Original Article

pISSN 2383-9309 ▮ eISSN 2383-9317
J Dent Anesth Pain Med 2021;21(2):113-118 ▮ https://doi.org/10.17245/jdapm.2021.21.2.113

Does the general public have concerns with dental anesthetics?

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Background: Consumers and patients in the last two decades have increasingly turned to various internet search engines including Google for information. Google Trends records searches done using the Google search engine. Google Trends is free and provides data on search terms and related queries. One recent study found a large public interest in "dental anesthesia". In this paper, we further explore this interest in "dental anesthesia" and assess if any patterns emerge.

Methods: In this study, Google Trends and the search term "dental pain" was used to record the consumer's interest over a five-year period. Additionally, using the search term "Dental anesthesia," a top ten related query list was generated. Queries are grouped into two sections, a "top" category and a "rising" category. We then added additional search term such as: wisdom tooth anesthesia, wisdom tooth general anesthesia, dental anesthetics, local anesthetic, dental numbing, anesthesia dentist, and dental pain. From the related queries generated from each search term, repeated themes were grouped together and ranked according to the total sum of their relative search frequency (RSF) values.

Results: Over the five-year time period, Google Trends data show that there was a 1.5% increase in the search term "dental pain". Results of the related queries for dental anesthesia show that there seems to be a large public interest in how long local anesthetics last (Total RSF = 231) − even more so than potential side effects or toxicities (Total RSF = 83).

Conclusion: Based on these results it is recommended that clinicians clearly advice their patients on how long local anesthetics last to better manage patient expectations.

Keywords: Dental Anesthesia; Dental Pain; Lidocaine; Local Anesthesia; Google Trends.

INTRODUCTION

In 2014, 52.3% of adults reported that they had visited the dentist every six months, 15.4% reported visiting once per year, and 11.0% reported visiting once every two to three years. More than one in five (21.3%) reported that they had not visited the dentist in the last few years [1]. One reason a patient may not be seeing a dentist for regular non-emergency visits is because an individual may not have access to a dentist, as several studies have documented that access to care is an ongoing battle [2]. Poor health literacy is another reason a patient may not see a dentist regularly. Based on the American Dental Associations (ADA)'s Oral Health and Well-Being in the United States 2015 survey, while cost is still the number one prohibitive factor for patient dental visits, fear of pain is the next most significant deterrence factor [3].

One of the clinician's best tool to reduce pain is local anesthetics. Due to the impact local anesthetics have in eliminating pain, its study and the patients' or consumers' concerns are important. Thus, we used Google Trends to

Received: November 17, 2020 • Revised: January 23, 2021 • Accepted: February 8, 2021
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identify associated Google searches to identify potential interest, concerns, or issues patients might have with local anesthetics. Google Trends is a free resource that provides data on search terms and related queries entered into Google's search engine by consumers. From 2009 – 2013 the use of Google Trends in healthcare literature increased sevenfold [4]. From January 19, 2014 to January 12, 2018, Google's search engine held 86.9% of the total market share of search engines, making it the most significant search engine for public interests and therefore appropriate for use in our study [5]. Most of the current medical literature that has used Google Trends has used it to examine correlation and modeling (72.1%), while only a minority of the studies attempt to make predictions and forecasting (8.7%) [6]. One recent study attempted to gauge public interest in general anesthesia by using Google Trends between January 2014 and January 2019 and found a large public interest in "dental anesthesia" [7]. In this paper, we further explore this interest in "dental anesthesia" and assess if any patterns emerge.

METHODS

In this study we use Google Trends. Google Trends records searches made using the Google search engine and then provides public data on search terms and related queries. Related queries are aggregated queried terms that individual users searched for in addition to a given search term over a given period. For example, if a person searches for "dentist near me" and then searches for "dentist cost," "dentist cost" would be a related query for the search term "dentist near me". The data also provide lists of related queries by geographic location and timeline. The location can be as specific as an individual county, or as general as the entirety of the United States. Additionally, queries are grouped into two sections, a "top" category and a "rising" category. In the "top" category, the most frequent related queries are given a relative search frequency (RSF) value between 0 and 100, with 100 indicating the most common related query and 50 indicating a related query searched half as much as relative to the top term. The "rising" category shows the percent increase of related queries. For example, if the number of searches doubled from 200 to 400 searches, the rising category would show a percent increase of 100%.

