THIRD MOLAR EXTRACTION AND PARANASAL SINUS RELATED SIDE EFFECTS

By

Ian C. Clapp

Honors Thesis

Appalachian State University

Submitted to the Department of Biology and The Honors College in partial fulfillment of the requirements for the degree of

Bachelor of Science in Biology

December 2019

Approved by:

_____

Gregory Anoufriev, M.D., Thesis Director

_____

Ted Zerucha, Ph.D., Second Reader

_____

Jefford Vahlbusch, Ph.D., Dean, The Honors College

Table of Contents

Table of Figures

ABSTRACT

Third molar extraction is one of the most commonly performed dental surgeries in the world. Despite the routine nature of the procedure, some have questioned the benefits of prophylactic third molar extraction, and many potential long-term side effects of such extractions have not been widely studied. Herein, it was hypothesized that the patterns of bone loss and remodeling inferior to the maxillary sinuses caused by the extraction of the third molars could lead to increased rates of sinus-related maladies such as seasonal allergies, non-migraine headaches, and sinus infections. An online survey regarding third molar extraction and the aforementioned sinus-related symptoms was distributed to 1,000 Appalachian State University undergraduate email addresses, and 78 completed responses were received and analyzed. No significant correlation (with a cutoff of $p>0.05$) between the rates of sinus infections, non-migraine headaches, or seasonal allergies and the extraction of the third molars was observed ($p=0.57$, $p=0.57$, and $p=0.62$, respectively). Among those surveyed, the most common motives for undergoing third molar extraction were prophylactic extractions (45%) or concerns of overcrowding (24%). Additional analysis of demographic data from the survey revealed no correlation between sex or vegetarian diets and rates of third molar extraction, nor between sex and rates of third molar agenesis ($p=0.26$, $p=0.83$, and $p=0.26$, respectively). Although these results show no correlation between the sinus-related symptoms of interest and third molar extraction within the surveyed population, further research into the extent and effects of bone loss and remodeling,

especially among older populations, is recommended. Additionally, the lack of correlation between sex or diet and extraction rates found in this data brings the applicability of some hypotheses regarding the causes of difficulties with third molar eruption in modern humans within the surveyed population into question.

INTRODUCTION

The surgical extraction of the third molars, commonly referred to as wisdom tooth removal, is becoming increasingly common, with approximately 5 million operations performed yearly making up 95% of all extractions performed in young adults aged 16-20 (Friedman 2007; Cunha-Cruz et al. 2014). The operation is frequently performed on relatively young patients, with one Finnish study finding that two-thirds of third molar extractions occur in patients aged 20 to 39 (Kautto, Vehkalahti, & Ventä 2018). The extraction procedure is straightforward and involves five general steps (Farish & Bouloux 2007). First, an incision is made in the gingival tissue, which is then reflected (parted) to create flaps (Farish & Bouloux 2007). Following this, any bone covering the tooth is removed using a rotary tool and an elevator (a type of leverage tool) (Farish & Bouloux 2007). The tooth is then cut into sections using a rotary tool and extracted with elevators and forceps (Farish & Bouloux 2007). Finally, the empty socket is irrigated, and remaining bone is smoothed out using a file or rongeur (bone snips) so that the gingival flaps can be returned and sutured shut (Farish & Bouloux 2007). Generally, recovery from the extraction takes from three to five days, barring any surgical complications (Aravena, Delgado, Olave, Ulloa-Marin, & Perez-Rojas 2016). The procedure is relatively safe with most complications being minor, such as localized pain and swelling, but some

studies have noted joint injury and lasting paresthesia (numbness) (Huang et al. 2014). One factor contributing to the frequency with which this procedure is performed is the high rate of misalignment and incomplete eruption of third molars, which is hypothesized by some to be caused by the softer diets of modern humans failing to provide adequate pressure to allow for proper jaw development (Miclotte, Franco, Guerrero, Willems, & Jacobs 2015). Despite the widespread practice of prophylactic third molar extraction, some have called the benefits of this practice into question, citing the low rates of illness associated with impacted third molars, high rates of successful third molar eruptions, and mixed evidence for an association between third molar eruption and dental crowding (Cunha-Cruz et al. 2014; Esan & Scepartz 2017; Friedman 2007).

It is of note that some individuals never develop one or more of their third molars, a complete absence of the tooth known as third molar agenesis which is distinct from cases in which the tooth fails to erupt properly due to misalignment or impaction (Esan & Scepartz 2017; Moreno, Díaz, González, Manríquez-Soto, & Toro-Ibacache 2019). Although agenesis of more anterior teeth (those closer to the front of the mouth) can lead to issues with speech, appearance, and function, third molar agenesis generally has very little negative impact (Moreno et al. 2019). The effects of third molar agenesis are generally limited to a reduction in the size of the maxilla and mandible (upper and lower jaw bones), smaller jaw angles, and smaller overall facial height (Moreno et al. 2019; Sugiki, Kobayashi, Uozu, Endo 2018). Third molar agenesis is the most common form of dental agenesis, affecting roughly 18% of North Americans and 23% of people globally (Moreno et al. 2019). Although

it is observed in similar rates in males and females, it has differential structural effects related to sex-linked morphological differences (Moreno et al. 2019, Sugiki et al. 2018). Previous studies have also found no correlation between third molar agenesis and dental crowding (Esan & Scepartz 2017).

