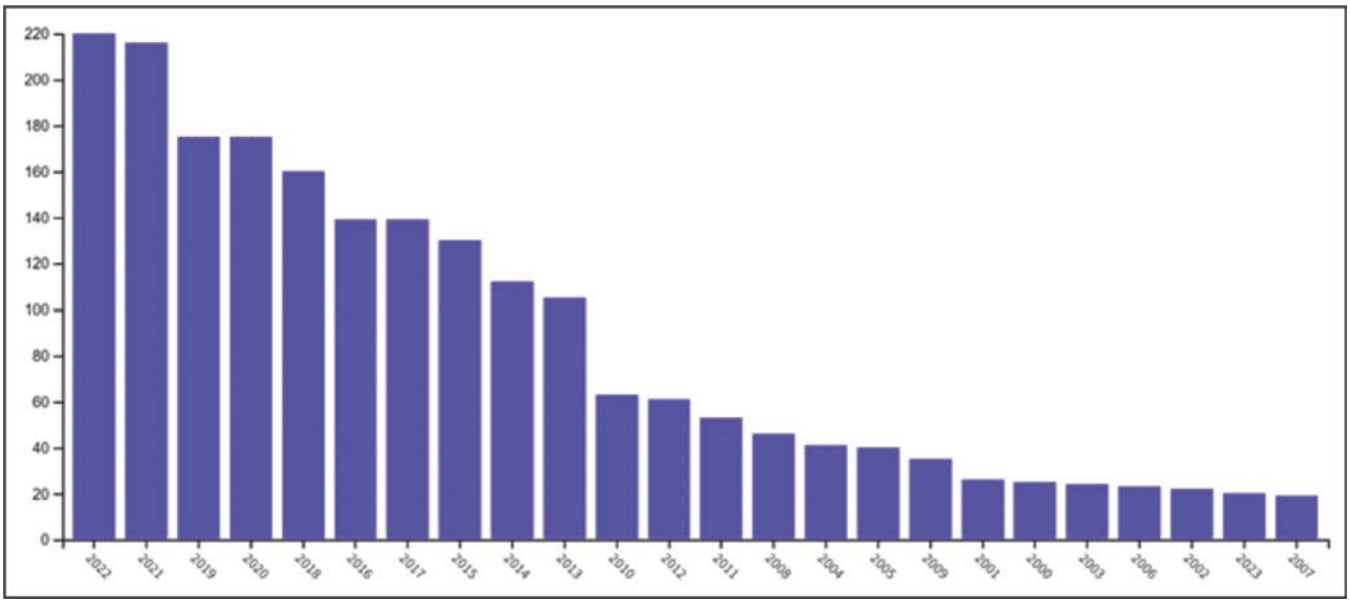

Figure 1: The number of publications per year on central serous chorioretinopathy.

