

Original Article •••



Bibliometric analysis of articles published in the Brazilian Journal of Plastic Surgery between 2005 and 2012. Part I: quantitative analysis of articles, authors, and geographical distribution

Análise bibliométrica dos artigos publicados na revista brasileira de cirurgia plástica entre 2005 e 2012. Parte I: análise quantitativa de artigos, autores e distribuição geográfica

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■ ABSTRACT

Introduction: Bibliometric indicators have been implemented in several national and international studies. However, there is no specific information about the scientific articles discussing plastic surgery in Brazil. This study therefore aimed to carry out a bibliometric analysis of articles published in the Brazilian Journal of Plastic Surgery (RBCP), the official journal of the Brazilian Society of Plastic Surgery. **Methods:** A bibliometric analysis using quantitative indicators of all articles published in the RBCP was performed to characterize the scientific results over a seven-year period (2005–2012) marked by major changes to the journal. All articles selected were analyzed individually, in order to collect data on article and author numbers, and their geographical distribution. Two periods (2005–2008 vs. 2009–2012) were considered for comparative analysis. **Results:** A total of 603 articles met the inclusion criteria. The average number of articles published per year and the number of authors per article were 75.38 ± 32.12 articles/year and 3.98 ± 2.01 authors/article, respectively. There was a significant increase ($p < 0.05$) in articles/year in 2009–2012 compared to the earlier time period. No significant variations were detected ($p > 0.05$) in the number of authors/article (2005–2008 = 2009–2012). Most articles came from Brazilian institutions (98.67%; $p < 0.05$), and the Southeast region (63.70%; $p < 0.05$) accounted for most of these publications. **Conclusion:** During the observation period, the number of scientific articles published in the RBCP increased, there was no change in the number of authors per paper, and there was a predominance of articles coming from the Southeast Brazil.

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■ RESUMO

Introdução: Os indicadores bibliométricos têm sido aplicados em diversos estudos nacionais e internacionais. No entanto, não existem informações específicas sobre a produção científica da cirurgia plástica no Brasil. Este estudo, portanto, tem o objetivo de realizar uma análise bibliométrica dos artigos publicados na Revista Brasileira de Cirurgia Plástica (RBCP), periódico oficial da Sociedade Brasileira de Cirurgia Plástica. **Métodos:** Foi realizada uma análise bibliométrica com indicadores quantitativos de todos os artigos publicados na RBCP, para caracterizar os resultados científicos de um período (2005 a 2012) marcado por grandes mudanças. Todos os artigos incluídos foram analisados individualmente, a fim de se coletarem dados referentes ao número de artigos, número de autores e distribuição geográfica. Dois períodos (2005–2008 versus 2009–2012) foram considerados para análise comparativa. **Resultados:** Seiscentos e três artigos preencheram os critérios de inclusão. As médias de artigos publicados por ano e de autores por artigo foram $75,38 \pm 32,12$ artigos/ano e $3,98 \pm 2,01$ autores/artigo, respectivamente. Houve um aumento significativo ($p < 0,05$) de artigos/ano (2005–2008 < 2009–2012). Não foram detectadas variações significativas ($p > 0,05$) no número de autores/artigo (2005–2008 = 2009–2012). A maioria ($p < 0,05$) dos artigos foi proveniente de instituições brasileiras (98,67%), sendo a região sudeste (63,70%) a responsável pela maioria dessas publicações ($p < 0,05$). **Conclusão:** Durante o período investigado, cresceu o número de artigos científicos publicados na RBCP, não houve modificação no número de autores por artigo e existiu um predomínio de artigos oriundos da região sudeste do Brasil.

Descritores: Bibliometria; Cirurgia plástica; Publicações científicas; Publicações periódicas; Revista de Cirurgia Plástica.

INTRODUCTION

Scientific production in Brazil has increased substantially in recent decades. According to a recent survey¹, Brazil is among the main producers of new knowledge, occupying the 14th place (quantitative component) and the 22nd place (qualitative component) in global scientific production.

