

### Introduction

Rhinosinusitis is defined as a group of disorders characterized by inflammation of the paranasal sinuses and the mucosa of the nose. The term rhinosinusitis has more recently been utilized in lieu of sinusitis given the high incidence of nasal airway inflammation that often accompanies sinusitis. This inflammation in the nose and sinuses causes changes in the sinonasal mucosa resulting in impairment of the cilia and edema of the mucosal lining followed by a transudate. The effect of the edema is that it causes obstruction of the ostia of the sinuses, thereby causing impairment in the drainage of secretions. The outcome of all these changes is that mucus collects within the sinuses and stasis occurs. This inflammatory response has both clinical and radiographic implications, which include sinus mucosal thickening, nasal discharge, and congestion, which is often seen as partial or complete sinus opacification on radiographs.

Since widening the maxillary transverse dimension has been shown to reduce nasal airway resistance, it could be hypothesized that treatment may also mitigate the incidence and severity of rhinosinusitis. Because maxillary expansion has been shown to decrease airflow velocity and reduce the negative pressures of the pharyngeal airway, we hypothesize that following maxillary expansion, the increase in nasal airflow may diminish the impact of inflammatory changes in the sinuses.

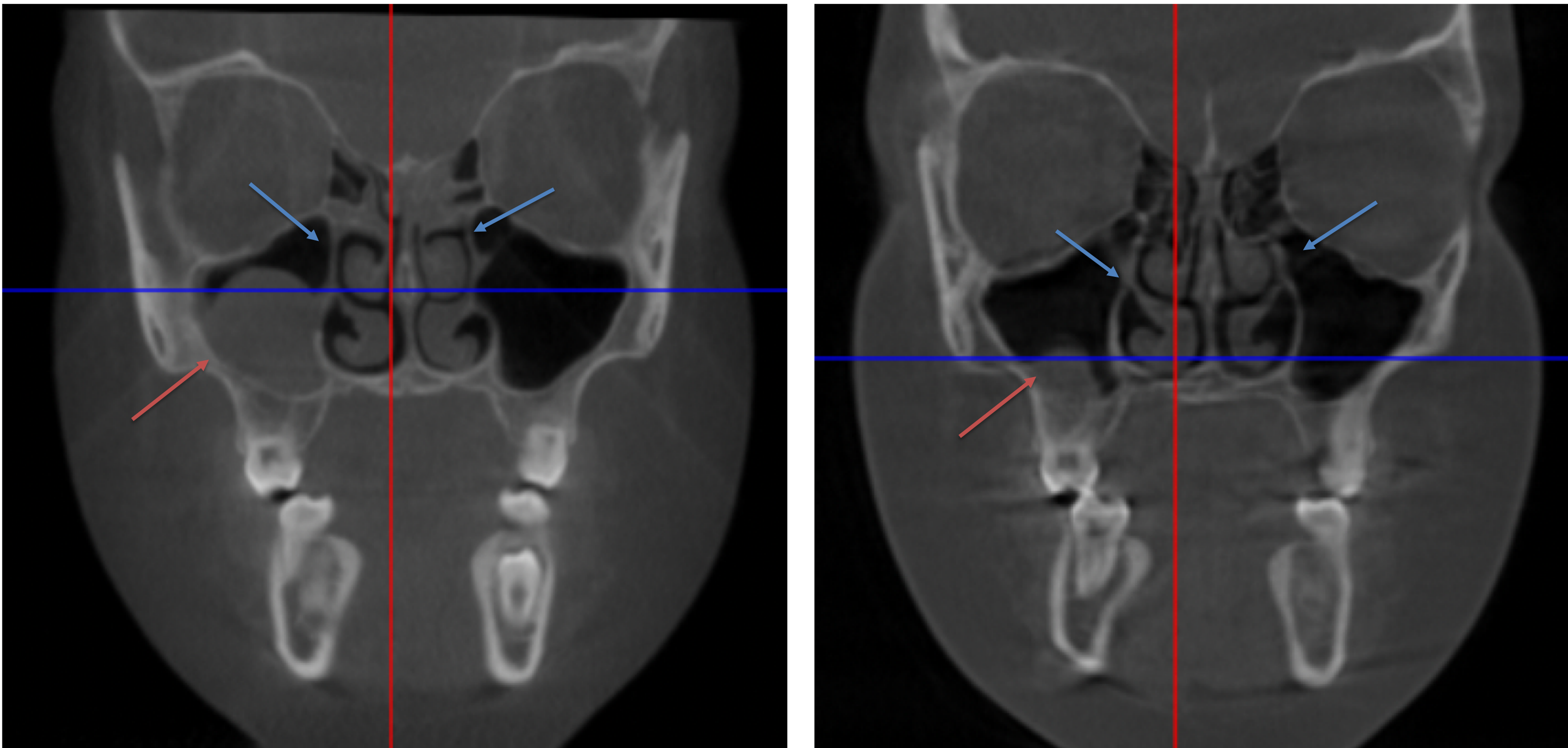
**Hypothesis:** There is no difference in the signs and symptoms of chronic rhinosinusitis between patients whom received rapid palatal expansion and those whom did not.