The bone surrounding the teeth, known as alveolar bone, consists of both dense cortical bone and porous trabecular bone, arranged in a manner that allows the jaw to absorb the mechanical stress created by biting (Figure 1) (Kingsmill 2018). The health of this bony structure is dependent on the transfer of these mechanical stresses from the teeth, and after the loss of any tooth the surrounding alveolar bone begins to break down in an irreversible process known as resorption (Bodic, Hamel, Lerouxel, Baslé, & Chappard 2005). Alveolar bone resorption begins around four days after a tooth is lost as osteoclasts begin to break down bone tissue in the region, continuing with mineralization and remodeling of new bone (Bodic et al., 2005). The external effects of this process are quickly noticeable, with significant bone loss and ridge height reduction occurring in the first one to three months post-tooth loss (Bodic et al. 2005; Horowitz, Holtzclaw, & Rosen 2012; Oltramari et al. 2007). In the third molar region, this loss can lead to fractures and other issues in the adjacent second molar region (Ranganathan, Balaji, Krishnaraj, Narayanan, Thangavelu 2017). Multiple factors have been identified as potentially influencing the rate and extent of alveolar ridge resorption, including age, gender, skull shape, diet, and levels of extraction trauma (Kingsmill 2018). Although alveolar resorption can be minimized through the use of prostheses or grafts, the placement of such materials is not standard practice for third molar extractions (Farish & Bouloux 2007; Horowitz

et al. 2012; Ranganathan et al. 2017). Generally, the maxillary ridge experiences both greater mechanical forces from mastication and corresponding greater levels of bone loss following a tooth extraction (Bodic et al. 2005; Oltramari et al. 2007).

Within the human skull, there are four sets of air-filled spaces known as the paranasal sinuses (Clement 2005). They consist of the maxillary sinus, the ethmoid sinus, the frontal sinus, and the sphenoid sinus, named after the specific cranial or facial bones they're located within (Figure 1) (Clement 2005). The function of the sinuses is not completely understood, but it is clear that they have a role in air flow control, immune mechanisms, and mucus production (Passàli, Passàli, Passàli, & Bellussi 2005). The hypotheses that the sinuses work to reduce the total weight of the skull or serve to change the resonance of the voice are commonly believed, but don't have much scientific data to support them (Passàli, Passàli, Passàli, & Bellussi 2005). Within the structure of the human maxilla, the maxillary third molars and alveolar ridge are directly inferior to the maxillary sinus (Figure 1) (Clemente 2005). The close relationship between the two is well recorded, with a significant amount of research dedicated to maxillary sinus infections with endodontic (dental) origins (American Association of Endodontists 2018). However, the potential effects of tooth extraction on the structure and function of the sinus cavities is not as well studied, leaving unanswered questions about some of the long-term consequences of routine third molar extraction. This paper aims to explore the possible relationship between third molar extraction and symptoms potentially arising from structural changes to the sinuses, such as headaches, seasonal allergies, and sinus infections through analysis of survey data. If this effect exists, then the rates of these symptoms should

be significantly higher following the extraction of the third molars. Additionally, the relationship between third molar extraction status and factors such as diet, sex, and age was extrapolated from the same data.

