Exploring Demographic Trends for Root Canal Therapy in Association with COVID-19 Pandemic

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INTRODUCTION

When is root canal therapy (RCT) necessary?

- Chip/crack/break of tooth, tooth decay, faulty crown, etc.
- Bacteria can enter the pulp chamber, overwhelming pulp defenses.
- Pulp of tooth becomes destroyed resulting in Inflammation, pain and sensitivity.
- Toxins from bacteria can leak out extending infection and inflammation into the jawbone.
- Left untreated, bone loss and acute abscess' could occur.

The goal of root canal therapy is to remove the bacteria that have invaded the tooth, from the pulp chamber and root canals. Then, the canals and pulp chamber can then be filled with a solid filling material to avoid any future difficulties.

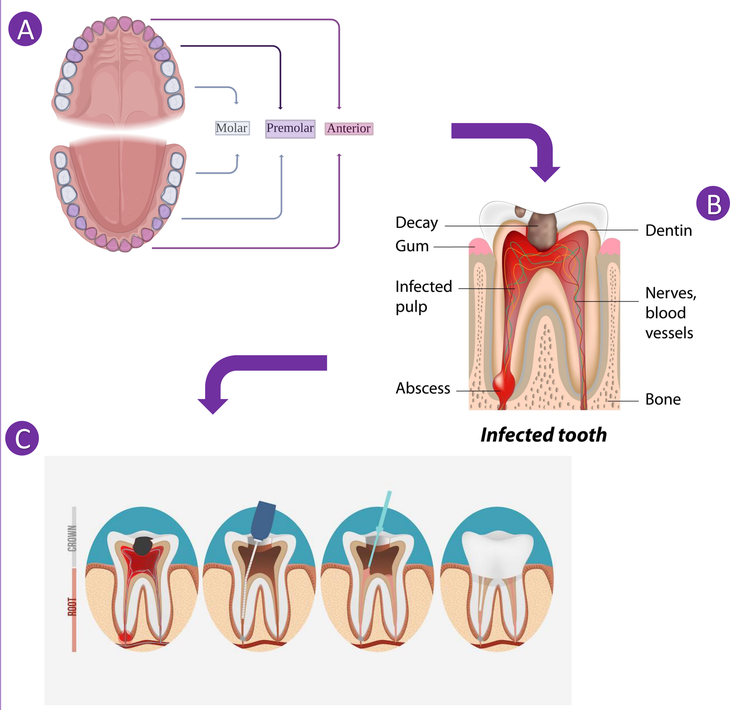

Figure 1. Schematic of how of a root canal is performed.
(A) Representation of a set of adult teeth, containing 32 total teeth. Highlighted grey areas represent molars, purple areas represent premolars, and magenta areas represent teeth that are considered anterior. [Created with BioRender.com] (B) Cross section of an infected molar tooth, showing the anatomy of the inside of a molar tooth and what an affected tooth can look like. (C) Visual for how to enter the tooth, clear the pulp, and fill the previously infected tooth.

OBJECTIVES

- Establish a greater understanding of the impacts of COVID-19 pandemic on demographic trends surrounding RCT.
- Explore whether there are trends in demographics throughout observed years (2019, 2020, & 2021).
- Hypothesize what caused observed trends.
- Create prevention and care plans in response to observed demographic trends.

METHODS & RESULTS

1,015 records of root canal therapy were reviewed from the Endodontics Northwest, University office. Molar, premolar, and anterior RCT cases were of interest, as well as patient demographics (sex and age of the patient). Demographic information of the patient who had received RCT between the months of June to December in the years 2019-2021 were documented. 2020 caused as the representative year for the start of COVID-19 pandemic. Thus, trends within this time frame were predicted to be different than 2019 and 2021.

1. Null Hypothesis: The proportion of males and females receiving RCT is equivalent in 2019, 2020, and 2021
   Alternative Hypothesis: At least two of the proportion of males is different.
2. Null Hypothesis: The proportion of RCT cases are equivalent in 2019, 2020, and 2021
   Alternative Hypothesis: At least two of the proportion of RCT is different.
3. Hypothesis: The average age for RCT during the representative year of COVID-19 (2020) was lower in comparison to 2019 and 2020.

- Through statistical analysis (chi-squared test), it was determined that the difference between RCT patients seen in 2019-2020 was significantly different (null hypothesis 1 was rejected) (Table 1A).
- However, null hypothesis 2 was accepted as the observed difference between RCT types was not significantly different (Table 1B).
- To examine the source of significance in greater detail, proportion tests were run for the male and female patient data. Through this, we discovered that the difference between RCT numbers in 2019 and 2021, as well as the difference between 2020 and 2021, were significant.
- Furthermore, the average age of the patients seen during 2020 was lower, averaging at about 57 years old. In contrast to 2019 and 2021, where the average age of the patient was about 59 years old.

