

Global Publication Outcomes in Retrograde Intrarenal Surgery and Türkiye's Effectiveness: A Bibliometric Analysis between 1980 and 2019

Retrograd İntrarenal Cerrahide Global Yayın Sonuçları ve Türkiye'nin Etkinliği: 1980-2019 Yılları Arasında Bibliyometrik Analiz

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What's known on the subject? and What does the study add?

Bibliometric analysis on retrograde intrarenal surgery. This study is the first study that makes a holistic analysis of the articles about this issue. One of the notable findings of this study is that Türkiye is among the world countries that produced the highest number of publications about this issue and the hospitals where this technique is used most are located in Türkiye.

Abstract

Objective: Urinary system stone disease is a very common health problem that affects 2 to 3% of people and causes serious complications when it is not treated. The prevalence of renal stones has been increasing worldwide and surgical methods have changed over time. However, there is no comprehensive bibliometric analysis of the retrograde intrarenal surgery (RIRS) method in the literature. This study aimed to conduct a bibliometric analysis of all articles regarding RIRS published between 1980 and 2019.

Materials and Methods: The literature search was performed using only the following keywords: "RIRS" and "flexible ureterorenoscopy/flexible ureteroscopy", in the "title" part of the search. Using this search method, all the articles published between 1980 and 2019 on this topic were accessed and downloaded from the Web of Science database, and the articles were analyzed using bibliometric methods.

Results: Totally, 1378 publications were found as a result of the literature search, of which 619 were articles. We noted that there has been a rapid increase in the number of publications, especially from the year 2011. Türkiye was found to be the most productive country with regard to RIRS. The journals that contributed most to the literature were: Journal of Endourology, Urology, Journal of Urology, Urolithiasis, and World Journal of Urology.

Conclusion: One of the notable findings of this study is that Türkiye is among the world countries that produced the highest number of publications with regard to this topic and that the hospitals where this technique is used the most are located in Türkiye.

Keywords: Retrograde intrarenal surgery, RIRS, Flexible ureterorenoscopy, Bibliometric analysis, Trends

Öz

Amaç: Üriner sistem taş hastalığı, insanların %2 ila 3'ünü etkileyen ve tedavi edilmediğinde ciddi sorunlara neden olan çok yaygın bir sağlık sorunudur. Renal taşların prevalansı dünya çapında artmaktadır ve cerrahi yöntemler zaman içinde değişmiştir. Bununla birlikte, literatürde retrograd intrarenal cerrahi (RIRC) yönteminin kapsamlı bir bibliyometrik analizi yer almamaktadır. Bu çalışma 1980 ve 2019 yılları arasında yayınlanan RIRC ile ilgili tüm makalelerin bibliyometrik analizini yapmayı amaçlamaktadır.

Gereç ve Yöntem: Literatür taraması sadece aramanın "başlık" kısmında "RIRC" ve "esnek üreterorenoskopi/esnek üreteroskopi" anahtar kelimeleri kullanılarak yapıldı. Bu arama yöntemi kullanılarak 1980-2019 yılları arasında bu konu hakkında yayınlanan tüm makalelere erişildi ve Web of Science veritabanından indirildi. Makaleler bibliyometrik yöntemler kullanılarak analiz edildi.

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Received: 3.02.2020

Accepted: 17.04.2020

Cite this article as: Baykam MB, Ekici M, Demir E. Global Publication Outcomes in Retrograde Intrarenal Surgery and Türkiye's Effectiveness: A Bibliometric Analysis between 1980 and 2019. J Urol Surg 2020;7(3):184-194

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Bulgular: Literatür taraması sonucunda toplam 1378 yayın bulundu. Bu yayınlardan 619'u makaleydi. Özellikle 2011 yılından bu yana yayın sayısında hızlı bir artış olmuştur. Türkiye'nin RIRS konusunda en verimli ülke olduğu tespit edildi. Literatüre en fazla katkıda bulunan dergiler Journal of Endourology, Urology, Journal of Urology, Urolithiasis, and World Journal of Urology olarak bulundu.

Sonuç: Bu çalışmanın dikkate değer bulgularından biri de Türkiye'nin bu konuda en fazla sayıda yayın yapan dünya ülkeleri arasında olması ve bu tekniğin en çok kullanıldığı hastanelerin Türkiye'de bulunmasıdır.

Anahtar Kelimeler: Retrograd intrarenal cerrahi, RIRS, Fleksibil üreterorenoskopi, Bibliometrik analiz, Trends

Introduction

Urinary system stone disease encompasses the kidneys, ureter, bladder, and urethral calculus. It is a commonly encountered health problem affecting 2-3% of people and causes serious complications when it is not treated. The retrograde intrarenal surgery (RIRS) technique performed under general anesthesia is done using a thin instrument, 3 mm in diameter (flexible renoscopy), with a light source that enables monitoring with an optic fiber by passing from the urethra (urinary canal) and bladder (urinary bladder) to the path that connects kidneys and bladder (ureter), in order to break the stone located within the kidney. Renal stone is broken using a laser power source that can pass through renoscopy and the big stone parts are taken out after the breaking procedure; the fragments that are now in powdered form are removed from the kidney (1,2).