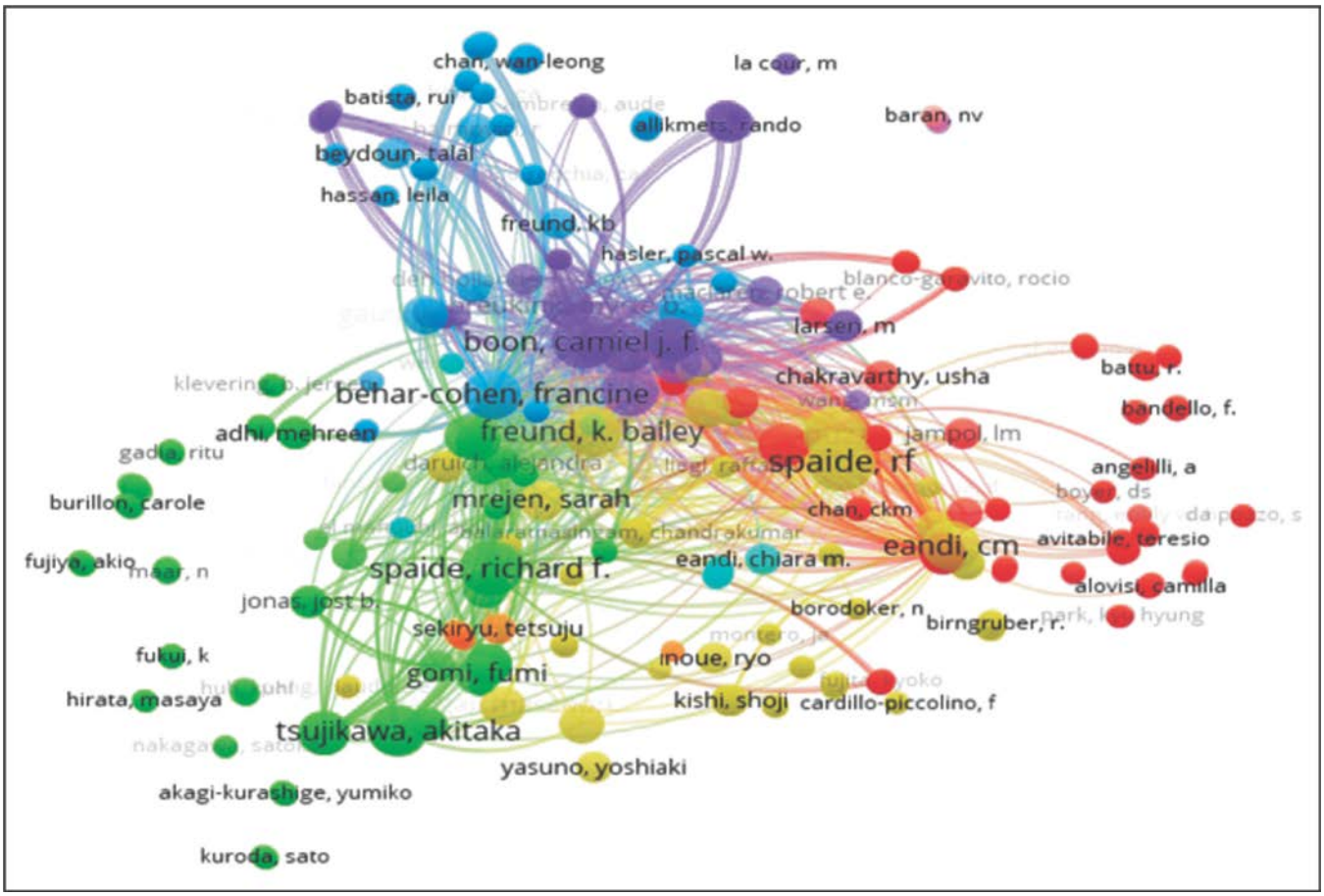

Figure 2: The relationship between the authors of the most cited manuscripts.

Table 2: *The top 10 countries that published the 100 most-cited manuscripts.*

Rank	Country	Number of Articles
1.	USA	27
2.	Japan	19
3.	France	13
4.	Italy	12
5.	Germany	11
6.	China	10
7.	England	8
8.	India	6
9.	Netherlands	6
10.	Switzerland	6

Table 2 shows the top 10 countries that published the 100 most-cited manuscripts on CSC. Figure 3 shows the relationship between countries of origin of the manuscripts. There were 122 organizations related with these manuscripts. The top institutions that published most cited articles are shown in Table 3.

The top 100 manuscripts were also analyzed for the main topics. The most common topic was imaging (n = 41), others were by treatment (n = 29), risk factors (n = 16), epidemiology (n = 7), pathogenesis (n = 4), genetic (n = 2) and natural history (n = 1). When articles on imaging were analyzed, optical coherence tomography was studied in 21 articles, Indocyanine Green angiography in 9, fundus fluorescein angiography in 5, fundus autofluorescence in 4 and optic coherence tomography angiography in 2. Eleven of the 100 most-cited manuscripts were published in 2015 and 10 of them were published in 2005. Figure4 shows the year of publication of the 100 most-cited manuscripts in CSC.