We conducted a retrospective study using the Google Trends data. We used the "Checklist for documentation of Google Trends" outlined by Nuti et al. for the purposes of reproducibility [4]. For this study we used Google Trend data over a five-year period from 7/12/14 to 7/12/19.

Our first search was for "dental pain." We used the data provided to identify the relative interest in dental pain by analyzing the number of searches. The data also provide a coefficient of determination (R^2) which gives a percentage value for the variance of the line or the goodness of fit. An R-squared value of 100% indicates the model explains all of the variance whereas a value of 0% explains none of the variance. We then recorded related queries for "dental pain."

Similarly, our second search was for "dental anesthesia". We also recorded related queries for "dental anesthesia" since the previous study by Niforatos et al. indicated there was a large relative interest in the search term [7]. We also added additional similar search terms in an attempt to gather more data. The search terms used for this study were dental anesthesia, wisdom tooth anesthesia, wisdom tooth general anesthesia, dental anesthetics, local anesthetic, dental numbing, anesthesia dentist, and dental pain.

The results of this study were obtained in two separate ways. The first chart obtained was the Google Trends data on "Dental anesthesia" (Table 1). This chart was directly pulled from Google Trends with no modification. Table 2 is an aggregate of multiple related queries across multiple search terms. If a related query repeated among these search terms, they were grouped together in a single category, for example "dental anesthesia toxicity". We then grouped the top ten related queries categories into a chart ranked by the total RSF number (RSF SUM). The

Table 1. Top related queries for Dental Anesthesia

Top related queries	Total (RSF)
anesthesia	100
dental anesthesia	84
anesthetic	33
dental numbing	28
dentist	24
anesthesia dentist	17
local anesthesia	7
oral anesthesia	7
lidocaine	6
dental anesthesia side effects	5
how long does dental numbing last	5

RSF, relative search frequency.

Table 2. Top ten related queries for Dental Anesthesia and similar terms

Top ten related queries for dental anesthesia and similar term	RSF Sum
Anesthesia	1084
Wisdom tooth removal	365
How long does local anesthesia last	231
Lidocaine	153
Local anesthetic toxicity	83
Dentist	54
last	18
local anesthetic max dose	9
anastasia	5
epinephrine	4

RSF, relative search frequency.

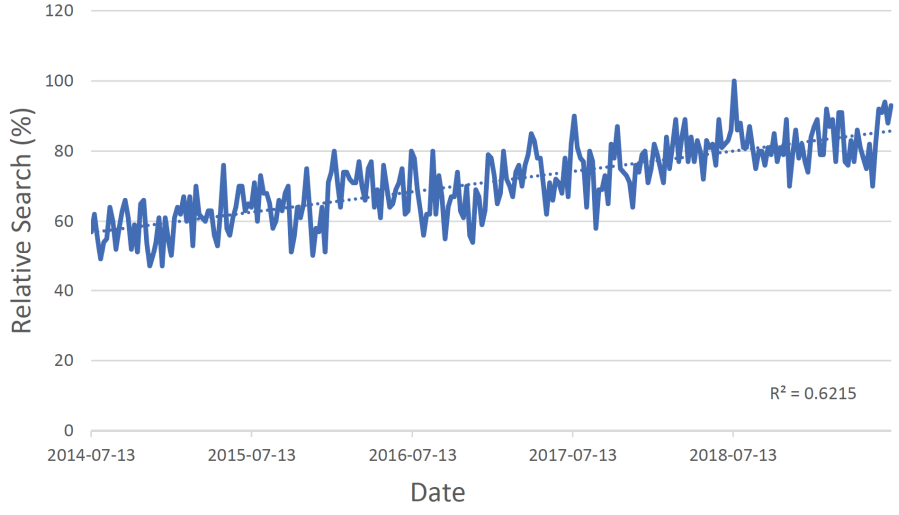

Fig. 1. Increase in Google Searches for the Term "Dental Pain"

total RSF number was calculated by adding up the RSF value for each time the search was repeated for the different search terms.

RESULTS

Over this 5-year period from 2014 through 2019, using Google Trends and the search strategy reported above, an increase of 1.5% in Google searches for "dental pain" was recorded as reported in Figure 1. As seen in Figure 1, the R^2 of the data was 0.6215, suggesting that 62% of the variance is explained by the trend model. As seen in Figure 2, over the same time frame, for the term "Dental Anesthesia", only a 1.15% increase in searches was recorded, suggesting little change in Google searches. Additionally, there was a low R^2 of 21%. suggesting that it does not explain the variance. Although Google Trends provides data by subregions, there was insufficient data to provide a geographic analysis.

