

# Should Mandibular Symphyseal Distraction Osteogenesis be considered in OSA Surgery?

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## KEYWORDS:

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**ABSTRACT – Introduction:** *Surgical maxillary expansion for the treatment of obstructive sleep apnea (OSA) has become common place. To maximize airway improvement, over-expansion of the maxilla can occur, resulting in an excessively widened maxilla that creates a mismatch to the mandible. Therefore, mandibular symphyseal distraction osteogenesis (MSDO) to widen the mandible along with maxillary expansion is being increasingly advocated in OSA surgery.* **Methods:** *The authors discuss their 20-year experience with MSDO and surgical maxillary expansion. They also analyze the airway impact between Distraction Osteogenesis Maxillary Expansion (DOME) and Endoscopically-Assisted Surgical Expansion (EASE) based on currently available computational fluid dynamic (CFD) data, which has implications in whether MSDO needs to be considered.* **Results and Conclusion:** *The goal of surgical maxillary expansion is to enlarge the nasal cavity and reduce the airway resistance. CFD data demonstrates that EASE results in a much greater reduction in airway resistance as compared to DOME. EASE achieved a 12-fold reduction in nasal airway resistance compared to 3-fold reduction by DOME; a 12-fold reduction of retropalatal airway resistance as compared to 3-fold reduction by DOME; a 10-fold reduction of oropharyngeal airway resistance as compared to a 3-fold reduction by DOME, and an 8-fold reduction of hypopharyngeal airway resistance as compared to a 3-fold reduction by DOME. Because there is no physiologic basis or data that demonstrates mandibular widening improves OSA, an airway centric surgical expansion technique such as EASE can achieve a much greater airway impact without needing excessive maxillary widening, thus eliminating the necessity MSDO.*

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## 1. Introduction

Since the first report of surgical maxillary expansion for the treatment of obstructive sleep apnea (OSA)<sup>1</sup>, procedures such as Surgically Assisted Rapid Palatal Expansion (SARPE) and Distraction Osteogenesis Maxillary Expansion (DOME) have become common place<sup>7</sup>. Because the goal of maxillary expansion is to enlarge the nasal airway in OSA patients, over-widening of the maxilla (10+mm) in order to maximize airway expansion has been advocated<sup>7</sup>. However, an excessively widened maxilla can create a mismatch to the mandible, resulting in difficulty in coordinating the two arches orthodontically. Because of this, Mandibular Symphyseal Distraction Osteogenesis (MSDO) performed to widen the

mandible, is being increasingly advocated along with maxillary expansion in OSA surgery.

Combining MSDO with SARPE for the treatment of OSA is nothing new. In fact, it is a 20-year-old concept<sup>2,4</sup>. The authors aim to examine whether combining MSDO and SARPE/DOME for the treatment of OSA is a rational approach.

## 2. Methods

The authors discuss their 20-year experience with MSDO and surgical maxillary expansion. The authors also compare the airway impact between DOME and Endoscopically-Assisted Surgical Expansion (EASE) based on currently available computational fluid dynamic (CFD) data, which has implications on whether MSDO needs to be considered.