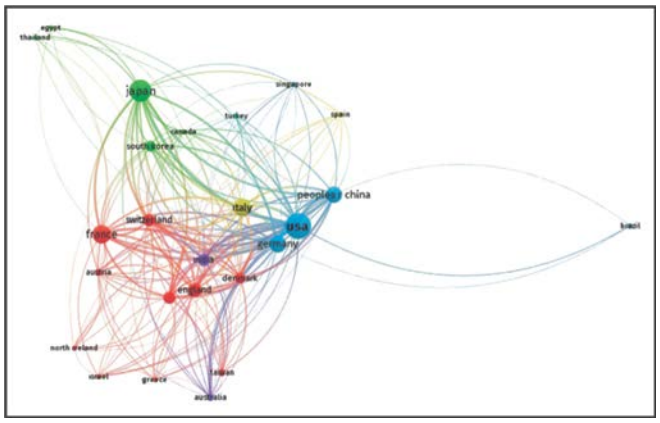

Figure 3: The relationship between countries of origin of the 100 most-cited manuscripts.

Table 3: *The top 10 organizations/institutions that published the 100 most-cited manuscripts.*

Rank	Organizations	Number of Articles
1.	Leiden university (Holland)	6
2.	Vitreous retina macula consultants (USA)	6
3.	NijmegenRadboud University (Holland)	5
4.	Manhattan eye ear & throat hospital (USA)	5
5.	University Hospital Cologne (Germany)	4
6.	University ofLausanne (Switzerland)	4
7.	New York University (USA)	4
8.	Southampton University(England)	4
9.	Paris University (France)	4
10.	Amsterdam University (Holland)	3

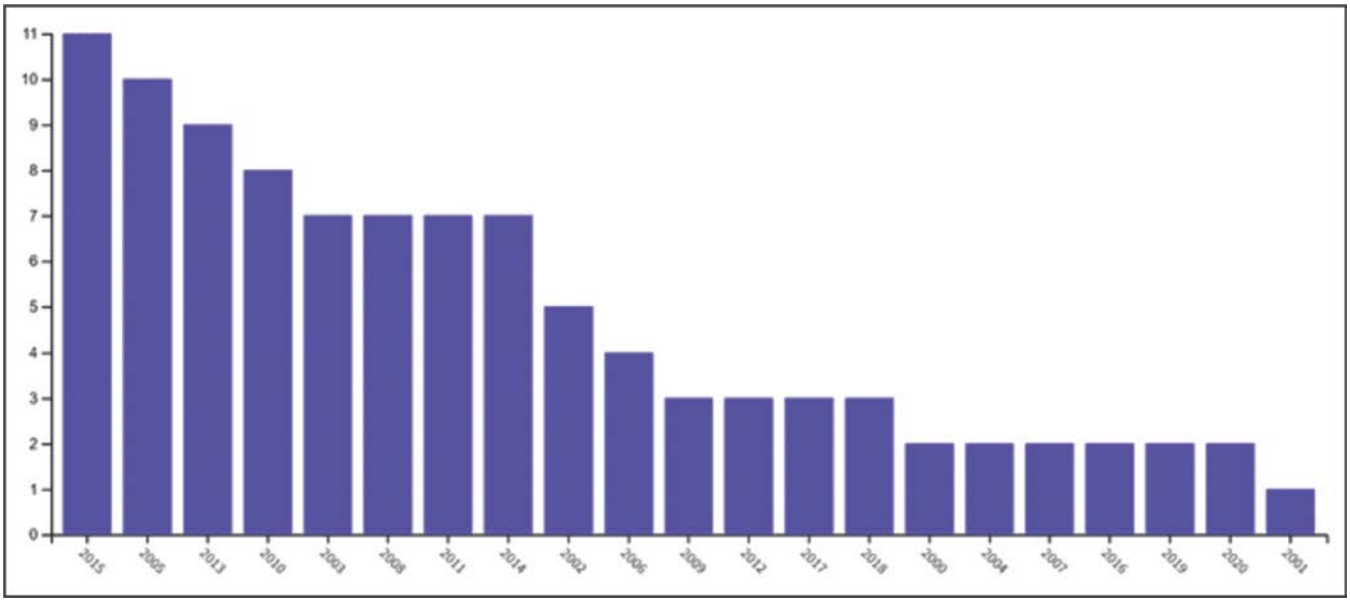

Figure 4: The year of publication of the 100 most-cited manuscripts on CSC.