*The purpose of this study was to identify if rapid palatal expansion is a treatment modality that may improve indicators of chronic rhinosinusitis in pediatric patients*

### Materials & Methods

- Subjects included healthy patients under the age of 18 whom presented for treatment at one of 2 private practice orthodontic practices
- Study subjects completed an initial CBCT , RPE, and a final CBCT
- Control subjects did not pursue or were not recommended immediate treatment and completed initial CBCT and a final CBCT when returning for re-evaluation at a later time.
- CBCT’s were analyzed for 20 different signs of chronic rhinosinusitis and patient charts were reviewed for 13 different clinical symptoms of chronic rhinosinusitis
- CBCT scans and chart data were reviewed by 1 pediatric dental resident, 1 dentist, and 2 dental students
- Glimmix model was used to analyze post vs pre for Control and Study group. The model was adjusted by age and gender.
- The differential change from pre- to post- between Control and Study group was assessed by testing the group\*time (pre vs post) interaction term.
- This study was approved for research using human subjects by the Institutional Review Board of UCLA (IRB #19-000483-AM-00001).

### Results

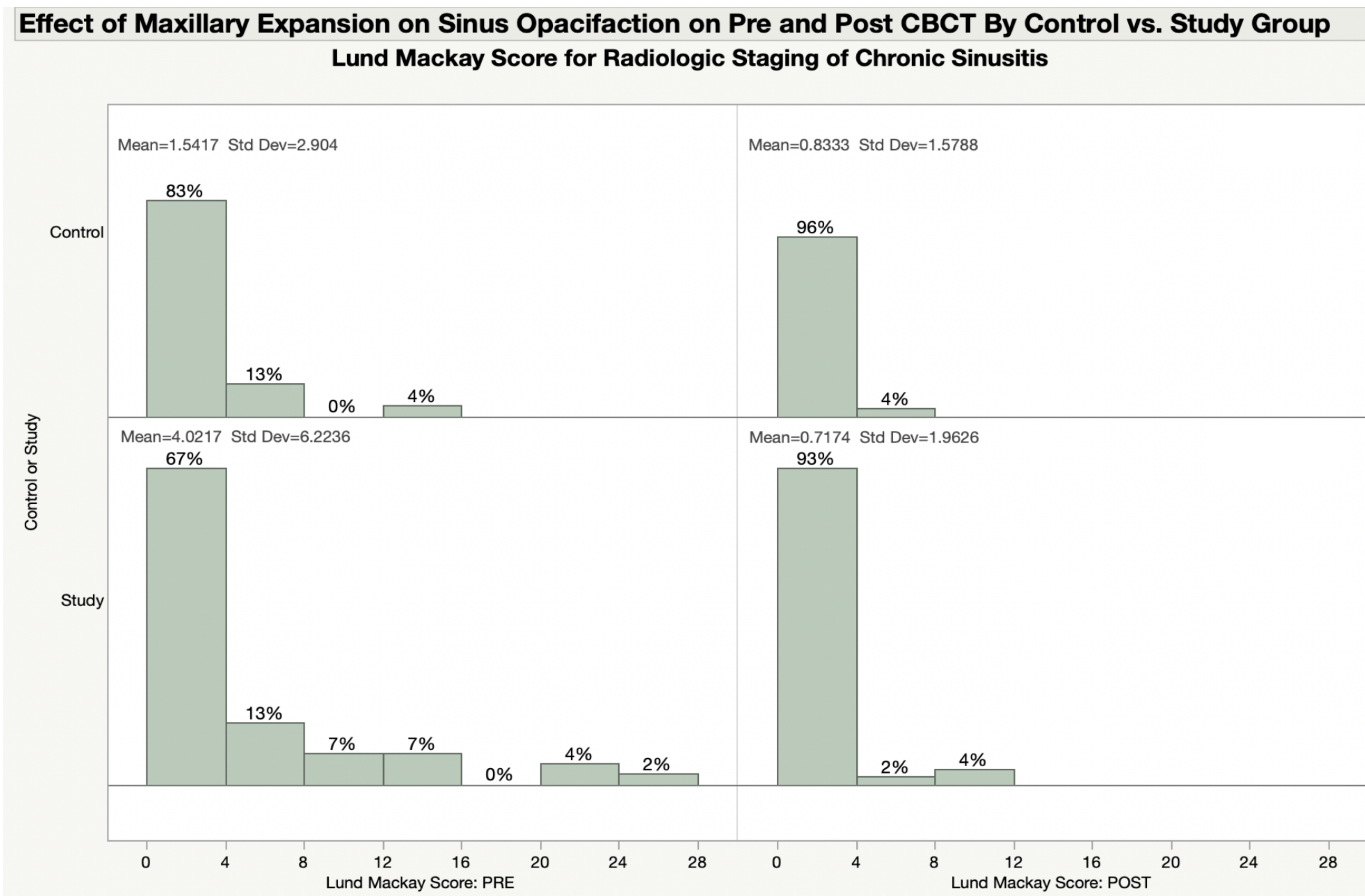


**Figure 1:** Before RPE (left) and after RPE (right)

Note the decrease in opacification on the right sinus (red arrow) as well as the decrease in left and right turbinate hypertrophy (blue arrow) following expansion

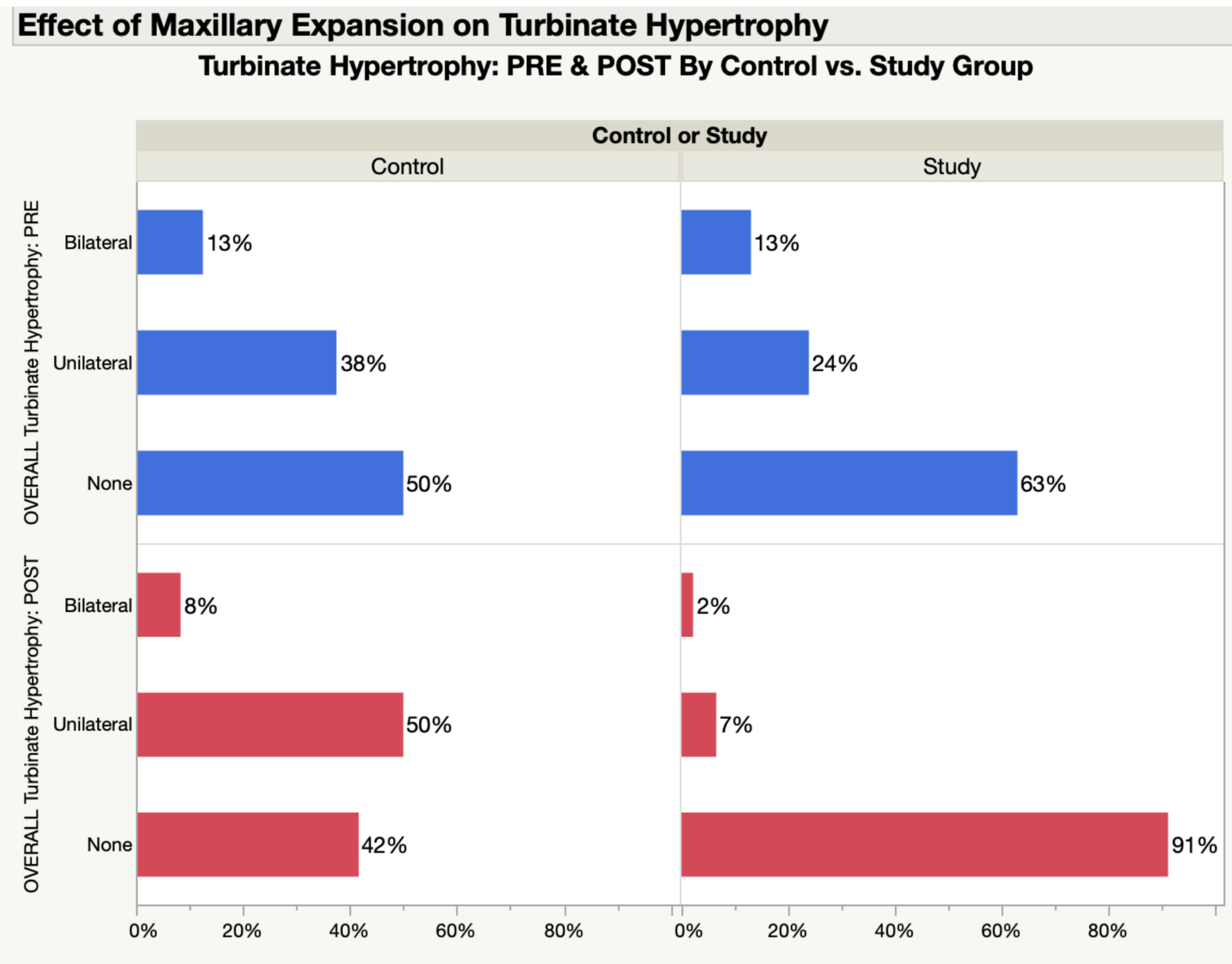
Group	N	Age Average	Females	Males	Change in intermolar distance (mm)	Time elapsed between CBCTs (years)
Control	24	7.9	12	12	1.7	1.1
Study	46	7.8	21	25	6.2	1.2