Today, RIRS enables the successful treatment for most small or medium size renal stones, without any need for open surgery or percutaneous nephrolithotomy (PCNL). This method makes it possible to access the kidney from the abdominal wall without needing to open any holes; renoscopy that could be bent by entering from the urinary canal and laser enable the complete breaking and removal of the stones. Using this method, patients could be discharged from the hospital in a shorter period and begin to live as before (3-5).

The treatment of renal stones has recently undergone significant changes. The treatment options include open surgery, as well as the less invasive PCNL, extracorporeal shock wave lithotripsy (ESWL), and RIRS (6). With the increase in surgical experience, RIRS has become an important and acceptable treatment option for renal stones for all age groups, stone sizes, and localizations (7).

Bibliometric analyses enabled the identification of the most effective and top-cited studies and journals, through the statistical analysis of articles published with regard to a specific topic, specific research field, journal, or a country (8-11). They also enabled us to explore the collaborations between countries, authors, and institutions.

Bibliometric studies involve the investigation of the relationship between publication productivity and various factors possible (12-15). There have been several bibliometric studies in the medical field in recent years. The value of bibliometric studies

has been increasing as a result of the increased number of publications in literature day by day (16).

The prevalence of renal stones has been increasing worldwide (5,17), and surgical methods have changed over time. However, there is no comprehensive bibliometric analysis of this method in the literature. This study aimed to conduct a bibliometric analysis of all the articles regarding RIRS published between 1980 and 2019.

Material and Methods

The literature review was done using the following keywords: "RIRS" and "flexible ureterorenoscopy/flexible ureteroscopy/FURS), in the "title" part of the search. [Access codes: (title: (retrograde intrarenal*) or title: (flexible uretero*) or title: (RIRS) or title: (FURS) timespan: 1980-2019. indexes: SCI-Expanded, A&HCI, SSCI, CPCI-S, BKCI-S, CPCI-SSH, BKCI-SSH, ESCI) and access date: August 01, 2020]. Through this search, all the articles that were published between 1980 and 2019 on this topic were accessed and downloaded from the Web of Science (WoS) database. The articles were analyzed using bibliometric methods. VOSviewer (Version 1.6.13) package program was used for the bibliometric web visualizations. The world map was drawn using an online web site (<http://lert.co.nz/map/>).

Results

Totally, 1378 publications were found as a result of the literature search, of which 619 were articles, 544 were Meeting Abstracts, 109 were Editorial Materials, 53 were Reviews, 33 were Letters, 19 were Proceedings Papers, and 20 were other publications (Early Access, Correction, Book Chapter, Note). This study included the bibliometric analysis of 619 publications only; all of which were articles. Of these articles, 90.3% were English (n=559), and the others were French (n=34), Spanish (n=22), Turkish (n=3), and Korean (n=1).

The 619 articles accessed received 8518 citations (without self-citations 5549) in total, and the mean citation number per article was found to be 13,76, while the H-index of all the articles was 44.

Active Research Areas

The top 10 research areas of the published articles included Urology and Nephrology (515: 83.2%); General Internal medicine (35); Surgery (30); Experimental Medicine Research (25); Multidisciplinary Sciences (11); Pediatrics (10); Pharmacology and Pharmacy (4); Radiology, Nuclear Medicine, and Medical Imaging (3); Anatomy Morphology (2); and Biotechnology Applied Microbiology (2).

Development of Publications

The distribution of the articles is demonstrated in Figure 1. The increase in the number of articles has been significant since 2011, and a notable increase was found after the year 2014.

Active Countries

A total of 51 countries had made publications on this topic; Figure 2 demonstrates the rank order of 23 countries that produced the highest number of articles. The network map of international collaborations between the 30 countries that produced a minimum of three publications is displayed in Figure 3.

Active Authors

Table 1 presents the top 25 authors producing the highest number of publications about this issue.

Active Organizations

The top active organizations involved and organizations that produced the highest number of publications are demonstrated in Table 2.

Active Journals and Citation Analysis

Table 3 presents the active journals producing the highest number of publications regarding this topic. The number of citations and the number of citations per article are shown in the last column of Table 3. The Citation network visualization map among the journals is given in Figure 4.

Most Cited Articles

Table 4 displays the top 15 articles that had received the highest number of citations (18-32).

Co-citation Analysis

A total of 4484 publications were cited in the references section of the 619 published articles. The studies receiving the highest number of citations were those conducted by Dindo, 2004 (Citation: 88) (33); Breda, 2009 (Citation: 80) (21); Breda, 2008 (Citation: 69) (20); Traxer, 2013 (Citation: 65) (18); and Bozkurt, 2011 (Citation: 58) (25). There were 33 articles that received citations at least 30 times. The density map of these articles is shown in Figure 5.