DISCUSSION

In this study, we aimed to investigate CSC in terms of bibliometric analysis. Bibliometric analysis showed us that the pathophysiology of the disease has not been clearly understood. Manuscripts on CSC regularly increased from 2000 to today. With the discovery of imaging techniques such as optical coherence tomography and optical coherence tomography angiography, the pathophysiology of the disease has become more understood. Recent manuscripts especially focused on chronic CSC and its treatment such as subthreshold laser and photodynamic therapy.[17–20]

All the 100 most-cited manuscripts were written in English and the most popular country was USA which was similar to the previous bibliometric studies in ophthalmology.[9,10,12,21] However, this finding was not surprising, because the leading journals are published in USA and the published language is English and these manuscripts have received more citations as expected.

Majority of the manuscripts were focused on imaging. The authors had used these techniques to explain the pathogenesis of CSC in the past 20 years. The theories, more commonly discussed, were choroidal dysfunction, retina pigment epithelium dysfunction and the mineralocorticoid hypothesis.[22] However, there was little improvement in the understanding of pathophysiology of CSC since it was first discovered.[23] Fundus Fluorescein Angiography and Indocyanine Green Angiography were used to identify the pathogenesis of CSC until the 2000. Later with the invention of Optical Coherence Tomography, understanding of the disease further increased. Optical coherence tomography angiography was used after 2015.[24–29] Newer manuscripts in the100 most-cited articles focused on the dysfunction and thickening of the choroid based on the data acquired through Optical coherence tomography angiography and mineralocorticoid pathway. The top cited manuscript had determined choroidal thickening with Optical coherence tomography.[30]

Manuscripts which discussed treatment were focused on photodynamic therapy with Verteporfin, subthreshold laser therapy, intravitreal anti-vascular endothelial growth factor and mineralocorticoid receptor antagonists. Manuscripts about mineralocorticoid receptor antagonists were published in the general medicine journal (Lancet)[31] and other manuscripts were published in ophthalmology journals. As the pathogenesis of the CSC has been understood, the treatment options will be changed. In recently published manuscripts, half-dose photodynamic therapy was found to be superior to subthreshold micropulse laser in the treatment of CSC and mineralocorticoids were found to be safe and effective for treatment.[31-32] Optical coherence tomography angiography provided us information on the pathophysiology of CSC, especially on the choroidal vascular changes. In this way, treatment options have been modified to address choroidal vascular changes.

Genetics, corticosteroids, endocrinological abnormalities, androgens, pregnancy, drugs, cardiovascular diseases, stress and psychological profile, helicobacter pylori, hypoxia, and obstructive sleep apnea were presented as risk factors for CSC.[22.] The most common risk factor was corticosteroid use. However, it is still unknown who is affected by CSC and when the CSC becomes chronic. Researchers have studied the genetic factors of the CSC as well.[33,34]

There were several limitations of this study. The results would have been different with different databases. Secondly, number of citations did not necessarily address the quality of manuscript. It only showed acceptance of manuscript in a specific area. For example, open access manuscripts definitely get more citations. Thirdly, older manuscripts get more citations than the newer ones.

In conclusion, despite these limitations, the bibliometric analysis is meaningful to learn the development of pathophysiology and treatment of CSC over a certain period of time. In future studies, researchers may focus on only one specific are a such as treatment of CSC and detailed information can be gathered by bibliometric analysis.

Conflict of Interest: Authors declared no conflict of interest.

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Author's Designation and Contribution

Ali Altan Ertan Boz; ----------: *Concepts, Design, Literature Search, Data Acquisition, Data Analysis, Statistical Analysis, Manuscript Preparation, Manuscript Editing, Manuscript Review.*

Succatin Ilker Kocamis; Associate Professor: *Concepts, Design, Data Acquisition, Data Analysis, Statistical Analysis, Manuscript Editing, Manuscript Review.*