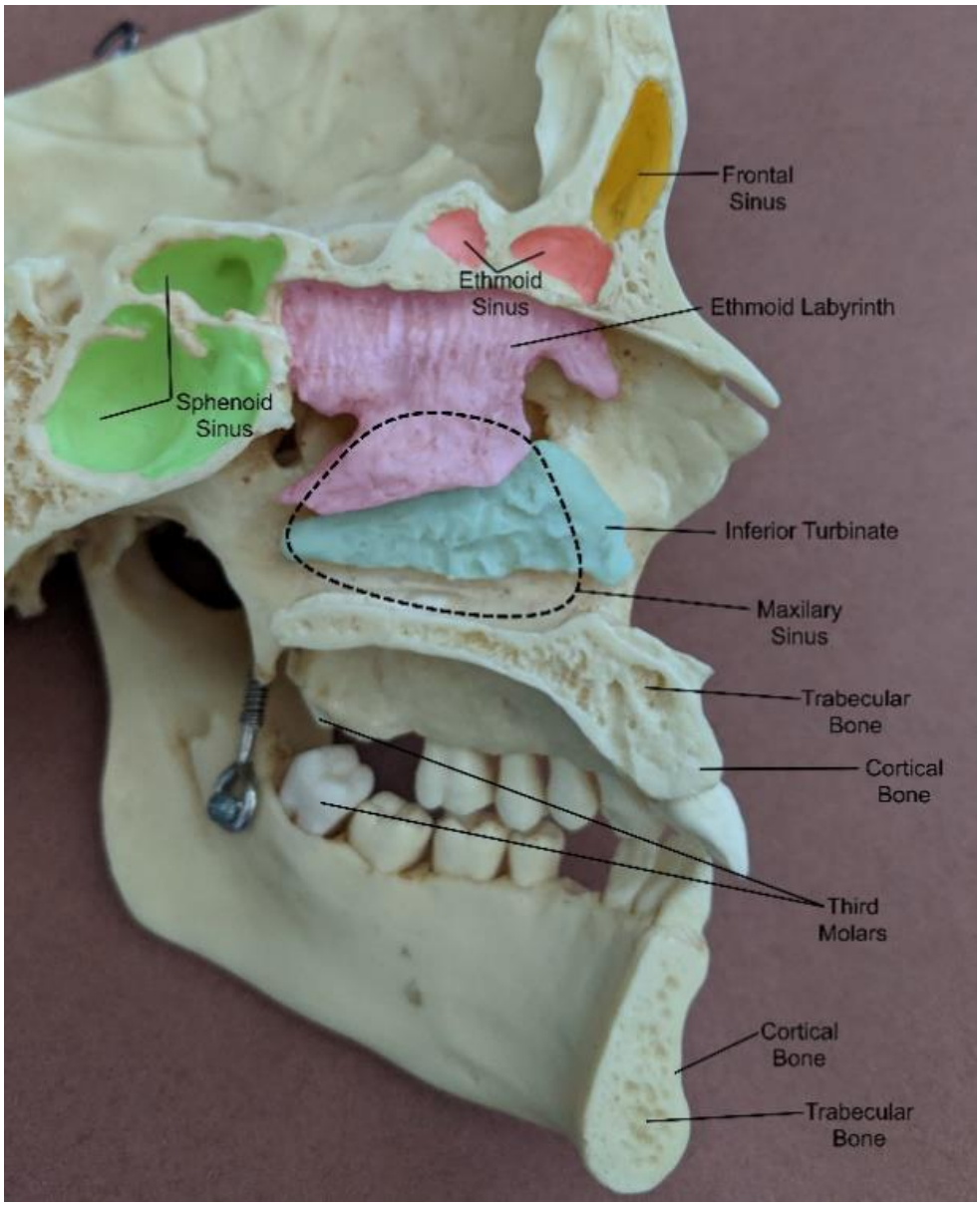

Figure 1. Structure of the human jaws and sinuses. An edited photograph of a sagittal cross-section of a human skull with the locations of the frontal, ethmoid, sphenoid, and maxillary sinuses as well as the portions of ethmoid bone and inferior turbinate overlying the maxillary sinus labeled in false color. Additionally, the location of the third molars and the types of bone (hard cortical and spongy trabecular) within the maxilla and mandible are indicated.

MATERIALS AND METHODS

Survey Distribution

Primary data collection was done via an anonymized survey hosted using the Qualtrics® research suite under the Appalachian State University license. The survey was distributed to 1,000 Appalachian State University student email addresses provided by the Office of Institutional Research, Assessment, and Planning (IRAP) and remained open to responses for a period of 31 days. From this pool of potential participants, 81 respondents initiated the survey. Three of these respondents did not complete the survey before it was closed, leaving a pool of 78 usable responses.

Data Analysis

After data collection was completed, the 78 survey responses were analyzed using the Qualtrics® cross tabulation and reporting tools alongside Microsoft Excel©. Statistical analysis of the relationship between third molar extraction status and age, sex, and diet, as well as that between pre- and post-extraction symptom data was done using Pearson's chi-squared test.

RESULTS

Demographic Data

Of the participants who completed the survey, 50 (66% of respondents) were female and 26 (34% of respondents) were male. Out of these responses, 17 people (6 males and 11 females, representing 23% and 22% of their sexes respectively and 22% of all respondents in total) experienced some degree of third molar agenesis

(Figure 2 A-B). Within this group, 5 from each sex (making up 10% of female respondents and 19% of male respondents and representing 13% of all responses) indicated that they never developed third molars at all and thus were exempted from further questions regarding extraction (Figure 2 A-B). This indicates that there is no statistical correlation between sex and partial or total third molar agenesis among those surveyed (p=0.91 and p=0.26, respectively). Of the 66 remaining respondents, 44 (67% of respondents) indicated that they had at least some third molars extracted, consisting of 28 (62%) of females and 16 (76%) of males that developed third molars (Figure 3 A-B). This indicates that there is no statistical correlation between sex and third molar extraction rates among those surveyed (p=0.26). Analysis of extraction rates cross referenced with diet showed that 67% of non-vegan/vegetarians and 64% of vegan/vegetarians had undergone third molar extraction (Figure 4 A-B). This indicates that there is no statistical correlation between diet and third molar extraction rates among those surveyed (p=0.83). All participants were between the ages of 18 and 44, with the vast majority (92% of respondents) being between the ages of 18 and 24.

The reason respondents indicated for undergoing third molar extraction showed some variation, with 10 (24% of respondents) citing concerns of overcrowding, 19 (45% of respondents) citing other prophylactic motives, 6 (14% of respondents) indicating issues with tooth impaction, 5 (12% of respondents) indicating issues with tooth malpositioning, and 2 (5% of respondents) indicating that they did not recall the reason for their procedure or pursued it for other reasons (Table 1). Only three participants reported complications from the procedure, with

one each indicating that they experienced oroantral communication, jaw fracture, or damage to other teeth. Interestingly, all three of these participants were female, and all reported that they began experiencing seasonal allergies after their extractions while never having experienced them prior (Table 2). This sample was too small for meaningful statistical analysis, so no determination as to the significance of this observation could be made.

Statistical Analysis

Patterns were similar in all three symptoms covered by the study. Participants were asked how frequently they experienced each symptom both before and after having their third molars extracted, with the options being constantly (once a week or more), frequently (two or three times a month), infrequently (less than once a month), or never. Each response was categorized as an increase, decrease, or no change based on these reported rates (Table 3). The vast majority of respondents indicated no change in the rates of sinus infections they experienced pre- and post-extraction, with 36 (86% of respondents) reporting no change, 3 (7% of respondents) reporting an increase in frequency, and 3 (7% of respondents) reporting a decrease in frequency (Table 3). For the rates of non-migraine headaches, 34 (81% of respondents) reported no change in frequency, 3 (7% of respondents) reported an increase in frequency, and 5 (12% of respondents) reported a decrease in frequency (Table 3). The pattern was similar in seasonal allergy rates, with 33 (78% of respondents) indicating no change in frequency, 5 (12% of respondents) indicating an increase in frequency, and 4 (10% of respondents) indicating a decrease in frequency (Table 3).

For the purpose of determining the significance of the symptom results, subjects were treated as their own control group, with reported pre-extraction frequencies treated as the control and reported post-extraction frequencies acting as the test group (Figure 5 A-C). Using this standard, the data indicates that there was no correlation between the extraction of third molars and the rates of sinus infections, non-migraine headaches, or seasonal allergies among those surveyed (p=0.57, p=0.57, and p=0.62, respectively).

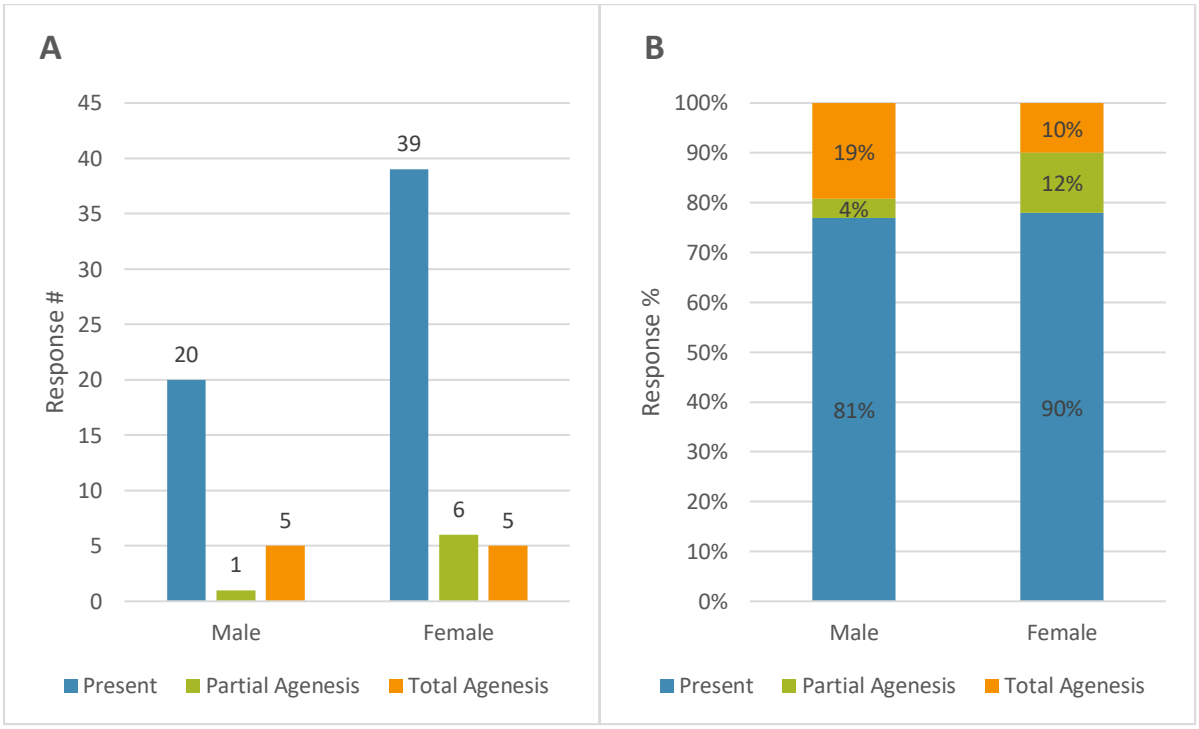

Figure 2. Third molar agenesis and sex. (A) a bar graph depicting the numerical breakdown of the absolute values of third molar agenesis by sex (B) a split bar graph depicting the percentage of males and females represented by each third molar development status

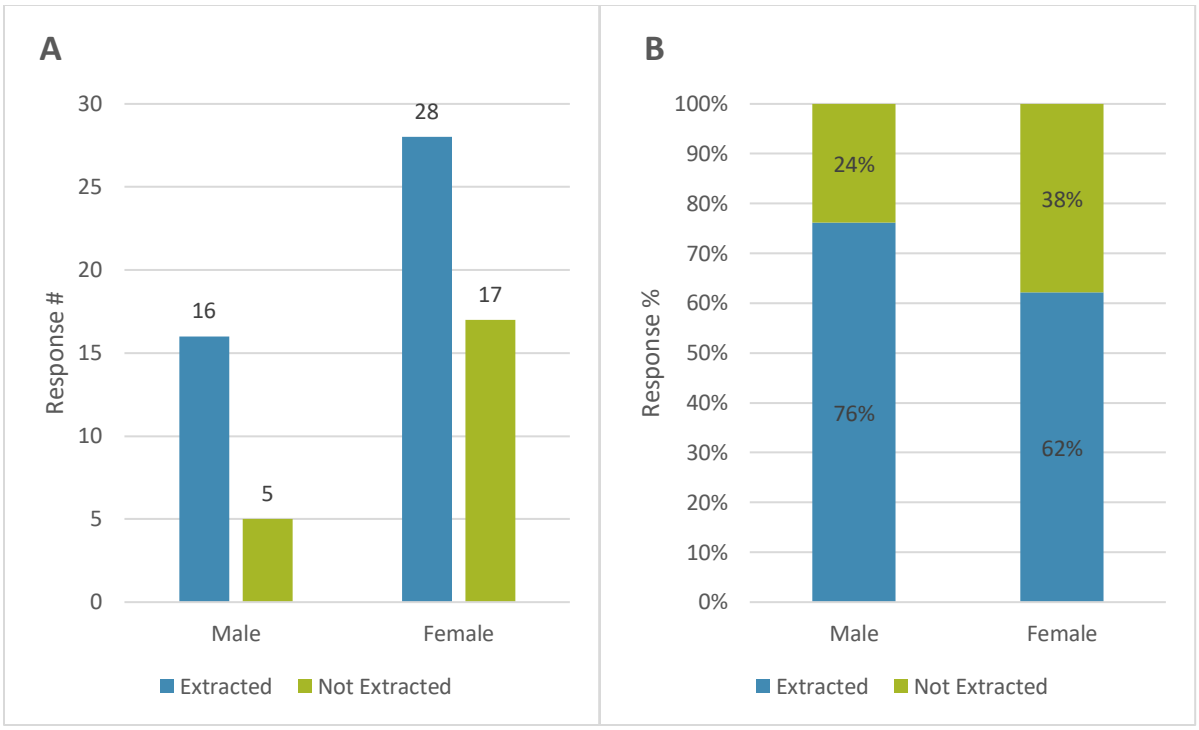

Figure 3. Third molar extraction and sex. (A) a bar graph depicting the numerical breakdown of the absolute values of third molar extraction by sex (B) a split bar graph depicting the percentage of males and females with extracted or non-extracted third molars

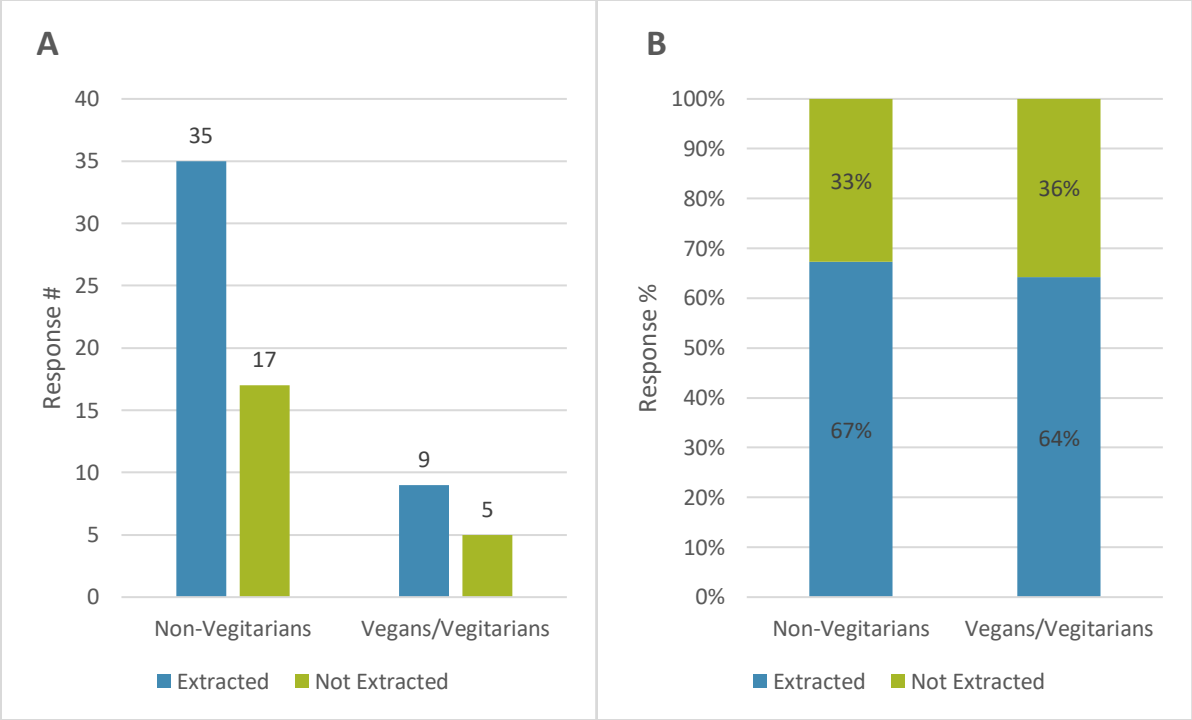

Figure 4. Third molar extraction and diet. (A) a bar graph depicting the numerical breakdown of the absolute values of third molar extraction by diet (B) a split bar graph depicting the percentage of non-vegetarians and vegetarians with extracted or non-extracted third molars

Table 1. Motives for third molar extraction. Motives and number taken from survey.

Motive	Number of respondents	Percent of respondents
Concerns of overcrowding	10	24%
Prophylactic	19	45%
Tooth impaction	6	14%
Tooth malpositioning	5	12%
Other/Do not recall	2	5%

Table 2. Symptom frequency changes in respondents reporting surgical complications. All three respondents were female, and all reported experiencing increased rates of seasonal allergies after the extraction of their third molars.

Respondent	Complication	Headaches	Sinus Infections	Seasonal allergies
Respondent 1	Oroantral communication	No Change	No Change	Increase
Respondent 2	Jaw Fracture	No Change	No Change	Increase
Respondent 3	Damage to other teeth	Increase	Increase	Increase

Table 3. Symptom rate outcomes post-extraction. Rate changes for sinus infections, non-migraine headaches, and seasonal allergies from the survey data.

Symptom	Increase	Decrease	No Change
Sinus infections	3	3	36
Non-migraine headaches	3	5	34
Seasonal allergies	5	4	33

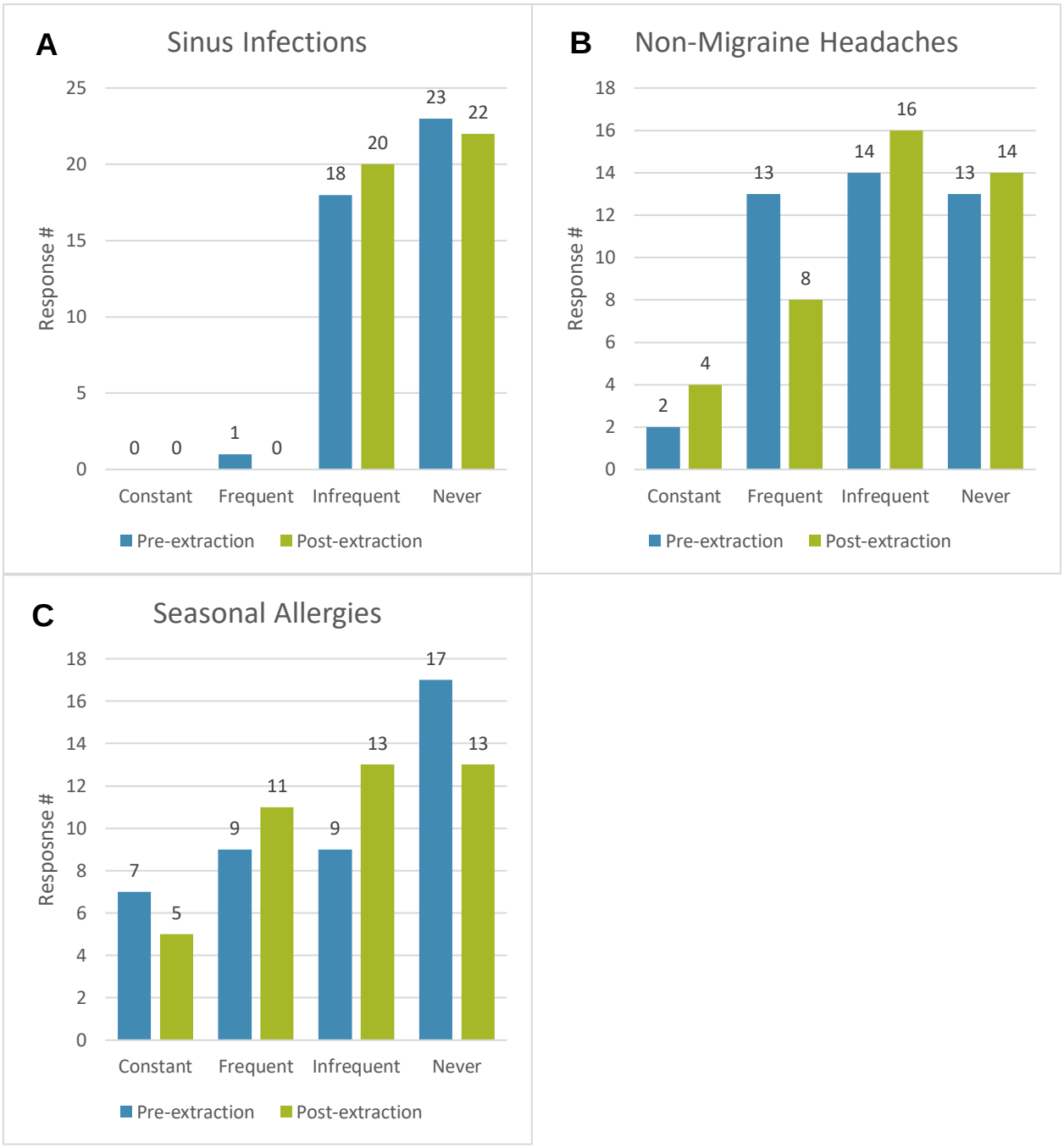

Figure 5. Symptom frequencies pre- and post-extraction. (A) a bar graph depicting the numerical breakdown of sinus infection frequencies (B) a bar graph depicting the numerical breakdown of non-migraine headache frequencies (C) a bar graph depicting the numerical breakdown of seasonal allergy frequencies

DISCUSSION

No significant correlation was found between third molar extraction and the rates of seasonal allergies, non-migraine headaches, or sinus infections. Since the majority of respondents indicated that they experienced no change in the frequency of any of the three conditions after their third molars were extracted, it can be assumed that the procedure does not have a major impact on the causes of any of them. While it is known that the loss of teeth for any reason causes structural changes within the skull, other factors such as genetics and lifestyle likely have a greater influence on the conditions examined by this study, based on these results. It is of note that this lack of correlation between symptom rates and third molar extraction goes both ways, and no significant decrease in frequency was observed either. This could indicate that the third molars were not having deleterious effects on the sinus before their extraction, counter to what some patients would expect when seeking prophylactic extraction. Interestingly, a large portion of respondents indicated that they underwent third molar extraction for prophylactic reasons or over concerns of overcrowding (45% and 24% of all responses, respectively), despite the fact that the role of third molars in dental crowding and the benefits of prophylactic third molar extraction are still debated (Cunha-Cruz et al. 2014; Esan & Scepartz 2017; Friedman 2007). One might expect to see differing rates of third molar extraction between vegetarians and non-vegetarians if the dietary shift explanation for difficult third molar eruption in modern humans was accurate, but no such correlation was observed (Miclotte et al. 2015). Likewise, no significant difference in extraction rates between males and females was observed, indicating that jaw size

is likely not the only factor for the ease of third molar eruption (Miclotte et al. 2015). This was consistent with past studies that have observed similar rates of third molar extractions in males and females (Kautto et al. 2018). The rates of third molar agenesis were comparable between males and females, as observed in earlier studies, and the overall rate was comparable to what has been observed in North American populations in the past (Moreno et al. 2019). These results are not completely conclusive however, and they should be considered with respect to the limitations of this study. A survey involving the self-reporting of symptoms in inherently less reliable than a full clinical study, and the small sample size of this study makes generalizing the results difficult.

CONCLUSION

Based on the survey data that was collected, the hypotheses that third molar extraction correlates with increased rates of seasonal allergies, non-migraine headaches, or sinus infections are all rejected. There was no significant difference between symptom frequencies pre- and post-extraction, and the number of individuals experiencing an increase in the rate of the symptoms after the procedure did not represent a majority of respondents. This means that the frequency of these symptoms did not decrease significantly either, as the most common outcome was no change in symptom frequency whatsoever. Future research into the effects of third molar extraction on the sinuses should still be pursued, especially studies involving radiographic bone analysis and researcher-monitored logging of symptoms rather than retrospective reporting. The segment of participants reporting surgical complications was too small to draw conclusions from, but the fact that those cases

made up the overwhelming majority of respondents that indicated an increase in seasonal allergy frequency warrants further investigation.