Trend Topics

There were 697 different keywords in the 619 articles. Figure 6 shows the network map of the cluster analysis results conducted with 71 keywords that were used in minimum of four different articles. The network map of trend words analysis is given in Figure 7.

Discussion

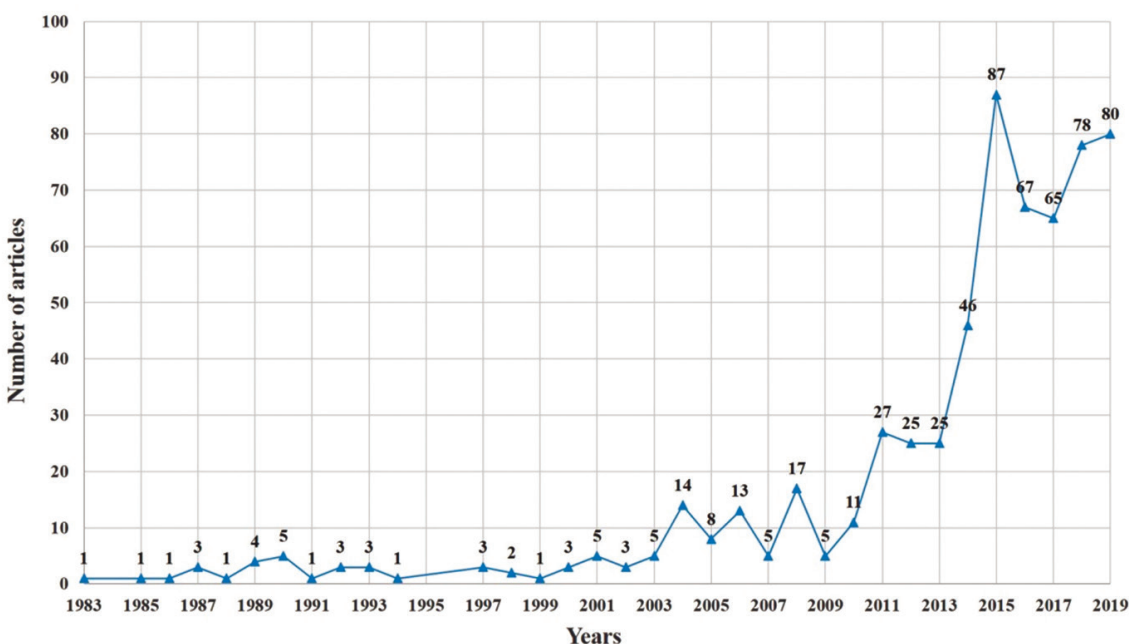


Figure 1. Distribution of articles published on retrograde intrarenal surgery by years

Table 1. Active authors on retrograde intrarenal surgery

Authors	RC	%
Traxer	46	7.431
Resorlu	23	3.716
Unsal	20	3.231
Atis	15	2.423
Bagley	15	2.423
Binbay	15	2.423
Bozkurt	15	2.423
Caskurlu	15	2.423
Proietti	15	2.423
Giusti	13	2.100
Ozgor	13	2.100
Tepeler	12	1.939
Doizi	11	1.777
Matsuzaki	11	1.777
Monga	11	1.777
Muslumanoglu	11	1.777
Lechevallier	10	1.616
Sener	10	1.616
Yao	10	1.616
Zeng	10	1.616
Cho	9	1.454
Clayman	9	1.454
Ito	9	1.454
Ozyuvali	9	1.454
Preminger	9	1.454

RC: Record count C: Number of citation

In line with the increase in the importance of RIRS, the importance of the number of publications and citations has also increased. Particularly, the number of publications has increased rapidly since 2011, and it has reached approximately 80 articles in recent years. Turkiye was found to be the most productive country with regards to RIRS. Although the publication productivity of developed countries such as the USA, China, France, United Kingdom, Germany, Italy, Spain, and Japan reveals that publication productivity is closely related to financial power; it is also important to note the contribution of countries such as Turkiye, India, Brazil, Chili, and Romania.

The analysis performed to detect the collaboration between the countries showed that the collaborations were in clusters of geographical location. Developing or undeveloped countries could be encouraged to create collaborations on this issue topic.

