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Analysis of Publications of the Russian Trauma and Orthopaedic Surgeons in Foreign Top-Rated Journals

A.P. Sereda, M.A. Andrianova

Federal Medical Biological Agency, Moscow, Russian Federation

Abstract

The present paper is dedicated to the publications analysis by Russian authors in top-rated foreign journals. The aim of the research to define the avant-garde status of the national trauma and orthopaedics science. The authors of the present paper analyzed the publications in the first thirty journals under the heading «Orthopaedics and sports medicine» from Scimago Journal & Country Rank rating. The search was conducted from the moment of the first issue of each journal. Total number of publications was calculated, total number of publications from each author, number of publications per institution, citations of each publication in PubMed Central и Google Scholar. The subject, chronologic characteristics and relation of the year of publication with number of citations were analyzed.

Keywords: orthopaedics, traumatology, scientific papers.

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Background

The third issue of the journal "Traumatology and Orthopedics of Russia" for 2018 contains article by I.V. Reshetov et al, "Scientific specialty "Traumatology and Orthopedics " in 2017: the analysis of the dissertations" [1]. In the same issue, the editors kindly published our comment, in which we criticized the authors for the fact that the defended dissertations were not exactly identical to the actual trends of the national trauma and orthopedic science due to a number of reasons. [2]. Since then, we have felt remorse for having been critical without offering anything in return. Indeed, there is nothing better than to do the work about which it was said. In this regard, we decided to carry out this work.

The objective — to clarify the status of the pioneering work in domestic orthopedics and traumatology by analyzing the number and topics of articles of domesticsorthopaedic surgeons, as well as their institutions, in the top-rated foreign scientific periodicals, based on the number of citations.

Materials and Methods

Our search for articles in foreign journals involved two steps. First, we identified a list of top-rated journals, and then we located articles of compatriots.

To determine the list of top-rated journals, we used the Scimago Journal & Country Rank*, in which the journals are ranked not just by impact factor, which is debatable, but by SJR index (Scimago journal rank).

* https://www.scimagojr.com/journalrank.php?category=2732

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Andrey P. Sereda; e-mail: drsereda@gmail.com

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The SJR index is a ranking which also considers the journal's prestige and influence, and it is measured as the average number of notable citations per year of those works published in the ranked journal over the past three years. Thus, the SJR index is always less than the common impact factor and does not allow those journals that published highly cited works a decades ago to be ranked high.

Scimago Journal & Country Rank indexes all scientific journals in all scientific fields. Orthopedic journals are included in the "Orthopedics and Sports Medicine" heading. There are a total of 266 journals in this category but only the 30 with the highest SJR index were analyzed (Table 1).

Table 1

Thirty journals with the highest SJR values in 2017 that were included in the study

Rank	Title of Journal	SJR Index	Country	Publisher
1	American Journal of Sports Medicine	3,949	USA	SAGE Publications
2	Sports Medicine	3,367	UK	Adis International Ltd.
3	British Journal of Sports Medicine	3,232	UK	BMJ Publishing Group
4	Journal of Bone and Mineral Research	2,808	USA	Wiley-Blackwell
5	Journal of Bone and Joint Surgery — Series A	2,722	USA	LWW Ltd.
6	Osteoarthritis and Cartilage	2,497	UK	W. B. Saunders Co., Ltd.
7	Journal of Arthroplasty	2,373	USA	Churchill Livingstone
8	Journal of Shoulder and Elbow Surgery	2,327	USA	Mosby Inc.
9	Skeletal Muscle	2,32	UK	BioMed Central
10	Medicine and Science in Sports and Exercise	2,073	USA	LWW Ltd.
11	Bone and Joint Journal	2,043	UK	British Editorial Society of Bone and Joint Surgery
12	Exercise and Sport Sciences Reviews	1,943	USA	LWW Ltd.
13	Clinical Orthopaedics and Related Research	1,908	USA	Springer New York LLC
14	Acta Orthopaedica	1,87	UK	Taylor & Francis
15	Knee Surgery, Sports Traumatology, Arthroscopy	1,845	Germany	Springer Verlag
16	International Journal of Sports Physiology and Performance	1,749	USA	Human Kinetics Publishers Inc.
17	Spine	1,736	USA	LWW Ltd.
18	Journal of Science and Medicine in Sport	1,714	Netherlands	Elsevier BV
19	Foot and Ankle International	1,626	USA	SAGE Publications Inc.
20	Scandinavian Journal of Medicine and Science in Sports	1,541	UK	Blackwell Publishing Inc.
21	European Spine Journal	1,535	Germany	Springer Verlag
22	International Orthopaedics	1,502	Germany	Springer Verlag
23	Arthroscopy — Journal of Arthroscopic and Related Surgery	1,459	UK	W. B. Saunders Co., Ltd.
24	Journal of Orthopaedic Trauma	1,451	USA	LWW Ltd.
25	Journal of Athletic Training	1,442	USA	National Athletic Trainers Association, Inc.
26	Journal of Cachexia, Sarcopenia and Muscle	1,432	USA	Wiley-Blackwell