**Table 1:** Demographics of Study and Control Groups



**Figure 3:** The results show statistical significance for the effect of maxillary expansion on sinus opacification as measured by Lund Mackay Score

There was significant decrease in Lund Mackay Score in study group patients (-2.7, SE .36, P<0.0001) and there was no significant change in the control group.



**Figure 2:** The results show statistical significance for the effect of maxillary expansion on turbinate hypertrophy

After maxillary expansion patients were 95% less likely (OR:0.05, CI: 0.02-0.17; P<0.0001) to have turbinate hypertrophy and there was no significant change in the control group.

### Conclusions

- Rapid palatal expansion was associated with improvements in CBCT indicators of rhinosinusitis including decreased turbinate hypertrophy, and decreased opacification of the maxillary sinus, ethmoid sinus and overall Lund-Mackay sinus score.
- History of adenoidectomy, tonsillectomy, allergies, congestion and nasal obstruction were found to be predictors of positive outcomes regarding improvement of indicators of chronic rhinosinusitis after RPE
- Rapid palatal expansion may help to alleviate signs and symptoms of rhinosinusitis in young patients.

Special thanks to research assistants: Neil Franklin, Yuvika Singh, Benit Felkermeyer

### References

- Heath, J., Hartzell, L., Putt, C., & Kennedy, J. L. (2018). Chronic Rhinosinusitis in Children: Pathophysiology, Evaluation, and Medical Management. *Current allergy and asthma reports*, 18(7), 37. <https://doi.org/10.1007/s11882-018-0782-8>
- Iwasaki, T., Yoon, A., Guillemainault, C., Yamasaki, Y., & Liu, S. Y. (2020). How does distraction osteogenesis maxillary expansion (DOME) reduce severity of obstructive sleep apnea? *Sleep & breathing = Schlaf & Atmung*, 24(1), 287–296. <https://doi.org/10.1007/s11325-019-01348-7>
- Calvo-Henriquez, C., Capasso, R., Chiesa-Estomba, C., Liu, S. Y., Martins-Neves, S., Castedo, E., O'Connor-Reina, C., Ruano-Ravina, A., & Kahn, S. (2020). The role of pediatric maxillary expansion on nasal breathing: A systematic review and metaanalysis. *International journal of pediatric otorhinolaryngology*, 135, 110139. <https://doi.org/10.1016/j.ijporl.2020.110139>
- American Academy of Pediatrics. Subcommittee on Management of Sinusitis and Committee on Quality Improvement (2001). Clinical practice guideline: management of sinusitis. *Pediatrics*, 108(3), 798–808. <https://doi.org/10.1542/peds.108.3.798>
- Camacho, M., Chang, E. T., Song, S. A., Abdullatif, J., Zaghi, S., Pirelli, P., Certal, V., & Guillemainault, C. (2017). Rapid maxillary expansion for pediatric obstructive sleep apnea: A systematic review and meta-analysis. *The Laryngoscope*, 127(7), 1712–1719. <https://doi.org/10.1002/lary.26352>