The journals that had the highest contribution to the literature were Journal of Endourology, Urology, Journal of Urology, Urolithiasis, and World Journal of Urology. As per the total number of citations, the Journal of Endourology, Urology,

Table 2. Active organizations-enhanced and organizations on retrograde intrarenal surgery

Organizations-enhanced	RC	%	Organizations	RC	%
Sorbonne Universite	47	7.593	University Paris 06	17	2.746
Assistance Publique Hopitaux Paris Aphp	46	7.431	Guangzhou Med University	16	2.585
Hopital Universitaire Tenon Aphp	45	7.270	Kecioren Training Res Hospital	16	2.585
Ankara Kecioren Training Research Hospital	23	3.716	Hop Tenon	15	2.423
Diskapi Yildirim Beyazit Training Research Hospital	21	3.393	Thomas Jefferson University	15	2.423
Istanbul Medeniyet University	19	3.069	Gazi University	14	2.262
Istanbul Haseki Training Research Hospital	17	2.746	Istanbul Medeniyet University	12	1.939
Guangzhou Medical University	16	2.585	Bezmialem Vakif University	11	1.777
Jefferson University	15	2.423	Bozok University	11	1.777
Gazi University	14	2.262	Yokohama City University	11	1.777
University of California System	13	2.100	Ankara Numune Training Res Hospital	10	1.616
Ankara Numune Training Research Hospital	12	1.939	Duke University	10	1.616
Bezmialem Vakif University	12	1.939	Haseki Training Res Hospital	10	1.616
Istanbul Goztepe Training and Research Hospital	12	1.939	University Health Science	10	1.616
Seoul National University Snu	12	1.939	University Wisconsin	10	1.616
Vita Salute San Raffaele University	12	1.939	Washington University	9	1.454
Bozok University	11	1.777	Ankara University	8	1.292
Ministry of Health Turkiye	11	1.777	Capital Med University	8	1.292
Yokohama City University	11	1.777	Seoul Natl University	8	1.292
Aix Marseille Universite	10	1.616	University Tubingen	8	1.292
Duke University	10	1.616	Asklepios Hospital Barmbek	7	1.131
Seoul National University Hospital	10	1.616	Cent S University	7	1.131
University of Wisconsin Madison	10	1.616	Huazhong University Sci Technol	7	1.131
University of Wisconsin System	10	1.616	Karabuk University	7	1.131
Eberhard Karls University of Tubingen	9	1.454	Medeniyet University	7	1.131

RC: Record count C: Number of citation

Journal of Urology, and BJU International were the effective journals. The journals receiving the highest number of citations per article were European Urology, Journal of Urology, BJU International, Urology, and Urological Research. Researchers could be recommended to consider these journals for studies that they would like to receive more citations. As for the journals addressing Turkiye, the notable journals were the Journal of Urological Surgery and Turkish Journal of Urology.

The articles with the highest total number of citations included the articles entitled "Prospective Evaluation and Classification of Ureteral Wall Injuries Resulting from Insertion of a Ureteral

Access Sheath During RIRS" written by Traxer and Thomas (18) and "Ureteral access sheath provides protection against elevated renal pressures during routine flexible ureteroscopic stone manipulation" written by Auge et al. (19). Apart from these studies, the top-cited articles according to the average number of citations included the studies entitled "Flexible Ureteroscopy and Laser Lithotripsy for Multiple Unilateral Intrarenal Stones" and "Flexible ureteroscopy and laser lithotripsy for single intrarenal stones 2 cm or greater - Is this the new frontier?" by Breda (20,21), respectively. The top-cited Turkish study entitled "RIRS Versus Percutaneous Nephrolithotomy in the Management

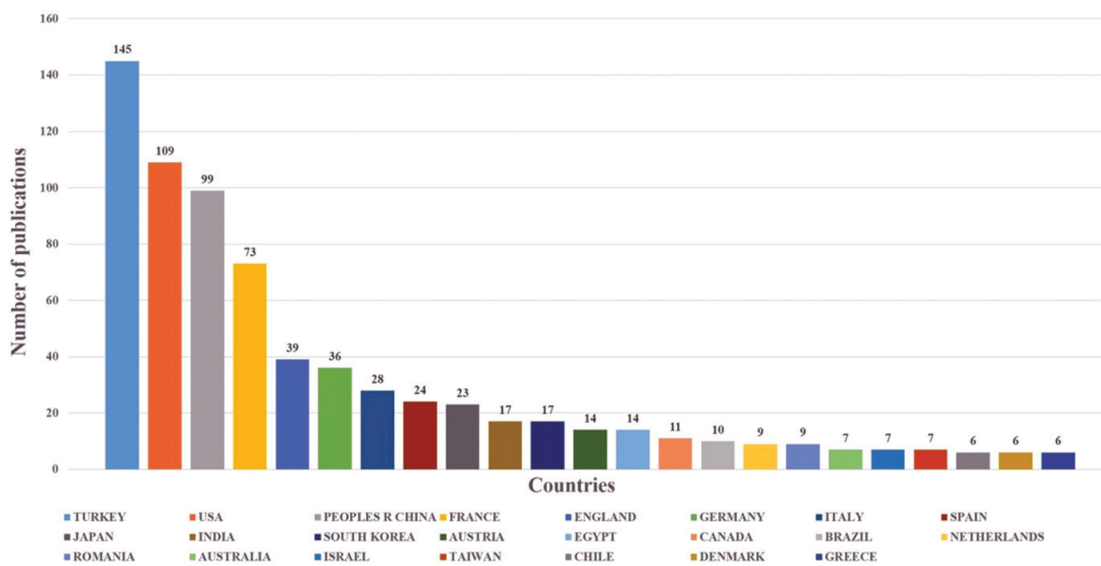


Figure 2. World map on the distribution of world countries producing publications on retrograde intrarenal surgery