In this context, the communication of research results is vital to the advancement and development of science. It is the means of disseminating new discoveries and legitimizing scientific production by peers². The dominant contemporary form of science communication is the publication of research articles in scientific journals². Scientific journals represent the most democratic and reliable information portals, as they adopt strict selection criteria for publication³. Several quantitative and qualitative bibliometric studies have attempted to characterize the production of national^{4–11} and international journals^{12–15}.

One role of bibliometry is the objective evaluation of articles published by a specific author, a research group, an institution, or a journal^{6,8}. Although bibliometric indicators have been used as an assessment tool of the different knowledge areas (including plastic surgery^{13–15}) in several national^{4–11} and international^{12–15} studies, there is a lack of specific and unique national information on scientific production in plastic surgery.

Bibliometry is a set of mathematical methods to analyze and measure the quantity and quality of scientific articles, books, and other publications¹⁶. Bibliometric indicators provide information about the process, volume, evolution, visibility, and structure of research. In general, there are three types of indicators:

1) Quantity: measures the productivity of an author or group of researchers (e.g., number of articles per country, growth rate of publications, productivity of the authors/institution, etc.)¹⁶;

2) Performance: measures the quality of a journal, an author, or a group of authors (e.g., citation analysis, impact factor, h-index, etc.)¹⁶; and

3) Structural: measures the connections between publications, authors, or fields of interest¹⁶.

Since scientific production is the embodiment of generated knowledge and because bibliometric measurements assist in demonstrating the development of this production¹¹, the present study aims to analyze, through a bibliometric analysis, the progression of articles published in the Brazilian Journal of Plastic Surgery (RBCP). This is the official journal of the Brazilian Society of Plastic Surgery (SBCP; maximum representative body of national plastic surgery) and the main vehicle for the dissemination of the Brazilian plastic surgeon community's scientific activity. In this study, the complete bibliometric analysis was divided into three parts (I, II, and III) owing to the complexity of the information collected and the need for specific discussions.

METHODS

Study design

An exploratory and descriptive analysis was performed¹⁰, using a bibliometric approach¹⁶ of all articles published in the RBCP between 2005 and 2012, to characterize the as-

pects related to authorship and published scientific production during this period, marked by great changes to the journal's governance structure. These changes included alterations to the editorial board, the journal name, its appearance, including a fourth issue per volume, changes in the submission criteria and peer review in the article submission process (changed to electronic media), and indexing in the SciELO database (Scientific Electronic Library Online). The publication of articles in the journal is now in two languages (Portuguese and English) and there was a recent agreement with Wolters Kluwer and the American Society of Plastic Surgeons (ASPS) to publicize the RBCP content on the Plastic and Reconstructive Surgery (PRS) website. In order to better characterize the evolution of SBCP scientific production, the time period (2005–2012) analyzed was divided into two smaller periods (2005–2008 and 2009–2012), which coincide with the change in name from Journal of the Brazilian Society of Plastic Surgery (RSBCP) to RBCP.

Bibliometric analysis

Due to the characteristics of the RBCP in the analyzed period (2005–2012), only the bibliometric indicators of quantity were accessed. The data collected were divided into three parts (I, II and III) due to the complexity of the information.

Search strategies

All editions (volumes 20–27) of RBCP published between 2005 and 2012 were accessed through the RBCP site (<http://www.rbcn.org.br/>) and the LILACS (Latin American and Caribbean Health Sciences) and SciELO databases. All issues (volume 20, issue 1 to volume 27, issue 4) were included, excluding the supplements. All published articles were identified, analyzed, and data-extracted.

Selection of scientific articles and data extraction

The articles were selected for analysis based on their titles and abstracts, when available. All potentially eligible articles were stored in their full versions for later review. Each item included was analyzed individually, in order to collect data for the year of publication, number of articles and authors, geographical distribution (country, state, and affiliation), with the data extracted from the main affiliation (always considering the first institution cited), prior presentation at scientific meetings, category/article section (original article, review article or case reports), study design, and levels of evidence^{13,15}. In this report (Part I), the only information presented relates to the number of articles published, number of authors per article, and geographical distribution of articles. One of the authors was responsible for the extraction of all data independently to avoid inter-rater bias¹⁴.