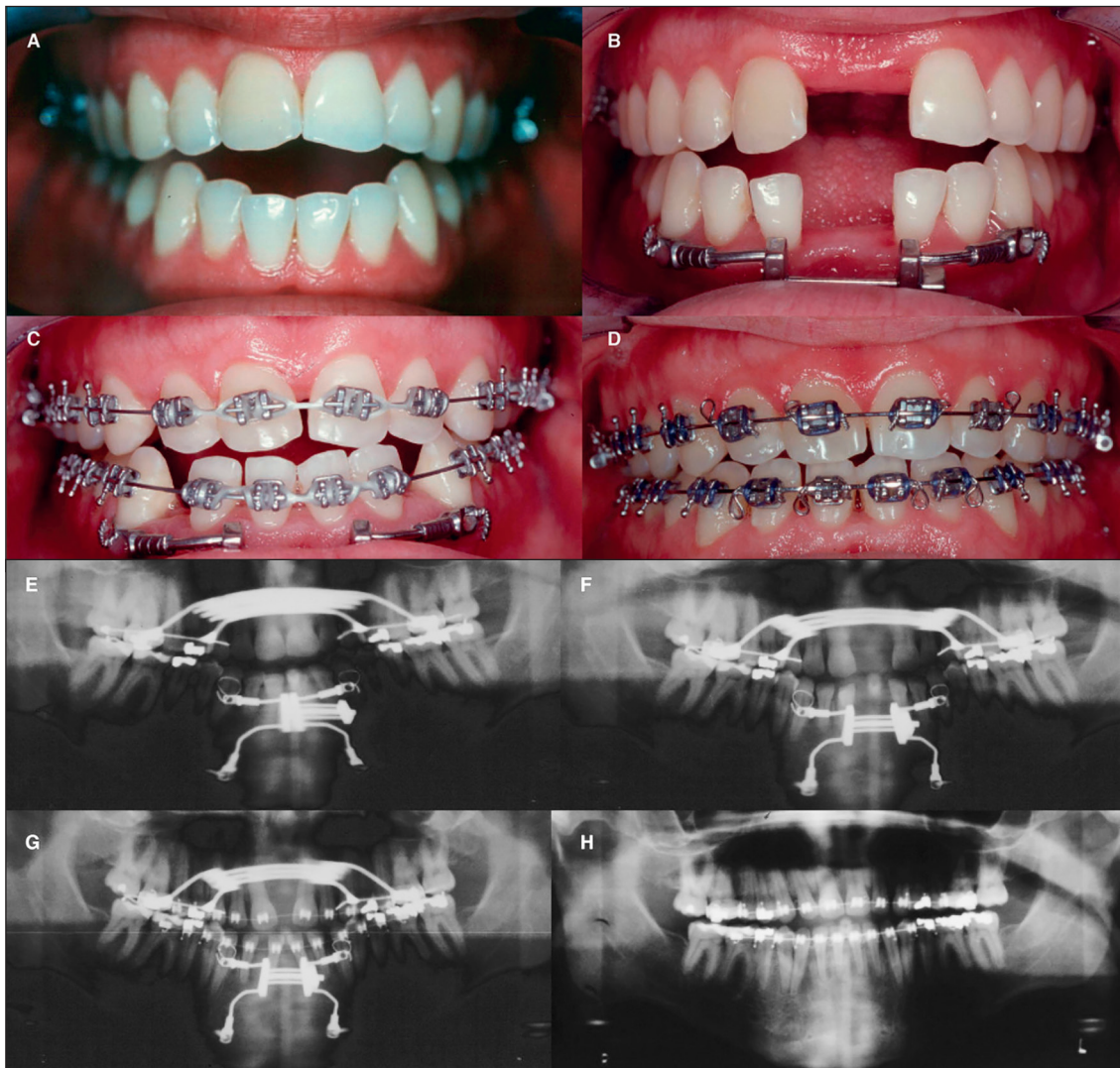


Figure 1

31-year-old man underwent SARPE/MSDO for OSA. (A-D) Clinical progression. (E-H) Radiographic progression.

### 3. Results and Discussion

The authors first published their experience in combining surgically assisted rapid palatal expansion (SARPE) and MSDO for the treatment of OSA in 2004 (Figs. 1 and 2)<sup>2,4</sup>. Since the initial publication, the authors have performed numerous combined, as well as isolated surgical maxillary expansions by SARPE and mandibular widening by MSDO for OSA. The rationale of the combined approach from 20 years ago is the same as what most practitioners believe today: that enlarging the oral cavity improves OSA, and larger the better.

However, our knowledge of OSA and the airway impact from different surgical maneuvers has evolved since 2004.

It must be emphasized that the goal of maxillary expansion is not to widen the oral cavity, but to widen the nasal cavity if the treatment objective is to improve OSA. Nasal expansion reduces nasal resistance which improves nasal breathing. The reduction of nasal airway resistance also lessens the retropalatal, oropharyngeal and hypopharyngeal airway collapse by reducing the negative airway pressure from improved nasal respiration<sup>3,5</sup>. To maximize the nasal expansion while avoiding the excessive maxillary widening as well as the need for mandibular widening, EASE was developed by the authors in 2017<sup>6</sup>. EASE is considerably less invasive but a much more efficient technique to expand the nasal cavity as compared to SARPE and DOME (see Fig. 3).