REFERENCES

American Association of Endodontists (2018). *Maxillary Sinusitis of Endodontic Origin* [Position Statement]. K. W. Tataryn (Ed.), Retrieved from https://www.aae.org/specialty/wp-content/uploads/sites/2/2018/04/AAE_PositionStatement_MaxillarySinusitis.pdf

Aravena, P., Delgado, F., Olave, H., Ulloa-Marin, C., & Perez-Rojas, F. (2016). Chilean patients' perception of oral health-related quality of life after third molar surgery. *Patient Preference and Adherence, 2016:10*, 1719–1725. doi: 10.2147/ppa.s106814

Bodic, F., Hamel, L., Lerouxel, E., Baslé, M. F., & Chappard, D. (2005). Bone loss and teeth. *Joint Bone Spine, 72*(3), 215–221. doi: 10.1016/j.jbspin.2004.03.007

Clemente, M. P. (2005). Surgical Anatomy of the Paranasal Sinus. In H. Levine (Ed.), *Sinus surgery: endoscopic and microscopic approaches* (pp. 1-56). New York, NY: Thieme

Cunha-Cruz, J., Rothen, M., Spiekerman, C., Drangsholt, M., Mcclellan, L., & Huang, G. J. (2014). Recommendations for Third Molar Removal: A Practice-Based Cohort Study. *American Journal of Public Health, 104*(4), 735–743. doi: 10.2105/ajph.2013.301652

Esan, T., & Schepartz, L. A. (2017). Third molar impaction and agenesis: influence on anterior crowding. *Annals of Human Biology, 44*(1), 46–52. doi: 10.3109/03014460.2016.1151549

Farish, S. E., & Bouloux, G. F. (2007). General Technique of Third Molar Removal. Oral and *Maxillofacial Surgery Clinics of North America, 19*(1), 23–43. doi: 10.1016/j.coms.2006.11.012

Friedman, J. W. (2007). The Prophylactic Extraction of Third Molars: A Public Health Hazard. *American Journal of Public Health, 97*(9), 1554–1559. doi: 10.2105/ajph.2006.100271

Horowitz, R., Holtzclaw, D., & Rosen, P. S. (2012). A Review on Alveolar Ridge Preservation Following Tooth Extraction. *Journal of Evidence Based Dental Practice, 12*(3), 149–160. doi: 10.1016/s1532-3382(12)70029-5

Huang, G. J., Cunha-Cruz, J., Rothen, M., Spiekerman, C., Drangsholt, M., Anderson, L., & Roset, G. A. (2014). A Prospective Study of Clinical Outcomes Related to Third Molar Removal or Retention. *American Journal of Public Health, 104*(4), 728–734. doi: 10.2105/ajph.2013.301649

Kautto, A., Vehkalahti, M. M., & Ventä, I. (2018). Age of patient at the extraction of the third molar. *International Journal of Oral and Maxillofacial Surgery, 47*(7), 947–951. doi: 10.1016/j.ijom.2018.03.020

Kingsmill, V. J. (1999). Post-Extraction Remodeling of the Adult Mandible. *Critical Reviews in Oral Biology & Medicine, 10*(3), 384–404. doi: 10.1177/10454411990100030801

Miclotte, A., Franco, A., Guerrero, M. E., Willems, G., & Jacobs, R. (2015). The association between orthodontic treatment and third molar position, inferior alveolar nerve involvement, and prediction of wisdom tooth eruption. *Surgical and Radiologic Anatomy, 37*(4), 333–339. doi: 10.1007/s00276-014-1357-8

Moreno, M. T., Díaz, A., González, A., Manríquez-Soto, G., & Toro-Ibacache, V. (2019). Is Third Molar Agenesis an Anomaly or Just a Sign of Variation? Prevalence and Manner of Presentation of this Condition in a Sample from the Metropolitan Region

of Chile. *International Journal of Morphology, 37*(4), 1382–1386. doi: 10.4067/s0717-95022019000401382

Oltramari, P. V. P., Navarro, R. D. L., Henriques, J. F. C., Taga, R., Cestari, T. M., Janson, G., & Granjeiro, J. M. (2007). Evaluation of bone height and bone density after tooth extraction: an experimental study in minipigs. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, 104*(5), 9–16. doi: 10.1016/j.tripleo.2007.06.015

Passàli, D., Passàli G. C., Passàli, F. M., & Bellussi L. (2005). Physiology of the Paranasal Sinuses. In H. Levine (Ed.), *Sinus surgery: endoscopic and microscopic approaches* (pp. 57-63). New York, NY: Thieme

Ranganathan, M., Balaji, M., Krishnaraj, R., Narayanan, V., & Thangavelu, A. (2017). Assessment of regeneration of bone in the extracted third molar sockets augmented using xenograft (CollaPlugTM Zimmer) in comparison with the normal healing on the contralateral side. J*ournal of Pharmacy And Bioallied Sciences, 9*(5), 180–186. doi: 10.4103/jpbs.jpbs_176_17

Sugiki, Y., Kobayashi, Y., Uozu, M., & Endo, T. (2018). Association between skeletal morphology and agenesis of all four third molars in Japanese orthodontic patients. *Odontology, 106*(3), 282–288. doi: 10.1007/s10266-017-0336-z

SUPPLEMENTARY MATERIALS

IRB Approval Information

IRB Number: 19-0149

Study Title: Honors Thesis: Wisdom Tooth Extraction

PI: Ian Clapp

Faculty Advisor: Gregory Anoufriev

Study Status: Exempt

Survey Full Text

Consent Information

Please Note:

The data collection for this study is conducted online, and no method of transmission over the Internet, or method of electronic storage, is perfectly secure. Therefore, we cannot guarantee absolute security. This survey is not expected to personally benefit any respondents. Appalachian State University's Institutional Review Board has determined this study to be exempt from IRB oversight.