Based on similar studies^{4,12}, some categories (Editorials, Editorial Message from the SBCP editorial board, Special Article, Ideas and Innovations, Review, Discussion, Letter to

the Editor, Forum, Discussion, Official Calendar, Acknowledgments, and Errata) published in the RBCP were not eligible for analysis. It was not the intention of this study to verify the validity and/or consistency of any information contained in the articles; the only purpose was to categorize them⁴.

Statistical analysis

All information was compiled in the Windows Excel 2013 software (Office Home and Student 2013, Microsoft Corporation, USA). For descriptive analysis, metric variables used averages and categorical variables used percentages. Two statistical tests (ANOVA and equality of two proportions) and the mean confidence interval were used for all comparative analyses between the two time periods. The Statistical Package for Social Sciences version 17 for Windows (SPSS, Chicago, IL, USA) was used for all analyzes. Values were considered significant at a confidence interval of 95% ($p < 0.05$).

RESULTS

Between 2005 and 2012, the RBCP (official journal of the SBCP) published eight volumes (volumes 20–27) with four issues each, totaling 32 issues. A total of 722 scientific articles were published in this period. Based on the methodology described above, 603 (83.52%) articles met the inclusion criteria and 119 (16.48%) were excluded (Figure 1).

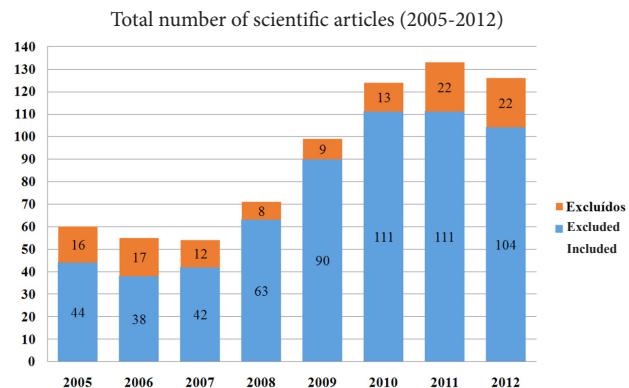


Figure 1. Total number of scientific articles published in the Brazilian Journal of Plastic Surgery between 2005 and 2012 ($n = 722$).

The analysis revealed that most of the articles were included ($p = 0.004$).

Number of scientific articles

During this period, the average number of published articles was 75.38 ± 32.12 articles/year, ranging from 38 to 111 articles/year (Figure 2).

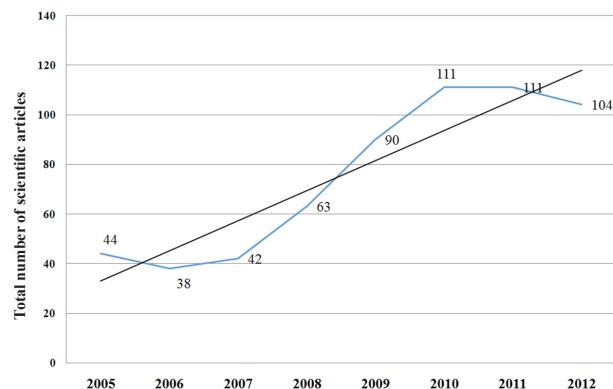


Figure 2. Number of scientific articles published in the Brazilian Journal of Plastic Surgery between 2005 and 2012 that met the inclusion criteria for this study ($n = 603$). Note the increasing curvature of the linear trend line.

The comparative analysis between the periods showed a growing number of articles published/period (187 [31.01%] articles in 2005–2008 versus 416 [68.99%] articles in 2009–2012; $p < 0.001$), causing a 122.46% increase in publications between 2005–2008 and 2009–2012.

