Original Article

A Bibliometric Study of Epidural Anesthesia: A 24-year Review

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ABSTRACT

Objective: After introduction of epidural anesthesia (EA) in the early 20th century, it has become an essential technique in anesthesiology and many physicians consider it the gold standard analgesic technique for major surgeries. As EA has improved anesthesia methods dramatically and there is no previous bibliometric study in this field, we aimed to perform a scientometric analysis on this topic.

Design: Cross-sectional study

Setting: Mashad University of Medical Sciences, Iran

Subjects: Articles were retrieved from the Web of Science (ISI) from 1990 to 2013.

Intervention(s): The total number of published items was 4612; subsequent analysis was performed on results considering published items per year, country, funding agency, institution, journal, publication language, and author and subject area.

Main Outcome Measure: The results were analyzed considering published items per year, country, funding agency and institution, journal, publication language and author.

Results: Additionally, subject areas under which the articles were published were evaluated. The primary search yielded 4612 publications; out of these 3200 (69.38%) were original articles. More than half of articles (2466) were published under “anesthesiology” subject. The USA was the leading country in producing articles under this topic and engaged highest collaboration rate with 64 collaborations.

Conclusion: It seems that there is an overall increase in total number of articles, citations and highly cited articles about EA during these two decades.

INTRODUCTION

Epidural anesthesia (EA) was introduced in early 20th century, about 50 years after the discovery of inhalation anesthesia. The first spinal analgesia was applied accidentally in 1885 by Leonard Corning on a dog[1]. Nowadays, this method is considered as an essential technique in anesthesiology[2], and many physicians consider EA as the gold standard analgesic technique for major surgeries. The reason is that this technique provides dynamic analgesia, allowing the patient to mobilize and resume normal activities unlimited by pain, attenuates the stress response to major surgery and reduces the incidence of postoperative complications such as pulmonary, thromboembolic and cardiac events[3-6]. Furthermore, EA can improve the quality of patient’s recovery from major surgery and shorten length of hospital stay[7].

Nowadays, there is an increasing interest in scientometric studies for evaluating the research quality and productivity. Furthermore, it is possible to measure the impact of an article or a researcher on the scientific community by means of citation rating[8-11].

Considering the fact that EA has improved anesthesia methods dramatically and plays an important role in pain management strategies, and there are no previous studies in this field, we aimed to perform a scientometric analysis on EA.

MATERIAL AND METHODS

Data was retrieved from the Web of Science. All publications during the period of 1990 - 2013 were considered. The keyword “Epidural analgesia” was used to search articles published during this time interval. A total number of 4612 publications were...
obtained. Further analysis was performed on the obtained results considering published items per year, country, funding agency, institution, journal, publication language, and author and subject area.

Considering the fact that citation analyses provide a qualitative assessment of the data and are used as an indicator for research quality, all published items were evaluated considering the number of citations. Also, a citation analysis for highly cited publications was performed and citation per paper was calculated.

Furthermore, the collaboration between different countries was assessed by Intcoll and Pajek softwares. The collaborations were divided into two main groups (domestic and international) considering the method used by Kim[12]. Domestic collaborations (teamwork within a country) itself was divided into two subtypes; intra-institutional and extra–institutional collaboration considering the institutions involved in article production.

Statistical analysis
Data analysis was performed using descriptive statistics. Other analysis was done using “Web of Science” analysis tools”.

RESULTS
The primary search with our keyword “Epidural analgesia” yielded 4612 publications, out of which, 3200 (69.38%) were original articles and the rest were made up of proceeding papers (8.69%), letter to the editor (7.91%), review (5.55%) , meeting abstract (4.94%), editorial material (3.18%), notes (0.17%), corrections (0.10%) and correction addition (0.04%).

Fig. 1 presents the number of publications in each year during the study period.

Total number of citations of the obtained articles was 58,862 times with average citations per item of 12.76. H-index for authors on this subject was 81. Additionally, 28 articles were cited more than 200 times, 64 were cited more than 100 times and 465 were not

<table>
<thead>
<tr>
<th>Rank</th>
<th>Author</th>
<th>Percent</th>
<th>Country</th>
<th>Percent</th>
<th>Language</th>
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<th>Institution</th>
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<td>7.56</td>
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<td>0.86</td>
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</table>
The USA and UK had the greatest contribution in publishing highly cited articles respectively. Fig. 2 demonstrates number of citations in each year during the study period.