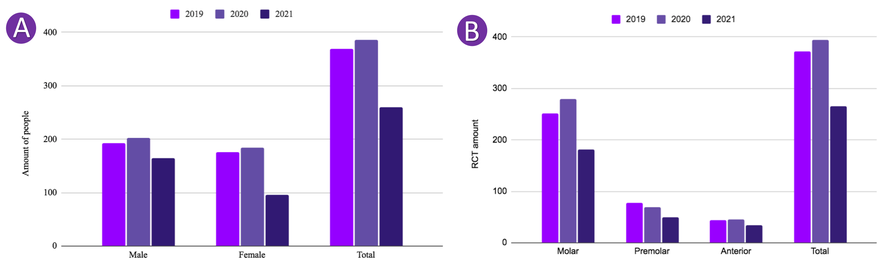

Figure 2: Graphical representation of cumulative RCT patient data.
(A) Comparative bar graph of the male and female patients, along with the overall total number of RCT patients seen for each year, respectively. 2020 represents the year with the most patients seen, with a value of 386 total people. The female and male patients seen during this year superseded those seen in 2019 and 2021. (B) Comparative bar graph of the type of RCT the patient received. Similarly, the amount of RCT performed in 2020 superseded the other years. Molar RCTs were the most common RCT performed across all three years.

Table 1:
Data analyzed using chi-squared test of independence. Chi-squared was determined using the following equation: $(\text{Observed-Expected})^2$ / Expected. Degrees of freedom (DF) was calculated using the following equation: (rows − 1) x (columns − 1). Using these two values and a t-distribution table, we determined the range for the p-value. (A) Observed, expected, and total values of the male and female patients seen. Values were utilized to determine a chi-squared value of 9.047 and a DF of 2. Due to the p-value being lower than 5%, null hypothesis 1 was rejected. (B) Observed, expected, and total values of the three types of RCT performed. Values were utilized to determine a chi-squared of 1.789 and a DF of 4. The p-value was greater than 5% in this scenario, resulting in the failure to reject null hypothesis 2.

A

	2019	2020	2021	Total
Observed Males	193	202	164	559
Expected	***203.22***	***212.59***	***143.19***	
Observed Females	176	184	96	456
Expected	***165.78***	***173.41***	***116.81***	
Total	369	386	260	**Grand Total: 1015**

Chi-Squared	9.047
DF	2
P-value	0.025 > P > 0.010
REJECT NULL	

B

	2019	2020	2021	Total
Molar	251	280	182	713
Expected	*257.26*	*272.48*	*183.26*	
Premolar	77	68	49	194
Expected	*69.99*	*74.14*	*49.86*	
Anterior	44	46	34	124
Expected	*44.74*	*47.39*	*31.87*	
Total	372	394	265	**Grand Total: 1031**

Chi-Squared	1.789
DF	4
P-value	0.900 > P > 0.500
ACCEPT NULL	

CONCLUSIONS & SIGNIFICANCE

- Significant difference in RCT patients seen (male and female) between 2019-2021 and 2020-2021.
- No significant difference in type of RCT performed across all three years observed.
- Younger average age for RCT observed during 2020.

Despite 2020 being the initial rise of COIVD-19 pandemic, this was not the end of the pandemic. Thus, the lack of significant difference in patients seen between 2019-2020 could have been due to the urgency to be seen before COVID-19 got worse or before their health benefits were terminated due to job loss from COVID-19 pandemic.
More so, the significant decrease in RCT during 2020-2021 and lower average age can be explained by the stress and anxiety that COVID-19 resulted in, leading to patients following strict COVID-19 guidelines and avoiding possible exposure. Additionally, it is predicted that due to possible loss-of-benefits related to COVID-19, patients were unable to afford RCT, further explaining the significant decrease in cases from 2019-2021 and 2020-2021.

Next Steps:

- Develop prevention and care plans to best avoid the need for RCT.
- Alterations to company insurance policies to better suit patients in extraordinary circumstances like COVID-19.
- Implement safe endodontic practices to ensure comfortability of RCT patients and reduce possible stress and anxiety.
- Offer payment plans in the scenario of lost health benefits.

LIMITATIONS

- The sample size was small and is only representative of a smaller population of Seattle residents that were seen at Endodontics Northwest.
- Due to HIPAA, individual patient names were not recorded, thus some data may be skewed as a result of some patients possibly being recorded more than once.
- Data was only gathered in six-month periods due to the time that the office had opened, observing a full year's worth of data may have produced different results.
- Complete demographic categories were not recorded including race/ethnicity and socioeconomic status

ACKNOWLEDGEMENTS

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Special thank you to Endodontics Northwest University Office, for hosting me in their office and welcoming me with open arms, allowing me to gain hands on experience, and assist with this research.

RESOURCES

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