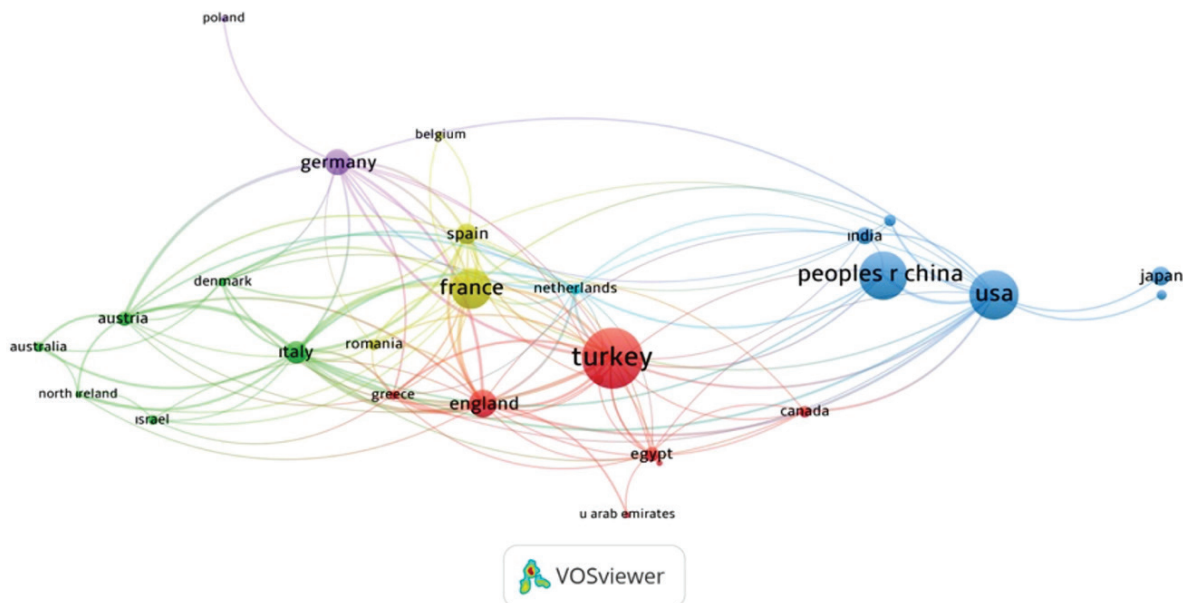


Figure 3. Network visualization map showing the international collaboration of countries on retrograde intrarenal surgery Footnote: Colors indicate clustering

Table 3. Active journals on retrograde intrarenal surgery

Journals	RC	%	C	AC
Journal of Endourology	114	18.417	2195	19.3
Urology	49	7.916	1213	24.8
Journal of Urology	37	5.977	1789	48.4
Urolithiasis	34	5.493	426	12.5
World Journal of Urology	34	5.493	445	13.1
Progres En Urologie	33	5.331	126	3.8
Urologia Internationalis	21	3.393	171	8.1
BJU International	19	3.069	548	28.8
Urology Journal	19	3.069	73	3.8
Actas Urologicas Espanolas	13	2.100	78	6.0
International Braz J Urol	13	2.100	77	5.9
International Journal of Clinical and Experimental Medicine	13	2.100	38	2.9
Archivos Espanoles De Urologia	10	1.616	7	0.7
Turkish Journal of Urology	9	1.454	24	2.7
Journal of Pediatric Urology	8	1.292	19	2.4
Arab Journal of Urology	7	1.131	11	1.6
BMC Urology	7	1.131	17	2.4
Urological Research	7	1.131	168	24.0
Archivio Italiano Di Urologia E Andrologia	6	0.969	20	3.3
CUAJ Canadian Urological Association Journal	6	0.969	37	6.2
European Urology	6	0.969	364	60.7
International Urology and Nephrology	6	0.969	34	5.7
Central European Journal of Urology	5	0.808	34	6.8
International Journal of Urology	5	0.808	78	15.6
Journal of Urological Surgery	5	0.808	0	0.0

RC: Record count C: Number of citation AC: Average citation per article

of Lower-Pole Renal Stones with a Diameter of 15 to 20 mm" was written by Bozkurt et al. (25) in the Journal of Endourology.

According to the co-citation analysis results, the studies conducted by Dindo et al. (33), Breda et al. (20,21), Traxer et al. (18), and Bozkurt et al. (25) were cited the most in the references sections of the articles. Researchers interested in RIRS are recommended to first read these studies.

Keyword analyses indicated eight different clusters, and the cluster centers included RIRS, flexible ureteroscopy, ureteroscopy, and urolithiasis. While previous percutaneous nephrolithotomy and ureteroscopy topics were searched, especially after the year 2000, laser and RIRS topics were searched, which is considered to be as a result of using holmium laser in RIRS operations in 1995.

Study Limitation

The limitation of the present study is that it did not search the PubMed and Scopus databases. WoS database was preferred, as the journals with a high impact factor are indexed there and it is

a more reliable database in terms of citations (11,34,35).

Conclusion

With the increase of the importance of RIRS, a less invasive technique for the treatment of urinary system stone diseases, the present study is the first of its kind study to conduct a holistic analysis of the articles on this issue. The study is believed to guide physicians, academics, and students in studying RIRS, on topics such as effective journals, top-cited studies, trend topics, and the most productive countries. One of the notable findings of this study is that Türkiye is among the world countries that had the highest number of publications on this topic and the hospitals where this technique is used are mostly located in Türkiye.

Ethics

Ethics Committee Approval: This article does not contain any studies with human participants or animals performed by any of the authors.

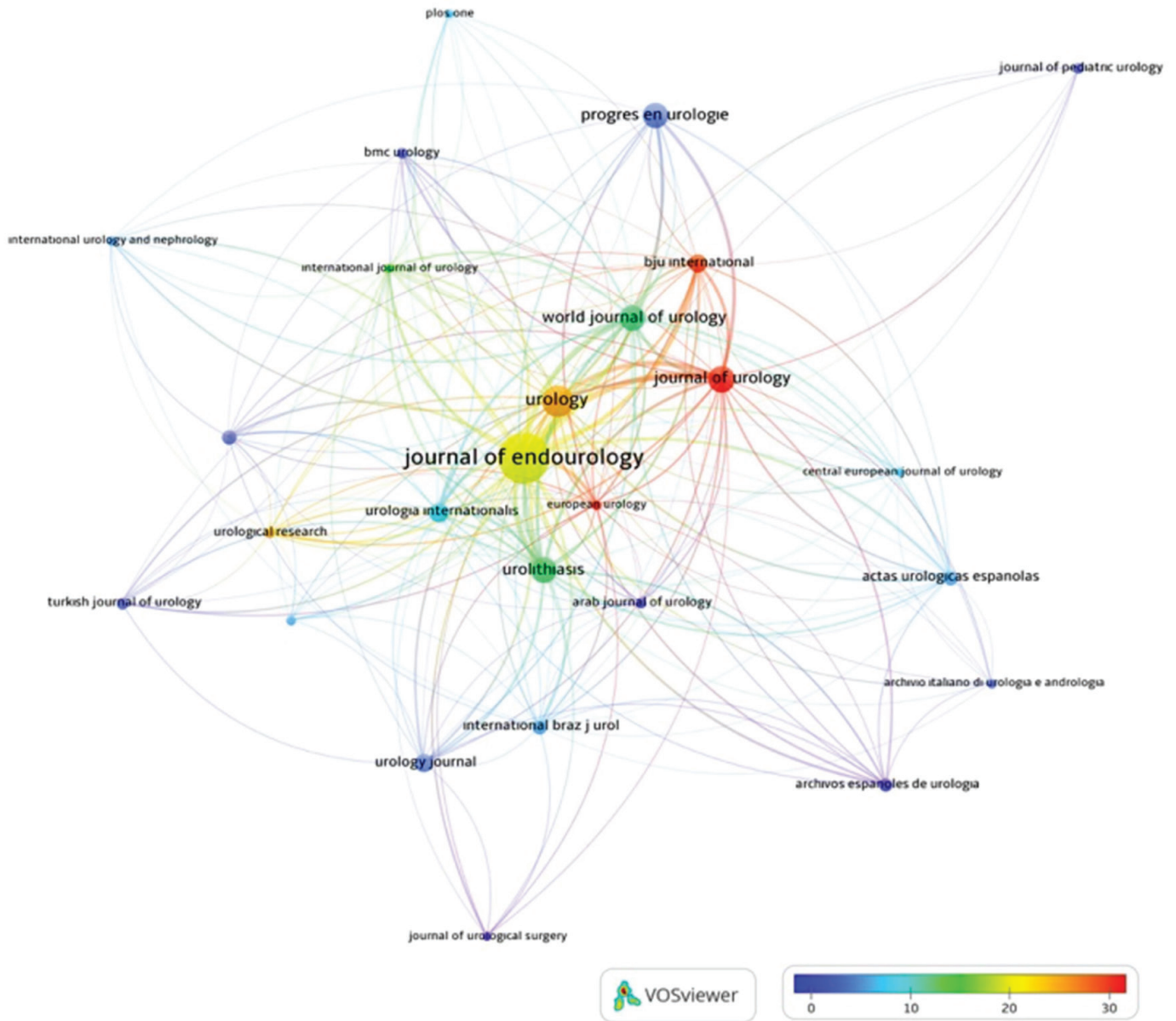


Figure 4. Network visualization map of citation analysis of active journals producing publications on retrograde intrarenal surgery
Footnote: Number of receiving citations increases from blue to red