Number of authors per scientific paper

Between 2005 and 2012, the average number of authors per article was 3.98 ± 2.01 , ranging from 1 to 15 authors/article. The comparative analysis between the periods showed no significant variation in the number of authors/article between the two time periods (3.82 ± 1.93 authors/article in 2005–2008 vs. 4.05 ± 2.05 authors/article in 2009–2012; $p = 0.206$) (Figure 3).

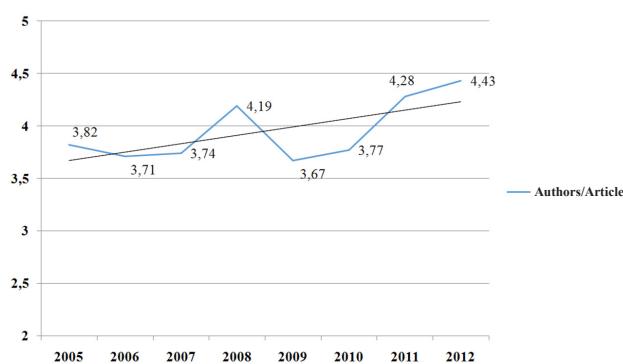


Figure 3. Average number of authors per article published in the scientific Brazilian Journal of Plastic Surgery between 2005 and 2012. Note the increasing curvature of the linear trend line.

Geographical distribution

There was a predominance ($p < 0.001$) of scientific articles from Brazilian institutions (595 [98.67%] articles). Only 1.33% (eight items) of the scientific articles were from international institutions, two (0.33%) contributions were from Portugal, two (0.33%) from the United States, one (0.17%) from France, one from Spain, one (0.17%) from Colombia, and one (0.17%) from Turkey. The comparative analysis between the periods showed that there was an increase in the number of international contributions (one article in 2005–2008 vs. seven articles in 2009–2012; $p < 0.001$).

All five geographical regions of Brazil contributed articles during the analyzed period (Figure 4). The Southeast region was responsible for most of the studies (379 articles),

Demographic regions (2005-2012)

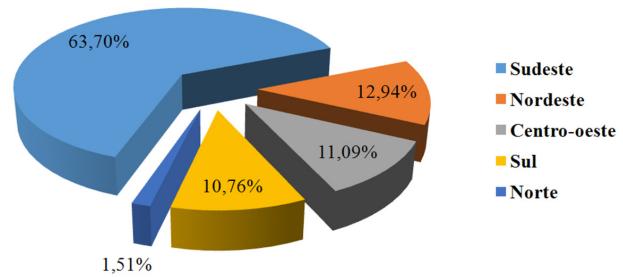


Figure 4. Number of scientific articles published in the Brazilian Journal of Plastic Surgery between 2005 and 2012, distributed according to the five geographic regions of Brazil ($n = 603$).

followed by the Northeast (77 articles), Midwest (66 articles), South (64 articles), and North (9 items) ($p < 0.001$ for all comparisons). Ten states accounted for the majority (92.37%) of scientific literature published in the RBCP between 2005 and 2012 (Figure 5). The comparative analysis between the periods showed a significant reduction in the contribution percentage coming from Minas Gerais (17.6% of all articles in 2005–2008 vs. 7.2% of all articles in 2009–2012; $p < 0.001$) and the Federal District (11.2% of all articles in 2005–2008 vs. 6.3% of all articles in 2009–2012; $p = 0.035$). There was a significant increase in the number of articles from Ceará (2.7% of the total articles in 2005–2008 vs. 8.2% of all articles in 2009–2012; $p = 0.011$). Contributions from the other states remained unchanged ($p > 0.05$) over the two periods.