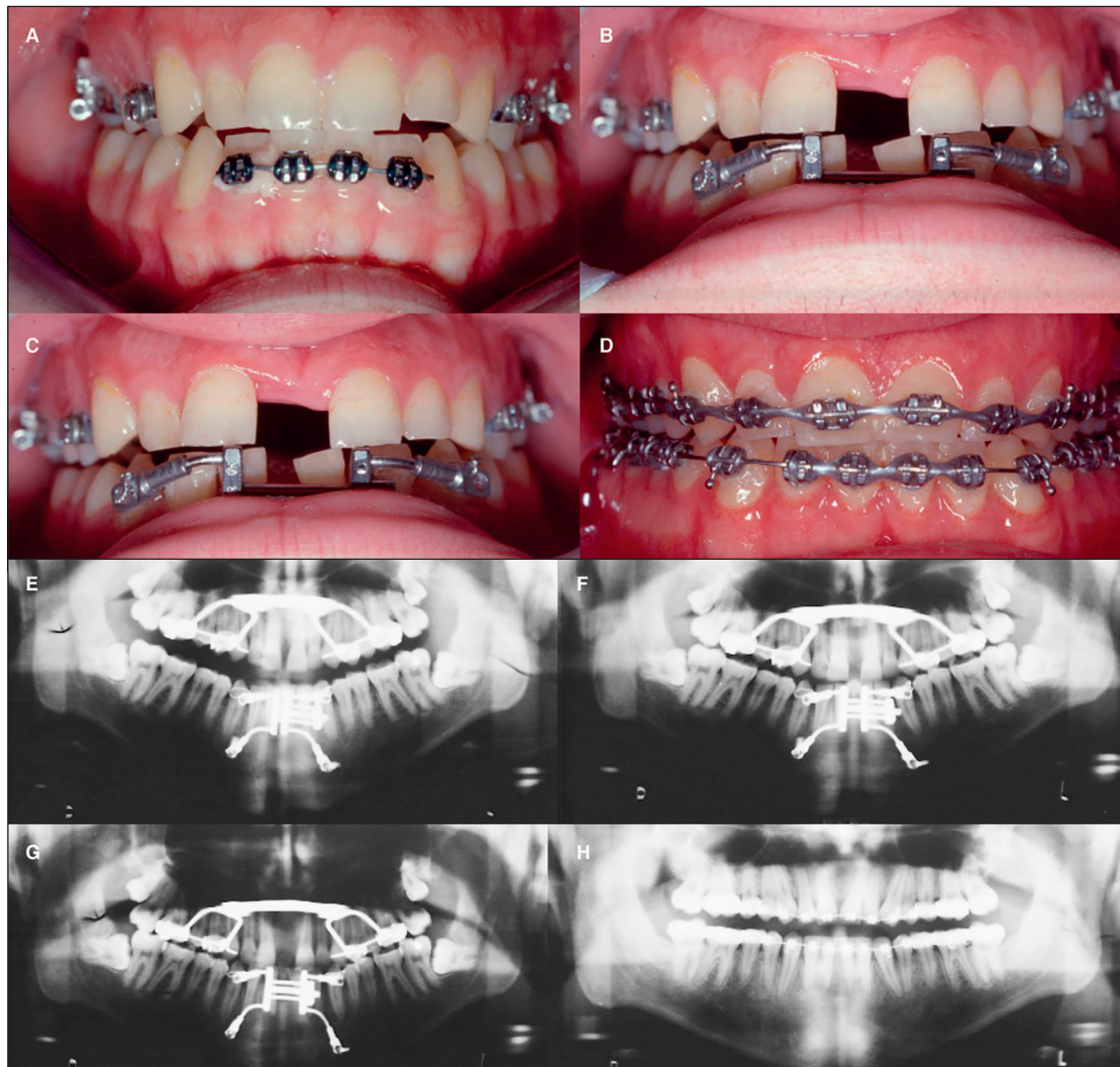


Figure 2

25-year-old man underwent SARPE/MSDO for OSA. (A-D) Clinical progression. (E-H) Radiographic progression.