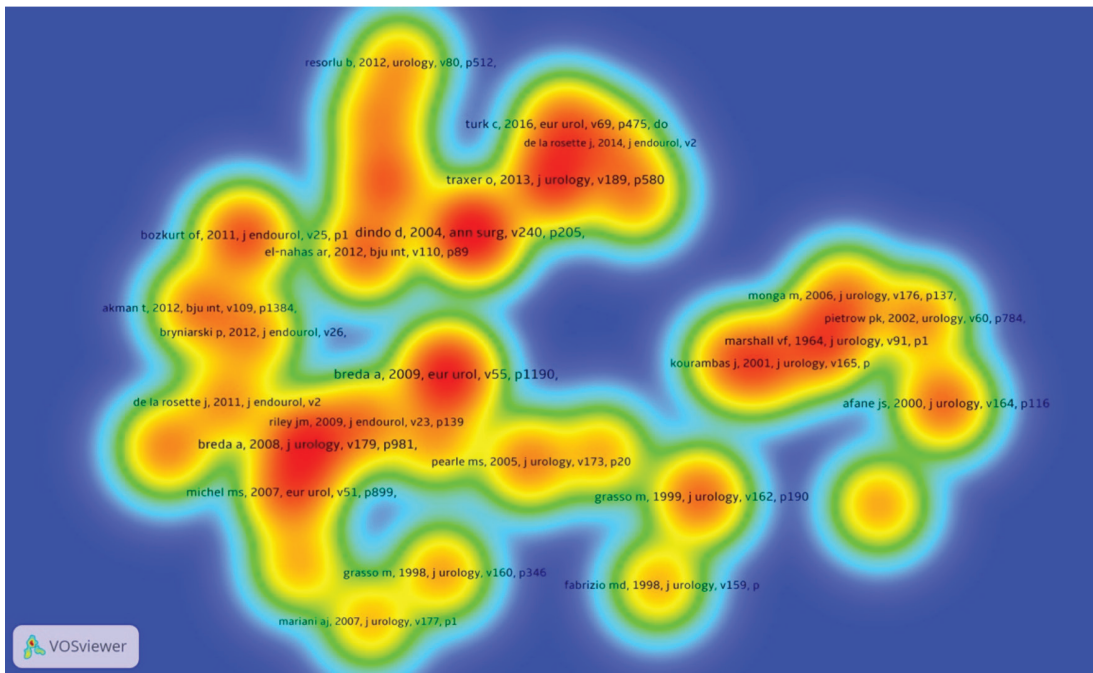


Figure 5. Density map of co-citation analysis in references on retrograde intrarenal surgery
Footnote: Number of receiving citations increases from blue to red

Table 4. Top 15 most cited articles according to total citations on retrograde intrarenal surgery						
No	Article	Author	Journal	PY	TC	AC
1	Prospective Evaluation and Classification of Ureteral Wall Injuries Resulting from Insertion of a Ureteral Access Sheath During Retrograde Intrarenal Surgery	Traxer and Thomas (18)	Journal of Urology	2013	202	25.25
2	Ureteral access sheath provides protection against elevated renal pressures during routine flexible ureteroscopic stone manipulation	Auge et al. (19)	Journal of Endourology	2004	151	8.88
3	Flexible ureteroscopy and laser lithotripsy for single intrarenal stones 2 cm or greater - Is this the new frontier?	Breda et al. (20)	Journal of Urology	2008	142	10.92
4	Flexible Ureteroscopy and Laser Lithotripsy for Multiple Unilateral Intrarenal Stones	Breda et al. (21)	European Urology	2009	141	11.75
5	Flexible ureteroscopes: A single center evaluation of the durability and function of the new endoscopes smaller than 9Fr	Afane et al. (22)	Journal of Urology	2000	121	5.76
6	Small diameter, actively deflectable, flexible ureteropyeloscopy	Grasso and Bagley (23)	Journal of Urology	1998	121	5.26
7	Management of lower pole renal calculi: shock wave lithotripsy versus percutaneous nephrolithotomy versus flexible ureteroscopy	Preminger (24)	Urological Research	2006	99	6.6
8	Retrograde Intrarenal Surgery Versus Percutaneous Nephrolithotomy in the Management of Lower-Pole Renal Stones with a Diameter of 15 to 20 mm	Bozkurt et al. (25)	Journal of Endourology	2011	97	9.7
9	Flexible Ureterorenoscopy and Holmium Laser Lithotripsy for the Management of Renal Stone Burdens That Measure 2 to 3 cm: A Multi-Institutional Experience	Hyams et al. (26)	Journal of Endourology	2010	93	8.45
10	Techniques to maximize flexible ureteroscope longevity	Pietrow et al. (27)	Urology	2002	90	4.74
11	Flexible ureterorenoscopy versus extracorporeal shock wave lithotripsy for treatment of lower pole stones of 10-20 mm	El-Nahas et al. (28)	BJU International	2012	88	9.78
12	Flexible Ureteropyeloscopy - Diagnosis And Treatment In The Upper Urinary-Tract	Bagley et al. (29)	Journal of Urology	1987	88	2.59
13	Durability of flexible ureteroscopes: A randomized, prospective study	Monga et al. (30)	Journal of Urology	2006	84	5.6
14	Lower-pole caliceal stone clearance after shockwave lithotripsy, percutaneous nephrolithotomy, and flexible ureteroscopy: Impact of radiographic spatial anatomy	Elbahnasy et al. (31)	Journal of Endourology	1998	83	3.61
15	Safety and efficacy of flexible ureterorenoscopy and Holmium : YAG lithotripsy for intrarenal stones in anticoagulated cases	Turna et al. (32)	Journal of Urology	2008	82	6.31