“Anesthesia and Analgesia”, “Anesthesiology” and “Canadian Journal of Anaesthesia - Journal Canadien d’Anesthésie”, “Regional Anesthesia” and “Acta Anaesthesiologica Scandinavica” ranked as first five journals for publishing highly cited articles.

Table 1 shows information about first ten authors, countries, institutions and languages of published articles. Sessler, with 75 publications (1.62%) was the most productive author in this field. USA was the leading country in producing articles under this topic with 1762 (38.20%) publications. Germany, Japan, England and Canada also had great contributions by publishing more than two hundred articles.

Most of the publications were in English (92.17%), followed by articles in German and French, respectively.

Harvard University was the most prolific institution, publishing 109 (2.36%) articles related to this topic. National Heart Lung and Blood Institute and National Sciences and Engineering Research Council contributed a maximum number of articles supported by a special funding agency (each 3 (0.08%)).

While more than half of the articles (2466) were published under “anesthesiology” subject, more than 1500 articles were also published under the subjects of “Surgery”, “Obstetrics and Gynecology”, “General Internal Medicine” and “Cardiovascular System Cardiology”.

The analysis about collaborations revealed that from the total publications, 2074 (49.00%) had domestic collaboration and remaining (2158, 51.00%) had international collaboration. The domestic collaborations contributed to 39.74% of citations, while 60.26% of citations were international collaborations. Details are presented in Table 2.

Furthermore, the analysis revealed 202 collaborations between 72 countries. The highest collaboration rate was for USA with 64 collaborations. England, Canada, Germany and Switzerland ranked second to fifth positions considering the number of collaborations, respectively. USA had most of its collaborations with Argentina and Australia, respectively. Twelve countries had no collaborations like Jordan, Pakistan, and Albania. Fig. 3 shows the distribution of collaborations.

Table 2: Distribution of articles by collaboration types

<table>
<thead>
<tr>
<th>Collaboration types</th>
<th>No. of Articles</th>
<th>Number of citations</th>
<th>Average Number of citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal-institutional</td>
<td>494</td>
<td>4272</td>
<td>8/64</td>
</tr>
<tr>
<td>External-institutional</td>
<td>1580</td>
<td>17311</td>
<td>10/95</td>
</tr>
<tr>
<td>International collaborations</td>
<td>2158</td>
<td>32714</td>
<td>15/15</td>
</tr>
<tr>
<td>Total</td>
<td>4232</td>
<td>54297</td>
<td>12/83</td>
</tr>
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</table>
DISCUSSION

After introduction of EA and its advantages, there was an increased interest in application of this method for surgeries. Our study revealed growing attention to EA according to the rise in the number of publications since 1990 that has also been accompanied with rise in the number of citations of these publications.

Consistent with our results, USA with contribution to more than 38% of the original articles about EA was the leading country in publishing articles. The results are the same as previously reported about USA contribution to the general anesthetic literature production, which is about 30 - 40% [13-14].

As expected, between institutions, Harvard University as the main contributing institution in the USA is outstanding by publishing 109 articles in this field of science.

In three out of the five leading countries including USA, Germany, Japan, England, and Canada in this field English is the official language and many countries with other languages publish their article in English. This is the reason for domination of English language in more than 90% of total articles published in this field.

Journals demonstrated different attribute toward article publication. The journal ‘Anesthesia and Analgesia’ was at the first place for publishing articles related to EA. The journal ‘Anesthesiology’ and the “Canadian Journal of Anesthesia” ranked second and third, respectively. Considering the information above, it seems that most of the investigations were printed by anesthesia journals.

Limitations of this study include, using the Web of Science database as the only data source and not including other databases and selection of only one keyword and search term as other search terms might yield different results.

CONCLUSION

It seems that there is an overall increase in total number of articles, citations and highly cited articles about EA during the study period.

ACKNOWLEDGMENT

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