

Determining Trends in Skull Base Neurosurgery Using Natural Language Processing and Machine Learning

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Introduction

- Neurosurgery remains a rapidly advancing field, particularly with respect to skull base neurosurgery.
- With an increasing publication rate and a wide breath of advancements, it is reasonable to assume the literature will be representative of the growing and declining aspects of skull base neurosurgery.
- Thus, we developed a topic modeling algorithm to explore trends in prominent topics of skull base neurosurgery.

Methods

- A dataset of over 185,000 articles collected from a Web of Science database search conducted in April 2024 using the keyword "neurosurgery" was created.
- Textual data from article titles, keywords, and abstracts were pre-processed then analyzed using BERTopic for identifying all topic with a minimum of 50 articles per topic.
- Topics were then manually assigned to one of the following topics:
 - adjuvant therapy,
 - anterior skull base / orbit,
 - basic science,
 - cavernous sinus / middle fossa,
 - chordoma,
 - clivus /craniocervical junction,
 - head and neck tumors - nonsinonasal malignancy,
 - lateral skull base / CPA / jugular foramen,
 - meningioma,
 - paraganglioma,
 - pediatrics,
 - pituitary adenoma,
 - reconstruction / CSF leak, sella / suprasellar,
 - sinonasal malignancy,
 - surgical approaches and technology,
 - training and education,
 - value based care / quality of life, and
 - vestibular schwannoma.
- Topics likely to have overlap with other neurosurgical subdisciplines, such as “pediatrics” and “basic science”, were excluded.
- Topic trends were visualized by graphic representation.

Results

- Topic modeling identified 226 topics that were manually mapped to the topics:
 - anterior skull base / orbit,
 - cavernous sinus / middle fossa,
 - chordoma,
 - clivus /craniocervical junction,
 - lateral skull base / CPA / jugular foramen,
 - meningioma,
 - paraganglioma,
 - pituitary adenoma,
 - sella / suprasellar, and
 - vestibular schwannoma.
- Meningioma demonstrated the most positive upwards trend, followed by vestibular schwannoma and pituitary adenoma (**Figure 1**).
- There was particular growth in topic volume onwards from 2015.
- Chordoma, lateral skull base / CPA / jugular foramen, and paraganglioma demonstrated modest and consistent publication volume, with a similar uptick in number of publications onwards from 2015.

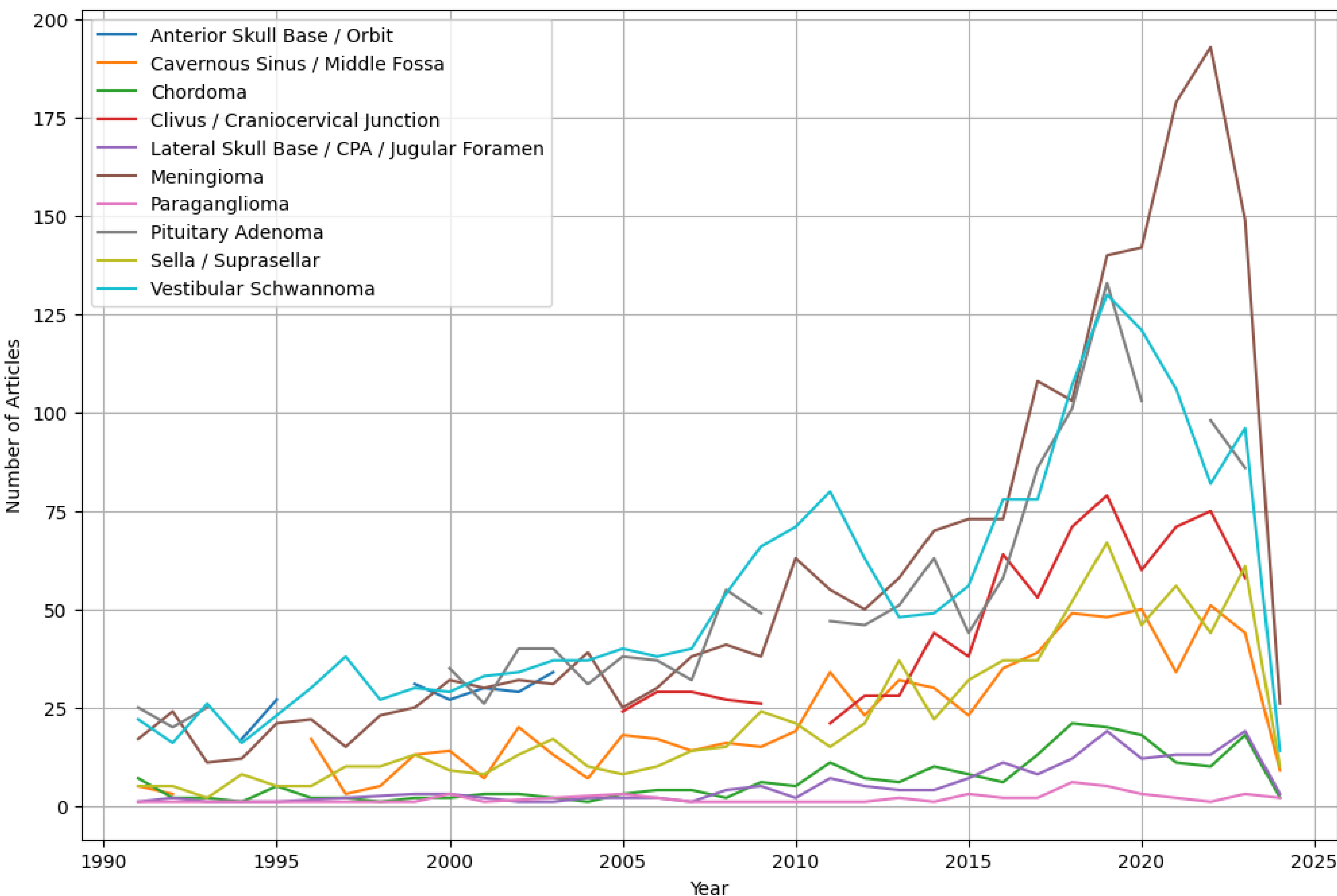


Figure 1. Number of articles per prominent skull base neurosurgery topics across time

Conclusion

- Trends in skull base neurosurgery reflect recent advancements in specific subdisciplines over the years.
- Understanding these trends provides valuable insights into the current state and future directions of skull base neurosurgery as an evolving field.

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References

