Worldwide Academic Contributions of
Japanese Neurosurgeons
—Annual Meeting: President’s Keynote Lecture—

Tomio SASAKI,1 Kimiaki HASHIGUCHI,1 Koji YOSHIMOTO,1 Akira NAKAMIZO,1 Masahiro MIZOGUCHI,1 and other Neurosurgical Staff of Kyushu University

1Department of Neurosurgery, Graduate School of Medical Sciences, Kyushu University, Fukuoka

Abstract

Based on the data reported in the National Institute of Science and Technology Policy 2010, Japan is ranked in fourth place in the world in terms of the numbers of the articles in the fields of clinical medicine. However, there had not been any objective data regarding the numbers of publications by neurosurgeons. As it is important for neurosurgeons to realize the extent of academic contributions by the neurosurgeons in different countries, the numbers of publications in the major journals by the members of the Japan Neurosurgical Society and those from neurosurgical institutions around the world were analyzed using both the biomedical literature database PubMed and the publication database “ISI Web of Knowledge.” Parts of the results were presented in the 69th Annual Meeting of the Japan Neurosurgical Society. As to the number of neurosurgical publications in English from the top 9 countries, the US has been consistently in first place and Japan in second. However, the number of publications from Japan has been decreasing since 2000. With regards to the “top 8 journals” such as the Lancet and the Journal of the American Medical Association, the number of first-author publications by Japanese neurosurgeons increased in the late 1980s and had been 2–9 articles per year until recently. In the “top 12 neuroscience journals” which include Stroke, Neuro-Oncology, Cancer Research, and others, Japan had been in the third next to the US and UK till 2004, but Germany surpassed Japan in 2005. In the “top 6 clinical journals” such as the Journal of Neurosurgery and Neurosurgery, the US has been consistently keeping first place and Japan second place since 1977. Searches using the key word elucidated that Japanese neurosurgeons are greatly contributing in the field of “aneurysm.” Regarding the number of publications per neurosurgeon, Canada and UK are in the forefront and Japan is down to eighth place. Japanese neurosurgeons have been contributing greatly next to the Americans to the field of clinical neurosurgery and neuroscience by publishing in English. However, the number of publications by Japanese neurosurgeons has been declining since 2000. The Japan Neurosurgical Society must come up with countermeasures to address this problem.

Key words: Japan, neurosurgery, neuroscience, English article, academic contribution

Introduction

The National Institute of Science and Technology Policy and Ministry of Education, Culture, Sports, Science and Technology, Japan previously published the Japanese Science and Technology Indicators 2010,2 in which Japan’s science and technology activities were analyzed systematically based on objective and quantitative data. As a part of the data, the numbers of scientific articles written by English and published in top class journals in each country in the world were analyzed. Based on the report, Japan was ranked in fifth place following the US, China, UK, and Germany, when the numbers of articles in all scientific fields were counted. For articles in the fields of clinical medicine, Japan was ranked in fourth place.3) However, no objective data regarding the numbers of publications by the members of each medical division were provided.

The first Annual Meeting of the Japan Neurosurgical Society (JNS) was held in 1948. Since then, Japanese neurosurgeons have worked very hard for

Parts of this article are available at and free to download from the homepage of the Japan Neurosurgical Society at http://jns.umin.ac.jp/.
the advancement of the field. As time goes by, the number of articles published in prominent journals in English has increased, especially from 1977. By the 1980s, the contribution of Japanese neurosurgeons in this field was recognized by the rest of the world. However, there has not been any objective data comparing the extent of contributions in the academic neurosurgical journals by the neurosurgeons in different countries. Therefore, we analyzed the contribution of Japanese neurosurgeons to publications in world’s top journals, and found valuable and interesting results that are reported here.

Materials and Methods

The chronological changes in the numbers of publications in major journals by the members of the JNS and from neurosurgical institutions around the world were analyzed.

The number of publications by the JNS members were analyzed by sub-categorizing into “top journals” (which include Nature, Science, Cell, Nature Medicine, the New England Journal of Medicine, the Lancet, the Journal of the American Medical Association, and Cancer Cell), “basic science journals” (which include the Journal of Clinical Investigation, Neuron, Brain, Proceedings of the National Academy of Sciences of the United States of America, Cancer Research, Stroke, Oncogene, Clinical Cancer Research, the FASEB Journal, Journal of Cerebral Blood Flow and Metabolism, the Journal of Biological Chemistry, and Neuro-Oncology), and “neurosurgical journals” (which include Journal of Neurosurgery, Neurosurgery, American Journal of Neuroradiology, Acta Neuochirurgica, Surgical Neurology, and Neurosurgical Review). Data were collected from the biomedical literature database PubMed, provided by the US National Library of Medicine, National Institutes of Health. Publications by the JNS members in the journals mentioned above were extracted by searching PubMed for the names of the JNS members (based on the JNS membership roll) and the journals’ name. The identities of the authors were confirmed by checking original articles for authors’ full name, their institutions, and publication year, when possible. The number of publications by JNS members from foreign institutions was extracted separately. The chronological changes in the number of publications by the JNS members in each journal were analyzed based on these database searches.

The chronological changes in the number of publications in the major journals from neurosurgical institutions around the world were analyzed using the publication database “ISI Web of Knowledge,” provided by Thomson Reuters. The total number of publications from neurosurgical institutions around the world and the number of publication from the major countries were analyzed. For the latter, total number, number by each journal, and number by each keyword were analyzed. The same sub-categories of journals that were used for analyzing JNS member publication were used for these analyses. The “major countries” consist of 9 countries, which are Japan (“Japan”), the US (“United States”), UK (including “England,” “Wales,” “Scotland,” “Ireland,” and “United Kingdom”), Germany (including “Deutschland”), France (“France”), Italy (“Italy”), Canada (“Canada”), China (“China”), and South Korea (“South Korea”). Name of the country and affiliation (“Neurosurg,” “Neuro surg,” or “Neurochirurg”) were entered into the “Affiliation” category. The searches were limited to “article” or “review” for the “Type of Articles” category and “English” for the “Languages” category. The name of each journal was entered into the “Topic” section for analyzing chronological changes of publications in each journal. Each keyword was entered into the “Topic” section for analyzing chronological changes of publications by the following keywords: “aneurysm,” “subarachnoid hemorrhage,” “endovascular,” “gamma knife” (or “cyber knife”), “glioma,” “meningioma,” “hydrocephalus,” “skull base,” “deep brain stimulation,” “epilepsy surgery,” “pediatric” (or “child”), “spine,” and “trauma.” These keywords were selected based on the number of publication hits and for the purpose of covering the vast fields related to neurosurgery. Data extracted from these searches were analyzed for the numbers of publications in each category and their chronological changes.

Results

The chronological changes in the number of neurosurgical publications in English from the top 9 countries are shown in Fig. 1. The US is in first place and continues to publish more every year. Japan was in second place. The gap between Japan and the UK and Germany in third and fourth places was very wide in the 1990s, but has narrowed dramatically due to the declining number of publications from Japanese neurosurgeons since 2000. Figure 2 demonstrates the percentage contribution to publications by the top 9 countries. The contribution from Japan has been also declining since 2000. On the other hand, the contributions from South Korea and China have been rapidly increasing.

To analyze the academic contribution of the JNS members more precisely, we performed searches of the number of publications by categorizing journals
Fig. 1 Chronological changes in the number of neurosurgical publications in English from the top 9 countries. Looking at the degree of participation for publication of papers, the US is in first place and continues to publish more every year. Japan has been in second place. However, the contribution from Japan has been declining since 2000.

Table 1

<table>
<thead>
<tr>
<th>Name of the journal</th>
<th>Impact factor (2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature</td>
<td>34.48</td>
</tr>
<tr>
<td>Science</td>
<td>29.75</td>
</tr>
<tr>
<td>Cell</td>
<td>31.15</td>
</tr>
<tr>
<td>Nature Medicine</td>
<td>27.14</td>
</tr>
<tr>
<td>The New England Journal of Medicine</td>
<td>47.05</td>
</tr>
<tr>
<td>The Lancet</td>
<td>30.76</td>
</tr>
<tr>
<td>The Journal of the American Medical Association</td>
<td>28.9</td>
</tr>
<tr>
<td>Cancer Cell</td>
<td>25.29</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Name of the journal</th>
<th>Impact factor (2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Journal of Clinical Investigation</td>
<td>15.39</td>
</tr>
<tr>
<td>Neuron</td>
<td>13.26</td>
</tr>
<tr>
<td>Brain</td>
<td>9.49</td>
</tr>
<tr>
<td>Proceedings of the National Academy of Sciences of the United States of America</td>
<td>9.43</td>
</tr>
<tr>
<td>Cancer Research</td>
<td>7.54</td>
</tr>
<tr>
<td>Oncogene</td>
<td>7.14</td>
</tr>
<tr>
<td>Stroke</td>
<td>7.04</td>
</tr>
<tr>
<td>Clinical Cancer Research</td>
<td>6.75</td>
</tr>
<tr>
<td>The FASEB Journal</td>
<td>6.4</td>
</tr>
<tr>
<td>Journal of Cerebral Blood Flow and Metabolism</td>
<td>5.46</td>
</tr>
<tr>
<td>The Journal of Biological Chemistry</td>
<td>5.33</td>
</tr>
<tr>
<td>Neuro-Oncology</td>
<td>4.98</td>
</tr>
</tbody>
</table>