Next, we explored the related queries for "dental pain" and "dental anesthesia" only as a Google search terms. No variations in the related queries for "dental pain" were seen. In Table 1, we explore the related queries for dental anesthesia only as a Google search term. As seen in the Table, the top 8 related queries were variations of the original search term "dental anesthesia" such as "anesthetic" or "anesthesia dentist". It is only in the 9th

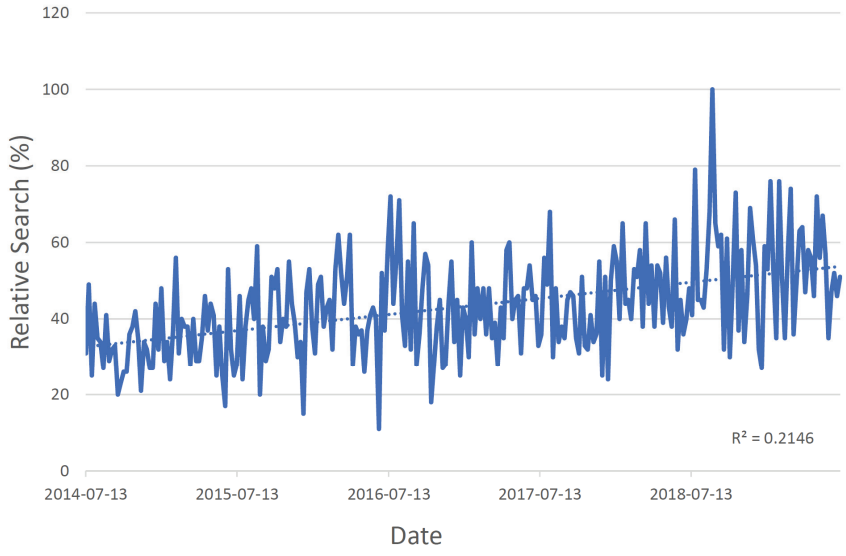

Fig. 2. Increase in Google Searches for the Term "Dental Anesthesia"

most common related query that "dental anesthesia side effects" was addressed, and the 10th was "how long does dental numbing last." Both the 9th and 10th most common had an RSF of 5 which is a low value. The RSFs ranged from 100 to 5.

In Table 2, when adding various search terms together, a dramatically different pattern is observed. Although the most recurring related queries in Table 2 remained "anesthesia," additional terms or themes are seen. "Wisdom tooth removal" become the second most recurring related query. The third most recurring was "how long does local anesthesia last" (RSF SUM = 231), the fourth was "Lidocaine", and the fifth was "local anesthetic toxicity" (RSF SUM = 83) The RSF SUM ranged from 1084 for the term "anesthesia" to 4 for "epinephrine".

DISCUSSION

A main finding of our study is a 1.5% increase in Google searches for the term "dental pain". Although an increase of 1.5% seems a modest increase in the number of times the term "dental pain" was searched, this increase reflects an ongoing public interest that has not been addressed or solved. While local anesthetics have been significant in reducing pain for patients, the public concern over pain in Dentistry is still ever-present.

On the other hand, only a 1.15% increase was seen in Google searches for the term "dental anesthesia". Based on the results from our Google Analytics analysis for dental anesthesia, there was a major split in the results. Looking solely at the top ten RSF for "dental anesthesia," local anesthesia side effects and how long local anesthetics last only had an RSF of 5 which would indicate a lower level of public interest. But in the combined top ten related queries, the third highest query was "How long does local anesthesia last" with an RSF sum of 231, whereas "local anesthetic toxicity" had an RSF sum of 83.

The dramatic shift between the "dental anesthesia" queries and the combined queries indicates simply looking at one search term does not fully explain the public's true interests on a particular topic. Based on the combined query RSFs, individuals are significantly more concerned with how long local anesthetics last than they are with the side effects or toxicities. This might be expected, as the primary reason for the use of an anesthetic in Dentistry is to remove or reduce pain. Therefore, the duration of the anesthetic and the return of pain may be a patient's primary concern.