End of Table 1

Rank	Title of Journal	SJR Index	Country	Publisher
27	Journal of Clinical Densitometry	1,423	USA	Elsevier Inc.
28	The Journal of the American Academy of Orthopaedic Surgeons	1,41	USA	Lippincott Williams & Wilkins Ltd.
29	Journal of Strength and Conditioning Research	1,366	USA	National Strength and Conditioning Association
30	Orthopedic Clinics of North America	1,294	UK	W. B. Saunders Co., Ltd.

To find articles of compatriots in the selected 30 top-rated journals, we used the PubMed database, generating for each journal a separate search query of the following type: (Russia [Affiliation]) AND "Journal Name" [Journal].

Thus, in the search within a particular journal, we included only those articles whose authors were listed in column "Russia". The search results were checked manually, because the information about the authors sometimes mentioned them mistakenly as authors from "Russia", despite the fact that the authors were not our compatriots. For example, the search query (Russia [Affiliation]) AND "The American journal of sports medicine" [Journal] identified an article of Kim SH et al. [3], wherein the place of work of one of the co-authors (Jung M) was indicated as follows: «Russia Science Seoul Center» in the Seoul ElectrotechnologyResearch Institute. Of course, we did not take such works into account.

In addition, we did not take into account those articles in which the author indicated two institutions as his place of work, the first of which was a foreign one. For example, when requesting ((Russia [Affiliation])) AND "Sports Med" [Journal], the work of Wilhelm EN, Mourot L and Rakobowchuk M [4] was identified. As the place of work of the second author (Mourot L), two institutions were indicated: the University of Bourgogne and Tomsk Polytechnic University. We did not take into account such works either.

To include in our analysis the scientific heritage of the USSR, in addition to the search options (Russia [Affiliation]), we generated queries of the type: (Soviet [Affiliation]) AND "Journal Title" [Journal] and (USSR [Affiliation]) AND "Journal Title" [Journal].

In cases where the title of the journal has changed, we conducted a separate search for the old name of the journal. For example, the British edition of The Journal of Bone & Joint Surgery in 2013 was renamed The Bone & Joint Journal (the eleventh place in the SJR rating). In such cases, search results are considered to be only for the successor journal (in this particular case, they were counted as publications in The Bone & Joint Journal).

The analysis was conducted as of October 17, 2018. Thus, it is likely that those works that, although they were published at this time (in the September and October issues) but were not yet indexed by PubMed, could not be taken into account.

Results

It turned out that the works of our compatriots were published in 13 of 30 top-rated journals. In total, we found 79 articles (Table 2). Of those, 19 explored exclusively sports medicine (the functional status of athletes, issues of the training process, etc.) and were not related to traumatology and orthopedics at al. The remaining 60 articles were published in 8 journals:

- Journal of Bone and Joint Surgery. Series A — 1 article [5];
- Journal of Bone and Joint Surgery. Series B (Bone and Joint Journal) — 1 [6];
- Clinical Orthopaedics and Related Research — 19 [7, 8, 9, 10, 11, 12, 13, 14, 15,

16, 17, 18, 19, 20, 21, 22, 23, 24, 25];

• Knee Surgery, Sports Traumatology, Arthroscopy — 1 [26];

• Spine — 7 работ [27, 28, 29, 30, 31, 32, 33];

• European Spine Journal — 4 [34, 35, 36, 37];

• International Orthopaedics — 24 [38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61];

• Foot and Ankle International — 3 [62, 63, 64].

Table 2

The number of articles of domestic authors in selected journals

Rank	Title of Journal	Year*	Number of Articles				Total
			Search options				
			Russia	Russian	Soviet	USSR	
1	American Journal of Sports Medicine	1976	0	0	0	0	0
2	Sports Medicine	1984	0	0	0	0	0
3	British Journal of Sports Medicine	1969	4	1	0	0	5
4	Journal of Bone and Mineral Research	1986	2	1**	0	0	2
5	Journal of Bone and Joint Surgery — Series A	1948	1	0	0	0	1
6	Osteoarthritis and Cartilage	1993	0	0	–	–	0
7	Journal of Arthroplasty	1986	0	0	0	0	0
8	Journal of Shoulder and Elbow Surgery	1992	0	0	–	–	0
9	Skeletal Muscle	2011	0	0	–	–	0
10	Medicine and Science in Sports and Exercise	1980	0	0	0	0	0
11	Bone and Joint Journal	1948	1	1**	0	0	1
12	Exercise and Sport Sciences Reviews	1973	0	0	0	0	0
13	Clinical Orthopaedics and Related Research	1963	8	1**	0	11	19
14	Acta Orthopaedica	2005	0	0	–	–	0
15	Knee Surgery, Sports Traumatology, Arthroscopy	1993	1	1**	–	–	1
16	International Journal of Sports Physiology and Performance	2006	1	0	–	–	1
17	Spine	1976	5	2**	0	1	7
18	Journal of Science and Medicine in Sport	1998	1	0	–	–	1
19	Foot and Ankle International	1994	2	3**	–	–	3
20	Scandinavian Journal of Medicine and Science in Sports	1991	3	1**	0	0	3
21	European Spine Journal	1992	3	2**	–	–	4
22	International Orthopaedics	1977	10	20**	0	1	24
23	Arthroscopy — Journal of Arthroscopic and Related Surgery	1985	0	0	0	0	0
24	Journal of Orthopaedic Trauma	1987	0	0	0	0	0
25	Journal of Athletic Training	1992	0	0	–	–	0
26	Journal of Cachexia, Sarcopenia and Muscle	2010	0	0	–	–	0
27	Journal of Clinical Densitometry	1998	0	0	–	–	0
28	The Journal of the American Academy of Orthopaedic Surgeons	1993	0	0	–	–	0
29	Journal of Strength and Conditioning Research	1993	7	1**	–	–	7
30	Orthopedic Clinics of North America	1970	0	0	0	0	0
Total			49	34	0	13	79

* — the year in which the issues of the journal began according to the NLM Catalog; ** — an article or some articles are categorized by two Affiliation keys, so the total number of articles is less.

Further analysis was carried out exclusively among these 60 works. The primary themes of publications were works on the use of external fixators (20 articles), vertebrology and spinal surgery (14 articles), pediatric orthopaedics including vertebrology (10 articles), and reconstruction of bone defects (9 articles) (Fig. 1).

These 60 works of a traumatologic-orthopedic profile were written by 158 authors. Of these, 136 (86.0%) authored only one work, 16 (10.1%) authors have two publications in their portfolio, 3 (1.9%) authors — three publications, 2 (1.3 %) authors — four works, and one author (0.6%) – five works (Table 3).

When analyzing the distribution of the number of articles by year, it turned out that there are four "waves". The first "wave" of 13 articles, including two papers of Ilizarov G.A. [11, 12], began in 1989 and ended in 1991. Undoubtedly, that surge was generated by studies of Soviet period. In 1992 and 1993, not a single article was published. The second "wave" (11 works) came in 1994–1999. Probably, these publications can be also regarded as a continuation or development of research initiated in the USSR, or as their results. From 2000 to 2005, there was a second lull without a single publication. In the third "wave" from 2006 to 2009, there was one publication a year (a total of 4 papers). These are of Sokolovsky VA, Voloshin VP et al. [56], Gorodetsky IG, Gorodnichenko AI et al. [6], Shevtsov VI et al. [55], Gubin AV et al. [29]. We would characterize this as a period of scientific enthusiasm. From 2010 to 2011, there was again a pause. In 2012, the fourth "wave" began which already includes 32 works, nine of which are dated 2018. At the same time, we hope that the year 2018 that has not ended will please us with an even greater number of works (the analysis was carried out as of October 17, 2018). According to the number of works, this fourth period became the most productive — 53.3% of all publications (Fig. 2).