By continuing to the research procedures, I acknowledge that I am at least 18 years old, have read the above information, and agree to participate

1. Was is your age group?
    a. Under 18
    b. 18-24
    c. 25-34
    d. 35-44
    e. 45-54
    f. 55-64
    g. 65+
2. What is your sex?
    a. Male
    b. Female
    c. Trans male
    d. Trans female

3. Are you a smoker?
    a. Yes
    b. No
4. Do you eat a vegan or vegetarian diet?
    a. Vegan
    b. Vegetarian
    c. No
5. Did you ever develop wisdom teeth?
    a. Upper wisdom teeth
    b. Lower wisdom teeth
    c. Both upper and lower wisdom teeth
    d. Neither upper nor lower wisdom teeth
6. Were any of your wisdom teeth removed?
    a. Upper wisdom teeth
    b. Lower wisdom teeth
    c. Both upper and lower wisdom teeth
    d. Neither upper nor lower wisdom teeth
7. What was the reason for the removal of your wisdom teeth?
    a. Tooth impaction (blocked by other teeth)
    b. Tooth malpositioning (crooked or misplaced teeth)
    c. Concerns of tooth crowding
    d. Prophylactic extraction (removal to prevent future issues)
    e. Other (please specify):
    f. Do not recall
8. Did you experience any of these complications from your wisdom tooth extraction:
    a. Oroantral communication (exposure of sinus cavities to mouth)
    b. Jaw fracture
    c. Damage to other teeth
    d. Do not recall
    e. None of the above
9. Did you experience any of the following prior to your wisdom tooth extraction (options: Never, Infrequently (Less than once a month), Frequently (Two or three times a month), Constantly (Once a week or more))
    a. Sinus infections

b. Non-migraine headaches
c. Seasonal allergies

10. Did you experience any of the following after your wisdom tooth extraction (options: Never, Infrequently (Less than once a month), Frequently (Two or three times a month), Constantly (Once a week or more)
    a. Sinus infections
    b. Non-migraine headaches
    c. Seasonal allergies

Survey complete

Thank you for your responses.

Any questions can be directed to the principal investigator, Ian Clapp, at clappic@appstate.edu or faculty advisory, Gregory Anoufriev, MD, at anoufrievg@appstate.edu.

Email Body Text

You are invited to participate in an anonymous survey that is intended to collect information about possible side effects of wisdom tooth removal (third molar extraction) for a student Honors thesis. If you agree to be part of the research study, you will be asked to answer up to 14 questions about your background and dental history. Participation in this survey is optional and there is no penalty for not participating in this survey, and no compensation will be provided. Even if you decide to participate now, you may change your mind and stop at any time. The Appalachian State University Institutional Review Board (IRB) has determined that this study is exempt from IRB oversight.

Any questions can be directed to the principal investigator, Ian Clapp, at clappic@appstate.edu or faculty advisory, Gregory Anoufriev, MD, at anoufrievg@appstate.edu.

By continuing to the research procedures, I acknowledge that I am at least 18 years old, have read the above information, and agree to participate.

Cross Tabulations

	Q7: * What is your sex?				
Removal	Female	Male	Trans Female	Trans Male	Total

Both upper and lower wisdom teeth	23	15	0	0	38
Lower wisdom teeth only	3	1	0	0	4
Neither upper nor lower wisdom teeth	17	5	0	0	22
Upper wisdom teeth only	2	0	0	0	2
Total	45	21	0	0	

	Q7: * What is your sex?					
Development	Total	Female	Male	Trans Female	Trans Male	Total
Both upper and lower wisdom teeth	59	39	20	0	0	59
Lower wisdom teeth	3	2	1	0	0	3
Neither upper nor lower wisdom teeth	10	5	5	0	0	10
Upper wisdom teeth	4	4	0	0	0	4
Total		50	26			

	Q11: Do you eat a vegan or vegetarian diet?			
Removal	Total	Neither	Vegan	Vegetarian
Both upper and lower wisdom teeth	38	30	3	5
Lower wisdom teeth only	4	4	0	0
Neither upper nor lower wisdom teeth	22	17	2	3
Upper wisdom teeth only	2	1	0	1

	Sinus Infections (column is before)				
	Constant	Frequent	Infrequent	Never	Total
Constant	0	0	0	0	0
Frequent	0	0	0	0	0

Infrequent	0	1	16	3	20
Never	0	0	2	20	22
Total	0	1	18	23	

	Non-migraine headaches (column is before)				
	Constant	Frequent	Infrequent	Never	Total
Constant	2	2	0	0	4
Frequent	0	8	0	0	8
Infrequent	0	3	1	1	16
Never	0	0	12	12	14
Total	2	13	14	13	

	Seasonal allergies (column is before)				
	Constant	Frequent	Infrequent	Never	Total
Constant	4	0	0	1	5
Frequent	1	9	0	1	11
Infrequent	2	0	8	3	13
Never	0	0	1	12	13
Total	7	9	9	17	

			Q6: * What is your age group?					
Removal	Under 18	18-24	25-34	35-44	45-54	55-64	65+	Total
Both upper and lower wisdom teeth	0	35	2	1	0	0	0	38
Lower wisdom teeth only	0	3	1	0	0	0	0	4

Neither upper nor lower wisdom teeth	0	22	0	0	0	0	0	22
Upper wisdom teeth only	0	1	1	0	0	0	0	2