The various queries identified in the top ten charts do

show other interesting and unclear results. For example, the word "anesthesia" was commonly misspelled as "Anastasia". The related query "last" was also common and it is not clear what the intention of the search is. This ultimately leads to the first limitation of this study: the meaning of some of the related queries are open to interpretation. This paper considered only related queries that were clear in their intent. Related queries that do not have a clear-cut meaning require additional research if their data is to be considered. Additionally, while there was a 1.5% increase in dental pain searches, it is not clear if or how much increased Google search traffic reflects an increased interest in dental pain itself. It could reflect increased use of the internet and the Google search engine to get dental information, not increased interest in the topic. Further, our assumption is that it is public interest in the topic, however there is the possibility that the searches were by dental professionals too. Likewise, it is not clear if individuals are searching once or searching repeatedly. Even then, the increase seen is relevant as it indicates and increased prevalence in public interest in the topic. Further, it should also be noted that the relative search frequencies are search term dependent, and therefore RSF numbers between separate keyword searches have some qualitative or relative significance, but no quantitative significance. Therefore while "How long does local anesthesia last" had an RSF sum of 231 and "Local anesthetic toxicity" had an RSF sum of 83, it would not be correct to assume "How long does local anesthesia last" was searched for 2.8 times more that "local anesthetic toxicity". The only concrete conclusion that can be drawn from the sum RSF related queries is that the higher a related query was on the list, the higher the public interest. Lastly, with any Google trend analysis there are two limitations. First, there is a selection bias, as not everybody uses Google search engine. Additionally, there is no information on the individuals who are searching for these terms.

From a clinician's perspective, this study provides useful information that can be used by the clinician to better prepare their patients for dental procedures. First, clinicians should advise their patients how long the anesthesia will last and how long their patients can expect to be numb. Additionally, should a long-acting anesthetic be used to control post-operative pain, patients should be told how much the additional time they will be numb. These are achievable through clear communication with the patient during the informed consent process [8-10]. Patients may want to be able to structure their time around being numb or be aware of when the pain could be expected to return. Regardless of the reason, patients would seemingly be put at greater ease by having a better idea of when the local anesthetics will wear off.

While a follow-up research study, such as a consumer survey, is required to gain more concrete understanding of the public concerns with local anesthetics, this paper illustrated a public interest in how long local anesthetics last. It is recommended that clinicians clearly advice their patients on how long local anesthetics last to better manage patient expectations.

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Ana Karina Mascarenhas: Conceptualization, Methodology, Supervision, Writing - review & editing

DECLARATION OF CONFLICTING INTERESTS: The author(s) declare no conflicts of interest.
FUNDING: The author(s) received no financial support for the research, authorship, and/or publication of this article.

REFERENCES

1. Yarbrough C, Nasseh K, Vujicic M. Key differences in dental care seeking behavior between Medicaid and non-Medicaid adults and children. Health Policy Institute

Research Brief. American Dental Association. September 2014. Available from: http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_0814_4.ashx.
2. Bersell CH. Access to oral health care: a national crisis and call for reform. J Dent Hyg 2017; 91: 6-14.
3. American Dental Association. Oral health and well-being in the United States. Oral Health & Well-Being − Health Policy Institute State Fact Sheets. Available from: www.ada.org/en/science-research/health-policy-institute/oral-health-and-well-being.
4. Nuti SV, Wayda B, Ranasinghe I, Wang S, Dreyer RP, Chen SI, et al. The use of Google trends in health care research: a systematic review. PLoS One 2014; 9: e109583.
5. Liu R, García PS, Fleisher LA. Interest in anesthesia as reflected by keyword searches using common search engines. J Anesth Clin Res 2012; 3: 1000187.
6. Mavragani A, Ochoa G, Tsagarakis KP. Assessing the methods, tools, and statistical approaches in Google Trends research: systematic review. J Med Internet Res 2018; 20: e270.
7. Niforatos JD, Feinstein MM, Pescatore RM. Search engine queries as a metric of public interest in anesthesia. Anaesth Intensive Care 2019; 47: 302-4.
8. Moreira NC, Pachêco-Pereira C, Keenan L, Cummings G, Flores-Mir C. Informed consent comprehension and recollection in adult dental patients: a systematic review. J Am Dent Assoc 2016; 147: 605-19.e7.
9. Hulin J, Baker SR, Marshman Z, Albadri S, Rodd HD. Development of a decision aid for children faced with the decision to undergo dental treatment with sedation or general anaesthesia. Int J Paediatr Dent 2017; 27: 344-55.
10. Hajivassiliou EC, Hajivassiliou CA. Informed consent in primary dental care: patients' understanding and satisfaction with the consent process. Br Dent J 2015; 219: 221-4.