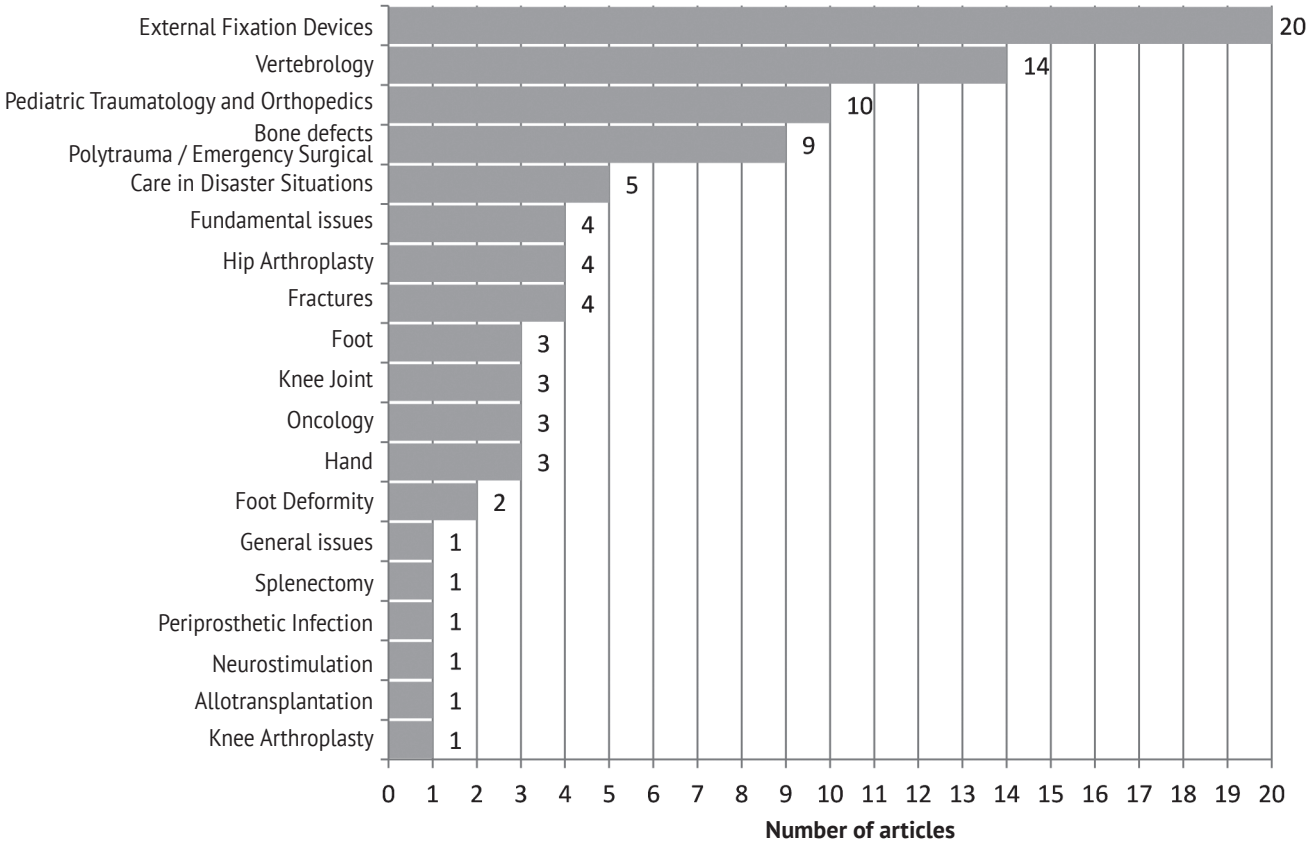


Fig. 1. Distribution of articles by subject (one article could have two or more subjects)

Table 3

Authors with two or more published articles (in descending order of the number of works and alphabetically)