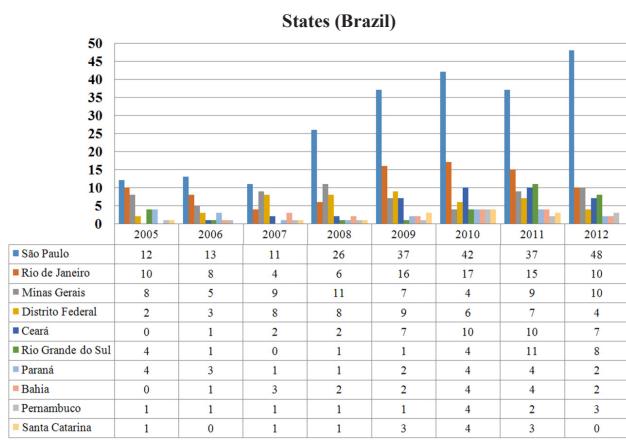


Figure 5. Number of scientific articles published in the Brazilian Journal of Plastic Surgery between 2005 and 2012, distributed according to top 10 producing states ($n = 557$).

States (Brazil)

DISCUSSION

There is a consensus in the scientific community on the need to share scientific results, that science that is not communicated is non-existent², and that from the maximum "the words the wind takes; what is written, is"¹⁷. Therefore, scientific research only makes its real contribution to the community when it reaches its ultimate goal: publication in a peer-reviewed journal². To do this, researchers must select a journal in which to publish their results. This selection is a complex task, and has been particularly important for researchers and institutions, because the bodies that regulate and foster research in Brazil take into account privileged publications in journals with better performance/reputation (impact factor) in their respective fields of knowledge¹⁸. Thus, researchers have been under increasing pressure to publish in international journals with high impact factors¹⁹.

It is important to note that scientific results should preferably be published in the journal most often read by the target audience^{18,19}. In fact, results of interest to the Brazilian community should not be published in foreign journals, as they may never be read and cited^{18,19}. The experimental publications in plastic surgery, for example, have been preferentially published in high impact journals, but not necessarily those journals that are often read by plastic surgeons²⁰. Thus, Brazilian researchers' awareness of the importance of publishing their main scientific results in national journals is necessary to improve their studies' impact factors, and to force foreign researchers to access and read these journals in order to use Brazilian science²¹. In China, for example, researchers publish in several international journals, but their main results appear in Chinese journals¹⁹. Furthermore, the majority (87.4%) of plastic surgery abstracts presented at scientific events in Korea are published in Korean journals²². It is therefore necessary to create a new cycle that fosters national publication. In this way, the effort of some authors will have an impact on the improvement of the

quality and dissemination of national journals.

In this context, the RBCP has been edited uninterruptedly since 1986 and distributed to all members of the SBCP in order to register the scientific production in plastic surgery (work related to aesthetic and reconstructive surgery, including basic and applied research), and to promote the study, improvement, and update of the specialty, always emphasizing its interdisciplinary aspect. In this study, we evaluated the articles published in the RBCP, from 2005 to 2012, to characterize the evolution of scientific publications during a period in which the Editorial Board worked to improve the quality and visibility of this, the most representative Brazilian plastic surgery journal.

The methodology used in this study, quantitative bibliometric analysis, is a useful tool to assess the internal affairs of journals and the relative positions between the various authors (or research groups) and competing journals⁸. Thus, similar to the bibliometric evaluations of other journals^{6,23-25}, the data presented in this full review (parts I, II and III) provide the developmental profile of the articles published in the RBCP between 2005 and 2012. This information can be used to guide the editorial policies of the editors and reviewers, assist authors on where to publish, and assist readers in their search for scientific information⁶. In addition, these analyses provide insight into the characteristics of the knowledge production process, and increase the viability of the growth analysis of science and the stage of each medical specialty²⁵.

Number of scientific articles

This bibliometric analysis showed that there was a significant increase in the number of articles published in the RBCP between 2005 and 2012, similar to that reported in other journals^{5,24}. The overall percent increase (122.46%) in the number of published articles is consistent with the data presented in another study¹⁴, which found increases of 121% (PRS), 175% (British Journal of Plastic Surgery [BJPS] - currently Journal of Plastic Reconstructive and Aesthetic Surgery [JPRAS]), and 65% (European Journal of Plastic Surgery) in the number of articles published in these three journals from 1972–2004.

