Highly Cited Works in Skull Base Neurosurgery

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OBJECTIVE: **Citation analysis can be used to evaluate an article's impact on its discipline. This study characterizes the most-cited articles related to skull base surgery.**

METHODS: **The 100 most-cited skull base neurosurgery articles in all journals were examined. A separate listing of the top 100 most-cited articles in dedicated skull base journals was also examined. The following information was recorded for each article: number of authors, country of origin, citation-count adjusted for number of years in print, topic, and level of evidence.**

RESULTS: **The 100 overall most-cited articles appeared in 25 journals. The top 100 most-cited articles in dedicated skull base journals appeared in 3 journals. Publication dates ranged from 1965–2006 for the overall list and 1993–2010 for the dedicated skull base list. Citations ranged from 11–59 (mean, 19) for the dedicated skull base list and 115–487 for the overall list (mean, 175). The average time-adjusted citation count was 8.4 for the overall list and 2 for the dedicated skull base journal list.**

CONCLUSIONS: **An original article in a nondedicated skull base journal related to the subspecialty of skull base with a citation count of 150 or more and time-adjusted citation count of 10 can be considered a high-impact publication. An original article in a dedicated skull base periodical having a total citation count of 20 or more and an average citation count of 2 per year or more can be considered a high impact publication.**

INTRODUCTION

Within scientific and—more specifically—neurosurgical literature, it is understood that a small percentage of publications can have a disproportionately large effect on clinical decision-making and operative technique. Citation analysis is able to differentiate these higher impact publications from the more than 50 million scientific publications in existence as of 2009 (11). Eugene Garfield (6, 7) first used the citation count as a surrogate for impact with the premise that articles of greater value will generate further readership, discussion, and change, which leads to increased citation counts. Therefore, citation-based metrics, such as citation counts, the journal impact factor, h-index, and normalized citation index, can be used to identify high impact articles and journals.

A number of studies have identified landmark articles within various specialties using citation analysis: anesthesiology (27), critical care (24), dermatology (3), emergency medicine (28), forensic science (12-14), ophthalmology (20), orthopedics (16), otolaryngology (5), pediatric surgery (1), plastic surgery (17, 37), urology (8, 26), and neurosurgery (15, 21, 22, 29). Wilkins (30-33) and Wilkins et al. (34, 35) published a series of articles presenting his personally selected neurosurgical classics in the *Journal of Neurosurgery* between 1962 and 1965, which was later published as a stand-alone text. Davis and Cunningham (2) evaluated the laboratory research publications by 39 of the first American neurosurgeons. Drs. Cushing and Penfield each wrote 3 of the 10 most-cited articles in this series. In 2010, Ponce and Lozano (21, 22) used citation index as a means of determining the top 100 most-cited articles in the neurosurgical literature, as well as compiling a list of articles that have been cited more than 400 times, which he termed citation classics; however, of the 100 articles listed, there were only 3 that were specific to the subspecialty of skull base neurosurgery: 1) Jannetta's original description of arterial compression of the trigeminal nerve in

Key words
- Articles
- Citation analysis
- Neurosurgery
- Skull base

Abbreviations and Acronyms
OCEBM: Oxford Centre for Evidence-Based Medicine
WOS: Web of Science

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Citation: World Neurosurg. (2015) 83, 4:403-418.
http://dx.doi.org/10.1016/j.wneu.2014.12.005

*Journal homepage: **www.WORLDNEUROSURGERY.org***

*Available online: **www.sciencedirect.com***

patients with trigeminal neuralgia (9); 2) the explanation of the etiology and definitive microsurgical treatment of hemifacial spasm by Jannetta et al. (10); and 3) the long-term follow-up of patients after total removal of craniopharyngioma by Yasargil et al, (36). After this lead, the neurosurgical subspecialties have begun to use citation analysis to provide a catalogue of landmark articles related to their subspecialty.

In pediatric neurosurgery, a composite of landmark articles has recently been established. These articles were identified by overall and time-adjusted citation count, leading to the production of two lists: 1) a listing of landmark articles from within pediatric neurosurgical journals (29), and 2) a listing of landmark articles related to pediatric neurosurgery but not present within dedicated pediatric neurosurgical journals (15). This composite now catalogues the most influential articles within the pediatric neurosurgery community based on how frequently each is cited by the academic community.

The goal of the present article is to characterize and present two lists: 1) the top 100 overall most-cited articles related to skull base surgery and 2) a list of the top 100 most-cited articles within dedicated skull base journals.

METHODS

Journal Identification

A search was performed in November 2013 using Elsevier's Scopus (http://www.scopus.com). The terms skull base and neurosurgery were queried using the *Source Title* function within Scopus. Journals that were related to skull base neurosurgery were identified. Journals that were not directly related to clinical skull base neurosurgery (i.e., related to basic science research) were excluded.

A separate search was performed in June 2014 using Thomson Reuter's Web of Science (WOS) to identify articles present in nondedicated skull base journals (i.e., *New England Journal of Medicine, JAMA, Journal of Neurosurgery, Neurosurgery*). This search was performed by using a set of key words related to skull base neurosurgery to query all journals indexed in Thomson Reuter's WOS (23) (**Table 1**).

Citation Analysis

Overall top 100 Most-Cited Articles. A total of 25 journals were identified from the initial search in WOS using the key words in **Table 1**. Each key word search was searched and the results were sorted in descending order by citation count and exported into Microsoft Excel (Redmond, Washington, USA). The 25 separate searches were combined into one database with more than 50,000 records sorted by descending citation count. Articles not directly related to skull base surgery (i.e., laboratory investigations, tumor articles not related to surgery) were excluded. The top 100 articles from this list were then further characterized. An "adjusted" citation count or index was calculated for each article by dividing the total number of citations by the years since initial publication. This adjusted citation count can be viewed as the average number of citations that article has received each year since it was published.

Table 1. List of Key Words Used in Web of Science Search to Identify Articles Related to the Field of Skull Base Surgery Not Published in Dedicated Skull Base Journals

Key Words Used in WOS Search
• (Cranial) schwannoma surgery
• (Skull base) aneurysm
• (Skull base) meningioma surgery
• (Skull base) radiosurgery
• Acoustic neuroma
• Cavernoma
• Cavernous angioma
• Cerebrospinal fluid leak
• Chondrosarcoma
• Chordoma
• Craniopharyngioma
• Encephalocele
• Endoscopic neurosurgery
• Epidermoid tumor
• Esthesioneuroblastoma surgery
• Glomus tumor
• Hemifacial spasm
• Microvascular decompression
• Nasopharyngeal angiofibroma
• Paranasal sinus cancer
• Pituitary adenoma
• Pituitary surgery
• Rathke cleft cyst
• Trigeminal neuralgia surgery
• Trigeminal schwannoma

Dedicated Skull Base Journals. A total of 3 journals were identified from the Scopus search: 1) *Journal of Neurological Surgery: Part B;* 2) *Skull Base;* and 3) *Skull Base Surgery*. These journals were then compiled into a single search within Scopus (4) and WOS (23). This search returned a list of all articles (n = 2381) present from these journals in Scopus and (n = 781) within WOS records. These articles from Scopus were then sorted in descending order based on citation count. The top 100 most-cited articles were extracted from this list for analysis in November 2013. An "adjusted" citation count or index was calculated for each article by dividing the total number of citations by the years since initial publication. This adjusted citation count can be viewed as the average number of citations that article has received each year since it was published.

Data

The following information was obtained from each article: number of authors, institution, country of origin, type of research (retrospective or prospective), topic (endoscopic: procedures including endoscopic removal of tumor; tumor: