

ABSTRACT

Introduction:

Maxillary transverse deficiency is one of the most common skeletal problems in craniofacial region. Constricted upper dental arch may result from abnormal functions such as abnormal breathing pattern. RME has been used as a routine clinical procedure in orthodontics, with its main purpose to expand the maxilla in young patients who had transversal maxillary constriction. An increase in nasal cavity width occurs after RME, particularly at nasal floor adjacent to mid-palatal suture. With advent of TADs, skeletal expansion is possible even in adults. As maxillary halves separate, outer walls of nasal cavity move laterally, and thus intranasal capacity increases.

Purpose:

The purpose of this study is to evaluate the airway changes in adults using two different expansion appliances: a traditional hyrax expander versus a hybrid hyrax expander appliance by employing Computational Fluid Dynamics.

Materials and Methods:

10 patients treated with a hybrid-hyrax RME and 10 treated with a hyrax RME were utilized for this study. CBCT scans were taken before treatment and after removal of appliance. 3D volume of pharyngeal airway was generated using MIMICS and Computational fluid dynamics assessment

was done using ANSYS. Changes in pre-and post-treatment measurements were measured and differences between the two treatment groups were evaluated using Mann-Whitney test and Wilcoxon signed rank test.

Results:

In hybrid hyrax RME, there was a statistical significant intragroup difference in Pressure (Pa) and Flowrate (sec). However, Maximum Velocity(m/s) showed no statistically significant change. In hyrax group all three parameters showed difference without statistical significance. Overall, the hybrid hyrax RME produced more changes in airway compared to conventional hyrax RME device.

Conclusions:

Comparative improvement of nasal airflow characteristics was seen in mini implant assisted expander group (MSE-1) which might be due to increased skeletal effects of implant supported palatal expansion as it produced statistically significant differences at nasal, frontonasal and zygomatic bone level. Further studies could be designed to examine the long-term effects of the hybrid hyrax expansion on pharyngeal airway.

Key word: *Hyrax RME, Implant-supported RME-hybrid hyrax RME, Cone beam computed tomography, Adult expansion, Pharyngeal airway changes, Computational fluid dynamics.*