We highlight some reasons for this publication increase, without expecting to exhaust the possibilities. First, the increase may be related to the expansion of scientific literature in plastic surgery¹⁴, in step with the growth of the national scientific production¹, as well as in other knowledge areas¹⁰. Second, with all the transformations in the structure of RBCP cited in the methods section, a greater number of authors who formerly published in general medical and surgical or specialty surgical focused journals may have opted to publish in the RBCP. The quantitative and qualitative improvement of the articles resulted in the indexing of RBCP in the SciELO database, which may also have encouraged authors to submit their articles to the RBCP. Moreover, authors are increasingly being encouraged to limit the number of pages per article, which allows more articles published per issue¹⁴. In addition, the increased publications may reflect an increase in the recognition of the journal's reputation²⁶. Nevertheless, further studies are required to examine these aspects in detail.

Number of authors per scientific paper

As the issue of the number of authors per scientific article is complex and is directly related to authorship criteria²⁷⁻³¹, this study will highlight some current and relevant aspects of the subject.

In the present study, there was no significant difference in the number of authors/article between the two time periods, a result similar to another bibliometric analysis⁹ that evaluated 14 years of Arquivos Brasileiros de Oftalmologia. However, an intriguing phenomenon (significant increase in the number of authors/article) has been reported in the analysis of different journals (British Medical Journal [BMJ], Journal of Pediatric Surgery, Journal of Trauma, Journal of the American Medical Association [JAMA], The New England Journal of Medicine [NEJM], PRS and BJPS/JPRAS, among others) under substantially longer periods of time^{26,29-32}. Thus, our increase in the number of authors/article (3.82 in 2005–2008, compared to 4.05 in 2009–2012) is consistent with the results of other studies (e.g., 1955: 1.4 and 1.7 authors/article in the PRS and BJPS/JPRAS, respectively; 2005: 4.0 and 4.2 authors/article in the PRS and BJPS/JPRAS, respectively)^{26,29-31}. However, future research, with the inclusion of a longer time range than the one used in this study, may better characterize the upward trend shown in Figure 3.

Although the authors of the present study, like others²⁹, are aware that the quantitative bibliometric data presented do not allow any interpretations of the real reasons for the upward trend, it is important to note that there are several acceptable or justifiable reasons for this phenomenon. The current "publish or perish" culture puts enormous pressure on researchers to increase publication output, and is probably the main reason for this trend^{26,29-31}. The growing number of medical scientists may also explain this increase, at least partially³⁰. Other explanations, such as the remarkable increase in the complexity of research, the growth of translational medicine, and multicenter studies which include several experts, have also been described as an acceptable explanation^{9,26,29-31}. On the other hand, numerous reasons are unacceptable or unethical. The most common trick used to increase the number of published articles is the exchange of courtesies: a researcher grants an authorship to another researcher in exchange for assuring a co-authorship in one of the colleague's future publications. Other actions, such as a "gift authorship" (inclusion of authors who did not participate effectively in the study, such as heads of departments or members of study sponsors as a return gesture), the "ghost" authors (usually a professional writer or a well-known expert, whose real role in article preparation is not well established), are also described as unjustifiable^{26,28,29,31}.

An intriguing finding is that the prevalence of "gift authorship" and "ghost authorship" can reach 21% in some journals (Annals of Internal Medicine, JAMA, The Lancet, Nature Medicine, NEJM and PLoS Medicine)²⁸. Moreover, a worrying portion (up to 60%) of the authors of articles published in international journals did not meet the criteria for authorship established by the International Committee of Medical Journal Editors (ICMJE) in analyses of respect for authorship crite-

ria^{28,30}. Within the context of plastic surgery, a recent study³¹ evaluating members of the American Association of Plastic Surgeons found that 64% (2003) and 37% (2011) of the included surgeons had previously named a co-author that did not meet all the ICMJE criteria.