Fig. 1 Number of first-author publications in the top 8 journals. The number of first-author publications in the top journals by Japanese neurosurgeons increased in the late 1980s and had been 2–9 articles per year until recently. The number has been low for the past 3 years.

into three sub-groups: “top journals,” “basic neuroscience journals,” and “neurosurgical journals.”

Eight journals listed in Table 1 were selected as the “top journals” based on the impact factors in 2009. As shown in Fig. 3, the number of first-author publications in the top journals by Japanese neurosurgeons increased in the late 1980s and had been 2–9 articles per year until recently. Thus, several JNS members have been making great academic contributions which is beyond praise, although the number of publications has been low for the past 3 years.

Next, we analyzed the number of publications in the top 12 neuroscience journals (listed in Table 2) from the top 9 countries. The chronological changes are shown in Fig. 4. Japan had been in third place af-
Fig. 4  Chronological changes in the number of publications in the top 12 neuroscience journals from the top 9 countries. Japan had been in third place after the US and UK till 2004, but Germany surpassed Japan in 2005. Japan is now down to fourth place.

Fig. 5  Chronological changes in the number of articles written by Japanese neurosurgeons in the top 12 neuroscience journals. Japanese neurosurgeons published more in *Journal of Cerebral Blood Flow and Metabolism*, *Neuro-Oncology*, *Stroke*, and *Cancer Research*.

Fig. 6  Chronological changes in the number of publications in the top 6 clinical journals from the top 9 countries. Japan has been consistently ranked in second place next to the US since 1977.

Fig. 7  Number of publications in the top 6 clinical journals by Japanese neurosurgeons. The number of publications increased by leaps and bounds during the 1980s and 1990s, but has been gradually decreasing since 2000. Approximately 60% of the articles by Japanese neurosurgeons were published in either *Journal of Neurosurgery* or *Neurosurgery*.

Table 3  Top 6 clinical journals

<table>
<thead>
<tr>
<th>Name of the journal</th>
<th>Impact factor (2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Journal of Neurosurgery</em></td>
<td>2.59</td>
</tr>
<tr>
<td><em>Neurosurgery</em></td>
<td>2.86</td>
</tr>
<tr>
<td><em>American Journal of Neuroradiology</em></td>
<td>3.3</td>
</tr>
<tr>
<td><em>Acta Neurochirurgica</em></td>
<td>1.47</td>
</tr>
<tr>
<td><em>Surgical Neurology</em></td>
<td>1.38</td>
</tr>
<tr>
<td><em>Neurosurgical Review</em></td>
<td>1.9</td>
</tr>
</tbody>
</table>

We selected 6 journals listed in Table 3 as the “top clinical journals.” Figure 6 shows chronological changes in the number of publications from the top 9 countries. In those “top clinical journals,” the US has consistently maintained first place and Japan second place since 1977. The number of publications in the top 6 clinical journals by Japanese neurosurgeons over the 5-year period since 1965 is shown in Fig. 7. The number increased by leaps and bounds during the 1980s and 1990s, but has been gradually decreasing since 2000. Approximately
60% of the articles by Japanese neurosurgeons were published in either Journal of Neurosurgery or Neurosurgery.

Journal of Neurosurgery: As expected, the US has always been ranked in first place (Fig. 8). Japan has consistently been in second place since 1977, reflecting the hard work and efforts by Japanese neurosurgeons. However, the gap between the US and Japan was very wide. Germany and Canada have been competing for third place.

Neurosurgery: As shown in Fig. 9, Japan had been in second place till 2005, but Germany has been competing strongly lately.

American Journal of Neuroradiology: Japan has been in second place by a wide margin over Germany in third place (Fig. 10). In this field, our Japanese neurosurgeons have been doing good work.

Acta Neurochirurgica: This journal is the European neurosurgical journal. However, Japanese neurosurgeons have been publishing great work in Acta Neurochirurgica. Between 1994 and 2001, Japanese neurosurgeons contributed most to the journal and occupied first place. But, lately Japan has been in second place next to Germany (Fig. 11). The reason for the sudden increase in the number of publications in 1994 is due to the increase in the supplements.

Surgical Neurology: In Surgical Neurology, Japan is competing with the US (Fig. 12). This also reflects the hard work of Japanese neurosurgeons.