Author	Author's professional institute	City	Articles
Dmitry Yu. Borzunov	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	38, 39, 40, 41, 43
Alexander V. Gubin	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	29, 34, 36, 43
Dmitry A. Popkov	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	50, 51, 52, 62
Gabriel A. Ilizarov	Kurgan All-Union Center for Restorative Traumatology and Orthopaedics	Kurgan	10, 12
	Author indicated "member of the Academy of Sciences" as his professional institute	–	11
Arnold V. Popkov	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	50, 51, 52
Oksana G. Prudnikova	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	34, 53, 54
Anna M. Aranovich	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	50, 51
Irina S. Istomina	N.N.Priorov National Medical Research Center of Traumatology and Orthopaedics	Moscow	5, 17
Razmik A. Keshishyan	Emergency Children's Surgery and Traumatology Research Institute	Moscow	13, 20
Nikolay M. Klyushin	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	45, 64
Marina M. Lipina	I.M.Sechenov First Moscow State Medical University	Moscow	47
	V.A.Nasonova Research Institute of Rheumatology	Moscow	46
Maksim A. Makarov	V.A.Nasonova Research Institute of Rheumatology	Moscow	46, 47
Tatiana A. Malkova	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	43, 45
Alexander Yu. Mushkin	St.Petersburg Research Institute of Phthisiopulmonology	St. Petersburg	37, 49
Oganes V. Oganesyan	N.N.Priorov National Medical Research Center of Traumatology and Orthopaedics	Moscow	5, 17
Vladimir M. Rozinov	Emergency Children's Surgery and Traumatology Research Institute	Moscow	13, 20
Leonid N. Solomin	R.R.Vreden Russian Research Institute of Traumatology and Orthopedics	St. Petersburg	57, 63
Rashid M. Tikhilov	R.R.Vreden Russian Research Institute of Traumatology and Orthopedics	St. Petersburg	59, 60
Eduard V. Ul'rikh	St. Petersburg State Pediatric Medical University	St. Petersburg	29, 36
Alexander Yu. Chevardin	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	38, 39
Igor I. Shubnyakov	R.R.Vreden Russian Research Institute of Traumatology and Orthopedics	St. Petersburg	59, 60
Elena N. Schurova	Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics	Kurgan	53, 54

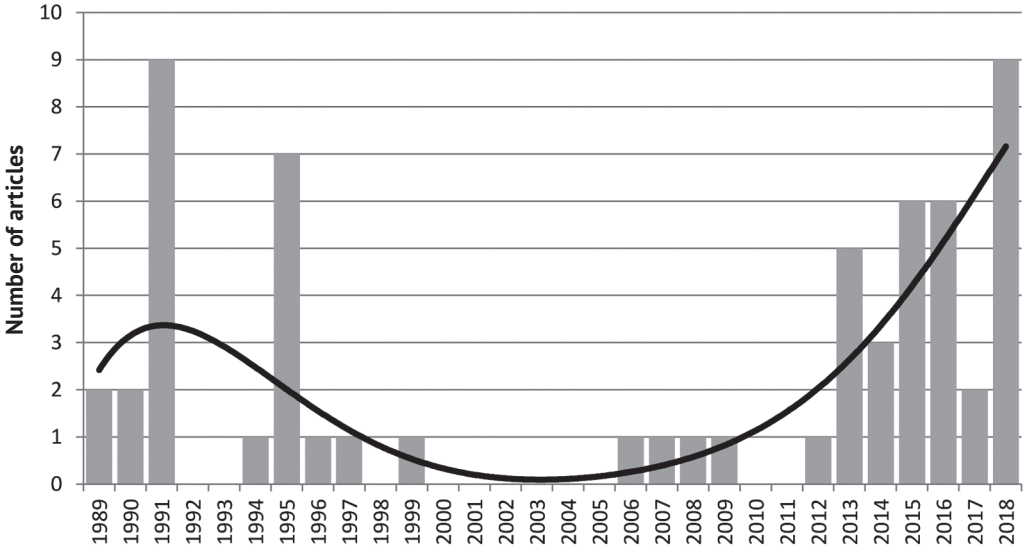


Fig. 2. The distribution of the number of articles by year with a polynomial trend line (sixth degree)

To some extent, perhaps, the increase in the number of publications was also influenced by the introduced system of scientometric results, when colleagues were simply required to have publications. It is gratifying that our colleagues do not follow the path of publications in less rated journals, but set a really high level, sending work to top-rated journals. The fourth wave can be called the renaissance of Russian orthopedic science.

An important indicator of any scientific work is its citation. A total of 60 works of our compatriots have 499 citations in PubMed Central and 6.613 citations in Google Scholar.

In PubMed Central, 30 (50%) of 60 articles were cited, and 30 papers were never cited (Table 4). Some of the uncited articles were published in the fourth "wave", in particular, in 2018. However, many papers published in 1990–2009 still do not have a single citation in PubMed Central.