In this context, several rules have been established to try to suppress such unacceptable conduct^{27,28,30,31}. Some journals (e.g., PRS) are embracing authorship criteria established by various organizations, such as ICMJE, Council of Science Editors, World Association of Medical Editors, and Committee on Publication Ethics³². In addition to the criteria suggested by the ICMJE, detailed in the RBCP Instructions to Authors²⁷, the Editorial Board requires a statement outlining each author's contributions for those studies with more than eight (original article) or five (other categories) authors. Perhaps, like other journals (e.g., BMJ, The Lancet, JAMA, and PRS)³⁰⁻³³, author contributions should be required for all articles submitted for evaluation to the RBCP. Furthermore, the inclusion of individual authorship criteria for all authors on the title page or at the end of articles, which has also been adopted by various journals^{28,31,33}, can improve the criticism by both reviewers and peers. Reviewer requests for a thorough analysis of authorship criteria during the peer review process, as well as the improvement of education to all those involved in scientific research are also described^{28,31}.

Regardless of any measures to suppress this³², these rules are often violated, making it difficult to know each author's contributions to the work²⁹. Thus, everyone involved in the development, research, writing, editing, and publication of scientific articles should understand the importance and the implications of fair authorship credit and should strive to respect it^{28,32}.

Geographical distribution

This study found that between 2005 and 2012, there was a predominance (98.67%) of articles from national institutions, with minimal international contribution. National journals analyses also revealed the same situation^{7,9,23}. Most likely, the publication of RBCP in English and the increase of its international visibility through its inclusion in the SciELO database, its partnership with the ASPS, the creation of the joint PRS and RBCP site, and the larger number of accesses to its content³⁴ has transformed the RBCP into more internationally recognized journal, a trend that is similar to the findings of bibliometric studies of other national journals^{7,9,23}. This is also in accordance with the data presented in this bibliometric analysis, as the number of international articles published in 2009–2012 was significantly higher than the number published in 2005–2008. Furthermore, the increasingly higher number of international articles submitted to RBCP increases its strength as an important vehicle of Brazilian plastic surgery. It is therefore expected that there will be a further increase in the number of contributions from national authors.

This study revealed that the scientific articles published in the RBCP between 2005 and 2012 originated markedly from the Southeast region of Brazil, a trend that was also found in other journals^{5,8-10,23,24}. This can be explained by the

higher concentration of both medical institutions and professionals, as well as the economic centralization of the country in this geographical region⁹.

In this aspect, an interesting recently published study³⁵ conducted by plastic surgeons, addressed surgical research in northern and northeastern Brazil. Among the Master's and PhD level teachers from the three universities, the authors³⁵ point to a low percentage of teachers who are plastic surgeons as the reason for low knowledge production in this area. This is consistent with the data presented here, since only 14.45% of the articles published in RBCP originated from the North and Northeast regions of Brazil. Knowing the academic reality of the surgical area in the country's public universities is essential to reducing these inequalities and increasing the international competitiveness of Brazilian research³⁵. This study provides important and specific bibliometric information about the field of Brazilian plastic surgery, which can also help inform the policies of governmental institutions and the RBCP Editorial Board. Thus, an alternative would be that the incentive programs and fees of the SBCP and RBCP³⁶ turn their attention to regions of the country with lower publications rates.

It is important that plastic surgeons from different regions of Brazil publish the results of their surgery, as well as their technical innovations, as these contributions are essential to increasing the arsenal of existing surgical techniques available to the Brazilian plastic surgeon. It is likely that there are many alternative techniques (including surgical approaches and use/adaptation of materials) used in different regions of Brazil that are unknown among peers across the country. Moreover, as surgeons from different countries stand out because of their publications, often coming from private practice³⁷, those surgeons who perform plastic surgery in private clinics and hospitals also have to publish their experiences regardless of the reputation or encouragement of their institutions, besides the increase in contributions of surgeons with academic connection.

CONCLUSIONS

This quantitative bibliometric study (Part I) showed that during the period assessed (2005–2012), there was significant growth in the number of scientific articles published in the RBCP, with no significant variation in the number of authors per article. The articles mostly originated from the southeast region of Brazil, with a significant increase in international contributions in recent years.

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