Neurosurgical Review: This journal is published by Springer in Germany. Therefore, in this journal, Germany had been in first place for quite some time, but Japan has taken over for the past couple of years.
Fig. 12 Comparative analysis among top countries in Surgical Neurology. Japan is going head to head with the US.

Fig. 13 Comparative analysis among top countries in Neurosurgical Review. Germany had been in first place for quite some time, but Japan has taken over for the past couple of years.

(Fig. 13). The US was in third place next to Germany in 2009.

The chronological publications in each sub-field of neurosurgery were also analyzed using the following keywords: “aneurysm,” “subarachnoid hemorrhage,” “endovascular,” “gamma knife” (or “cyber knife”), “glioma,” “meningioma,” “skull base,” “hydrocephalus,” “deep brain stimulation,” “epilepsy surgery,” “pediatric” (or “child”), “spine,” and “trauma.” These searches were done in all journals published worldwide regardless of the journal standing, but limited to “article” or “review” for the “Type of Articles” category and “English” for the “Languages” category.

“Aneurysm”: When the number of publications from each country by the keyword “aneurysm” is compared, Japan is head to head with the US (Fig. 14). The gap between Japan and South Korea in third place is still wide, although the number of publications from South Korea has increased for the past 3 years. Japanese neurosurgeons are thus strong in this field.

“Subarachnoid hemorrhage”: For subarachnoid hemorrhage, there were as many publications from Japan as from the US till 2003, but the number has been declining recently (Fig. 15). However, Japan is still in second place.

“Endovascular”: In the endovascular field, Japan is next to the US (Fig. 16).

“Gamma knife” (or “cyber knife”): As shown in Fig. 17, Japan is again in second place in this field, but recently South Korea is contributing to the field as well.

“Glioma”: In the glioma field, Japan was getting close to the US in the 1990s, and has kept second
Fig. 16 Number of publications analyzed by the keyword “endovascular.” In the endovascular field, Japan is next to the US.

Fig. 17 Number of publications analyzed by the keyword “gamma knife” or “cyber knife.” The search by “gamma knife” or “cyber knife” shows that Japan is again in second place, but recently South Korea is contributing to the field as well.

Fig. 18 Number of publications analyzed by the keyword “glioma.” In the glioma field, Japan was getting close to the US in the 1990s, and has kept second place even after 2000. However, Germany and China caught up with Japan in 2008.

Fig. 19 Number of publications analyzed by the keyword “meningiomas.” In meningioma that is the major benign tumor, Japan is again next to the US.

Fig. 20 Number of publications analyzed by the keyword “skull base.” In the field of skull base, the US absolutely dominates the field. Japan and Germany are competing for second place.
Fig. 21  Number of publications analyzed by the keyword “hydrocephalus.” For hydrocephalus, Japan had been in second place for quite some time, but now UK and Germany are ahead of Japan.

Fig. 22  Number of publications analyzed by the keyword “pediatric” or “child.” Regarding the number of articles on pediatric or child, Japan is in fourth place, behind the US, Canada, and Italy.

Fig. 23  Number of publications analyzed by the keyword “deep brain stimulation.” The number of articles on deep brain stimulation has increased dramatically since 1997, but the number of articles from Japan has not increased as much.

Fig. 24  Number of publications analyzed by the keyword “epilepsy surgery.” In this field, the US has consistently been in first place. Not enough articles on epilepsy have been published from Japan.

Absolutely dominates the field as well as the search by the keyword “hydrocephalus.” Japan is in fourth place, behind the US, Canada, and Italy (Fig. 22).

“Deep brain stimulation”: The number of articles on deep brain stimulation has increased dramatically since 1997, but articles from Japan have not increased as much, dropping down to sixth place (Fig. 23).

“Epilepsy surgery”: Not enough articles on epilepsy have been published from Japan. Japan is currently in sixth place (Fig. 24).

“Spine”: For spine, the contribution by Americans is huge, whereas that by Japanese is minimal, putting us in sixth place (Fig. 25).

“Trauma”: Again, the US has been dominating the field of trauma (Fig. 26). Not many articles on trauma have been published from Japan. Japan is now in fifth place.

The relationship between numbers of publications and career years after becoming neurosurgical resident is shown in Fig. 27. The numbers of publications in the top 8 journals, top 12 basic neuroscience journals, and top 6 neurosurgical journals were counted together. The neurosurgeons who are at 9–11 years into their neurosurgical career have most actively published in top class journals regardless of the institution where the work was done.