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

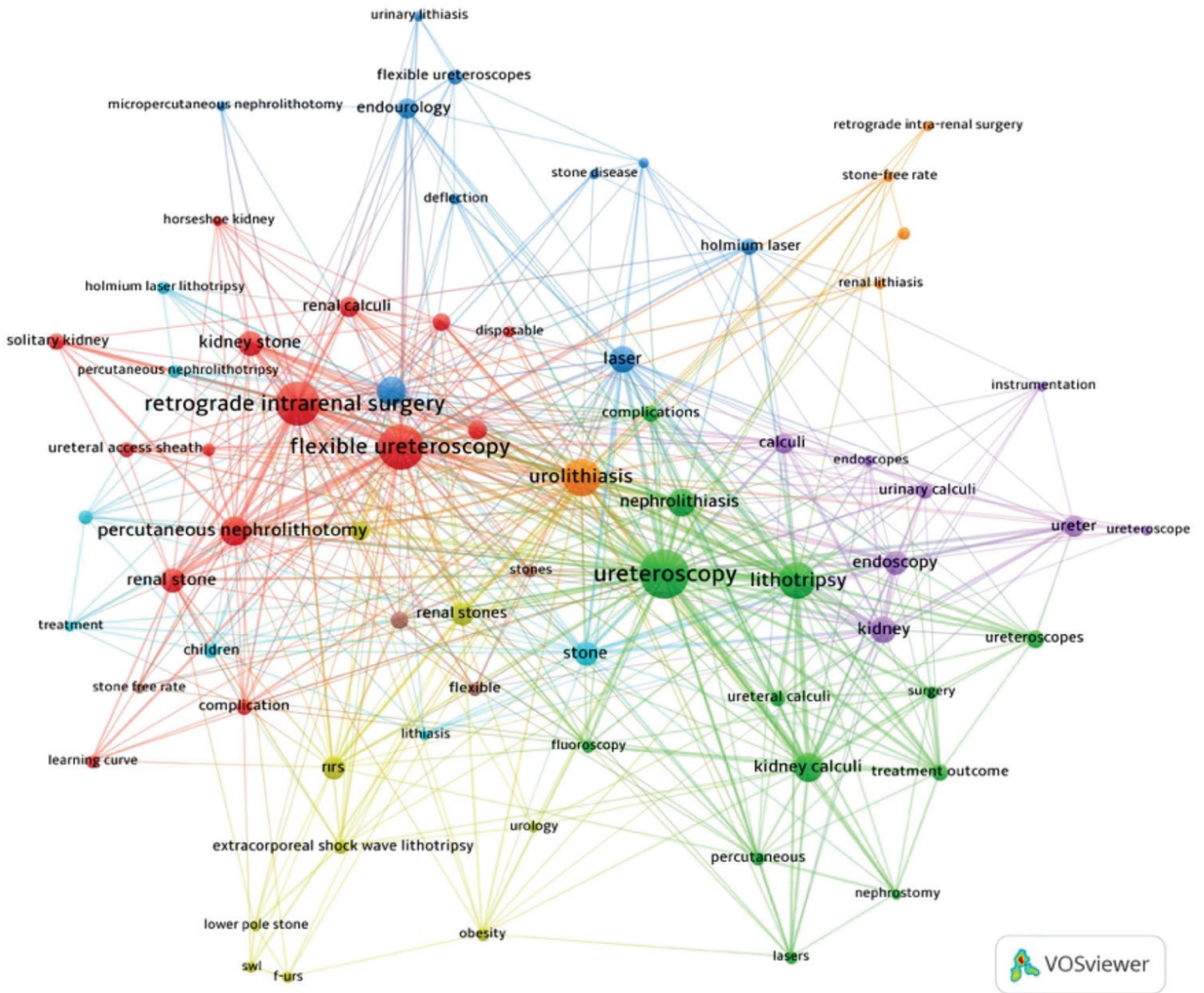


Figure 6. Network visualization map showing cluster analysis results based on keyword analysis on retrograde intrarenal surgery
Footnote: Colors indicate clustering

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