On the other hand, many articles from the fourth "wave", on the contrary, have a good start of citing which means a real interest to our work on the international scene. Obviously, the proportion of citing recent articles is small and significantly lags behind the works by Ilizarov GA, but their publication has not been published 30 years ago.

46 (76.7%) of 60 works were cited on Google Scholar. All papers that had at least one citation in PubMed Central had citations at Google Scholar. Those works that had at least one citation in PubMed Central had 6499 citations in Google Scholar. Thus, there were 16 works that were not cited in PubMed Central, but had citations in Google Scholar (114 citations).

To date, three works by Ilizarov GA [10, 11, 12] provide 82.2% of all citations of compatriots' articles. When plotting the correlation of the year of publication and number of citations in PubMedCentral, the prevalence of citations of works by Ilizarov GA significantly distorts the mathematical picture (Figure 3).

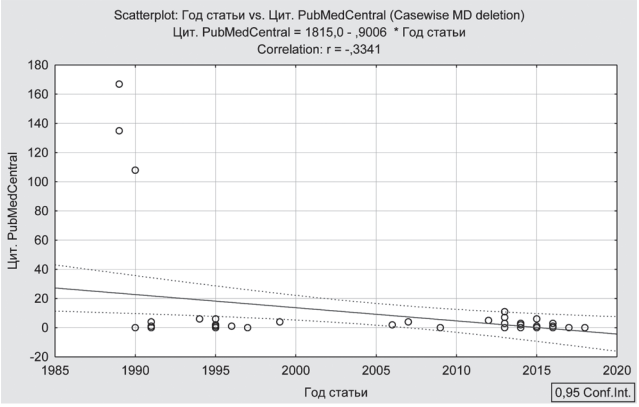
For clarity of analysis, we have excluded, however blasphemous it may sound, the three works by Ilizarov GA [10, 11, 12].

It turned out that the fourth "wave" of publications, which began in 2013, is characterized by respectable citation indicators. These indicators are already better than those of the first, second and third "waves". So far, the advantages of the fourth "wave" citation index over the previous ones (Pearson's 0.4513 coefficient, positive) are unreliable (p = 0.739, Fig. 4). However, so little time has passed that we can confidently hope that the works of our colleagues will continue to find considerable citation numbers.

Table 4

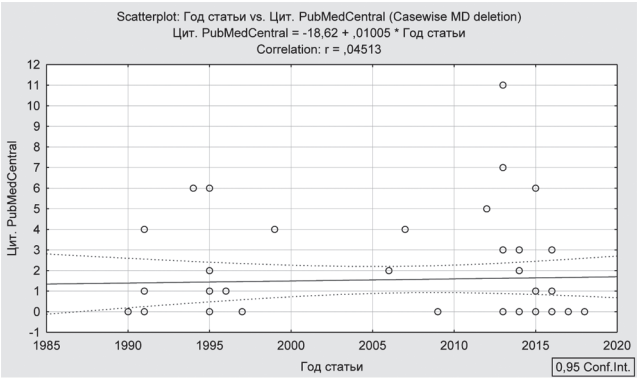
Scientific publications with one or more citations in PubMedCentral in descending order of the number of citations