As previously stated, we calculated the total number of publications by all neurosurgeons and performed a comparative analysis among countries. However, the number of neurosurgeons is different.
Discussion

Based on reports in the National Institute of Science and Technology Policy 2010,3) Japan is ranked in fourth place following the US, UK, and Germany when the numbers of articles in the field of medical sciences are counted. However, there had not been any objective data comparing the degree of participation in academic neurosurgical journals by neurosurgeons in different countries. Therefore, we analyzed the contribution of Japanese neurosurgeons to publications in not only world’s top journals but also all neurosurgical journals published in English, and clarified the degree of contribution worldwide.

Regarding the number of all neurosurgical publi-
countries in English, the US has been always ranked in first place and Japan has consistently been in second place since 1977 (Fig. 1), although the gap between the US and Japan was wide. As to the number of publications in the top 12 neuroscience journals, Japan had been in third place after the US and UK till 2004. Since 2005, Japan has fallen to fourth place (Fig. 4). In the top 6 clinical journals including Journal of Neurosurgery, Neurosurgery, etc., Japan has been consistently ranked in second place since 1977 (Fig. 6). Remarkably, Japanese neurosurgeons have published 2–9 articles per year as the first author in top journals such as Nature, Science, etc., since the late 1980s until recently (Fig. 3). Thus, JNS members have been making great academic contributions worldwide.

However, our JNS members must pay attention to the depressing facts that both the total number of publications and the percentage contribution to publications by Japanese neurosurgeons have been declining since 2000 (Figs. 1 and 2). Is the number of neurosurgeons doing research or clinical work decreasing recently in Japan? The numbers of graduate students newly enrolled in master’s programs and doctoral programs have been roughly unchanged for the last 20 years in the field of medical sciences. How about the number of Japanese neurosurgeons? The number of Japanese neurosurgeons including residents is still showing an upward trend. Then, why has the number of publications by Japanese neurosurgeons been declining since 2000?

The comparative analysis of the number of publications per neurosurgeon among countries, though limited to 2009, revealed that Japan is ranked in eighth place after South Korea. The number of publications by each Japanese neurosurgeon is only 0.12 per year on average. Therefore, it’s hard to say that Japanese neurosurgeons are putting enough efforts toward academic publication. Introduction of neurosurgical subspecialty boards may have partly played a role in decreasing the number of publications by Japanese neurosurgeons. Several Japanese neurosurgical subspecialty boards have started recently; the Japan Epilepsy Society in 1999, the Japanese Society for Neuroendovascular Therapy in 2000, the Japan Stroke Society in 2003, the Japanese Society of Spinal Surgery in 2005, and the Japanese Society for Neuroendoscopy in 2006. The timing of the introduction of neurosurgical subspecialty boards in Japan implies that the introduction of these subspecialty board examinations may have had a negative impact on the number of publications by Japanese neurosurgeons. Some Japanese neurosurgeons may have been prioritizing subspecialty boards over academic publications.

In contrast to the declining trend of the number of publications by Japanese neurosurgeons since 2000, recent vigorous efforts by neurosurgeons in South Korea and China are prominent. When all articles published in English are counted regardless of the quality of the journal, the numbers of publications from South Korea and China have been rapidly increasing for the past 5 years. Based on the analysis by keywords, neurosurgeons in South Korea appear to be noticeably contributing in the fields of aneurysm and spine. The number of articles in the field of glioma is noticeably increasing from China. Although the number of all publications in English is thus increasing in both countries, the numbers of publications in highly qualified journals such as “top 8 journals,” “top 12 basic neuroscience journals,” or “top 6 neurosurgical journals” are still low.

In conclusion, Japanese neurosurgeons have been contributing greatly next to the Americans to the field of clinical neurosurgery and neuroscience by publishing in English. However, the number of publications by Japanese neurosurgeons has been declining since 2000, whereas publications from other countries are increasing. Therefore, the JNS must come up with countermeasures to address this problem.

References

1) Ogawa A: [History of the Japan Neurosurgical Society for the Last 60 Years (1948–2008)]. Tokyo, The Japan Neurosurgical Society, 2008, p 244 (Japanese)
2) Saka A, Kuwahara T; National Institute of Science and Technology Policy: Japanese Science and Technology Indicators 2010. Tokyo, National Institute of Science and Technology Policy, 2011, p 124

Address reprint requests to: Tomio Sasaki, MD, Department of Neurosurgery, Graduate School of Medical Sciences, Kyushu University, 3-1-1 Maidashi, Higashi-ku, Fukuoka 812-8582, Japan. e-mail: tsasaki@ns.med.kyushu-u.ac.jp