Authors (including foreign co-authorship)	Year	Number in the List of References	Number of Citations	
			Pubmed Central	Google Scholar
Ilizarov G.A.	1989	[12]	167	2525
Ilizarov G.A.	1989	[11]	135	1965
Ilizarov G.A.	1990	[10]	108	1289
Ryzhkov I.I., Borzilov E.E., Churnosov M.I., Ataman A.V., Dedkov A.A., Polonikov A.V.	2013	[31]	11	31
Ezhevskaya A.A., Mlyavykh S.G., Anderson D.G.	2013	[28]	7	50
Gubin A.V., Borzunov D.Y., Malkova T.A.	2013	[43]	7	47
Keshishyan R.A., Rozinov V.M., Malakhov O.A., Kuznetsov L.E., Strunin E.G., Chogovadze G.A., Tsukanov V.E.	1995	[13]	6	61
Zatsepin S.T., Burdygin V.N.	1994	[24]	6	45
Popkov A., Aranovich A., Popkov D.	2015	[51]	6	21
Borzunov D.Y.	2012	[41]	5	36
Gerasimov A.M., Toporova S.M., Furtseva L.N., Berezhnoy A.P., Vilensky E.V., Alekseeva R.I.	1991	[9]	4	39
Mushkin A.Y., Kovalenko K.N.	1999	[49]	4	37
Gorodetskyi I.G., Gorodnichenko A.I., Tursin P.S., Reshetnyak V.K., Uskov O.N.	2007	[6]	4	34
Shevtsov V.I., Danilkin M.Y.	2008	[55]	4	31
Novikov K.I., Subramanyam K.N., Muradisinov S.O., Novikova O.S., Kolesnikova E.S.	2014	[16]	3	24
Borzunov D.Y., Chevardin A.V.	2013	[38]	3	15
Borzunov D.Y., Chevardin A.Y., Mitrofanov A.I.	2016	[39]	3	10
Toroptsova N.V., Benevolenskaya L.I., Karyakin A.N., Sergeev I.L., Erdesz S.	1995	[32]	2	101
Solomin L.N., Paley D., Shchepkina E.A., Vilensky V.A., Skomoroshko P.V.	2014	[57]	2	19
Sokolovski V.A., Voloshin V.P., Aliev M.D., Zubikov V.S., Saravanan S.A., Martynenko D.V., Nisichenko D.V., Strelnikov K.N.	2006	[56]	2	17
Oganesyan O.V., Istomina I.S., Kuzmin V.I.	1996	[5]	1	46
Bakhtadze M.A., Vernon H., Zakharova O.B., Kuzminov K.O., Bolotov D.A.	2015	[27]	1	14
Azolov V.V., Aleinikov A., Keilmann V.K., Kaiumov Y.	1995	[7]	1	9
Gudushauri O.H., Tvaliashvili L.A.	1991	[44]	1	7
Tikhilov R., Shubnyakov I., Burns S., Shabrov N., Kuzin A., Mazurenko A., Denisov A.	2016	[60]	1	3
Tikhilov R., Bozhkova S., Denisov A., Labutin D., Shubnyakov I., Razorenov V., Artyukh V., Klitsenko O.	2016	[59]	1	10
Barbier D., Neretin A., Journeau P., Popkov D.	2015	[62]	1	6
Popkov A., Aranovich A., Popkov D.	2015	[50]	1	4
Prudnikova O.G., Shchurova E.N.	2016	[53]	1	2
Popkov D., Popkov. A.	2016	[52]	1	1
Total			499	6499



Year of publication

Fig. 3. Correlation of the number of citations and year of publication



Year of publication

Fig. 4. Correlation of the number of citations and year of publication omitting the three articles of G.A. Ilizarov [10–12]

Conclusion

The Scimago Journal & Country Rank that we used, on the one hand, allowed us to select truly modern top-rated journals, but, on the other hand, the rating included mostly "young" journals, which startedkin 1980-90. This probably excluded the possible publications of compatriots, if they were made in the foreign periodicals before 1989 in those journals that were popular at that time.

Another factor that we cannot control is a common rubric for journals, combining the themes of "orthopedics" and "sports medicine". Sports medicine journals often publish purely orthopedic articles. Abroad, the boundaries between these two specialties are not so obvious. However, the filter applied by us excluded a number of orthopedic journals (Knee — 31st place in the ranking, Injury — 53rd place, Foot and Ankle Surgery — 101st place, etc.).

As expected, the proportion of publications from our country in the foreign periodicals is very small, although we did not carry out a specific analysis of this issue. There are a number of reasons for this, ranging from difficulties with the English language to some shortcomings of the design of research.

We found out that there were four "waves" of publications. Moreover, the current fourth "wave" is very productive both in terms of the number of publications and their citation frequency. Our papers are really interesting! On the other hand, the number of publications is still small, and we want this situation to be improved not only due to the introduction of scientometric reporting indicators, but also to scientific enthusiasm.

The leaders among the institutions were: Russian Ilizarov Scientific Center for Restorative Traumatology and Orthopaedics, R.R. Vreden Russian Research Institute of Traumatology and Orthopedics, N.N. Priorov National Medical Research Center of Traumatology and Orthopaedics, Emergency Children's Surgery and Traumatology Research Institute. The fourth wave of publications presents works from only the first two institutions.

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INFORMATION ABOUT AUTHORS:

Andrey P. Sereda — Dr. Sci. (Med.), deputy head of Federal Medical and Biological Agency, Moscow, Russian Federation

Marina A. Andrianova — Cand. Sci. (Eng.), consultant, Department of Health and Industrial Medicine, Federal Medical and Biological Agency, Moscow, Russian Federation