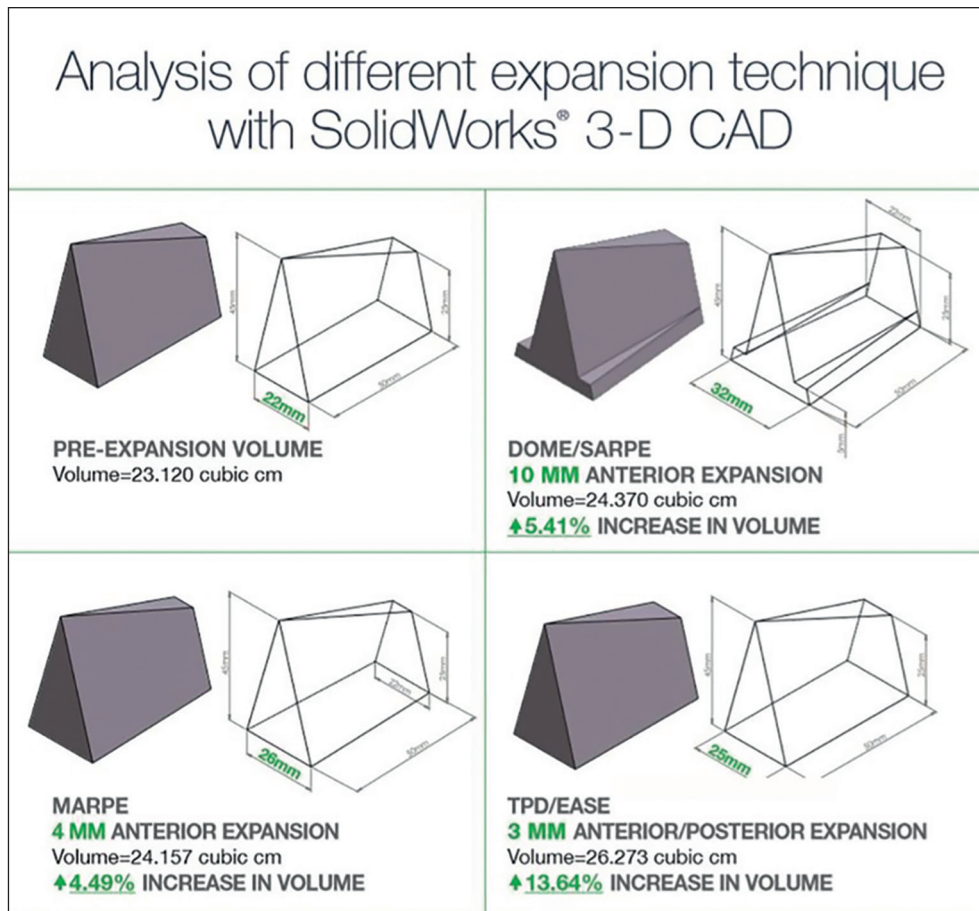


Figure 3

Solid modeling computer-aided design with SolidWorks® comparing expansion pattern and resulting nasal airway changes with different techniques.

**Tableau 1.** Computational Fluid Dynamics (CFD) Data.

AIRWAY SEGMENT	DOME Pre and Post pressure Mean ± SD Pa (n=20)	EASE Pre and Post pressure Mean ± SD Pa (n=20)
Nasal airway	-158.4 ± 115.3 to -48.6 ± 28.7	-395.5 ± 721.0 to -32.7 ± 19.2
Retropalatal airway	-174.8 ± 119.9 to -52.5 ± 31.3	-394.2 ± 719.4 to -33.6 ± 18.5
Oropharyngeal airway	-177.0 ± 118.4 to -54.9 ± 31.8	-405.9 ± 710.8 to -39.4 ± 19.3
Hypopharyngeal airway	-177.9 ± 117.9 to -56.9 ± 32.1	-422.6 ± 704.9 to -55.1 ± 33.7

The efficiency of EASE in impacting the airway resistance was demonstrated by current available computational fluid dynamic (CFD) data of EASE and DOME (Table 1)<sup>3,5</sup>.

EASE achieved a 12-fold reduction in nasal airway resistance compared to 3-fold reduction by DOME; a 12-fold reduction of retropalatal airway resistance as compared to 3-fold reduction by DOME; a 10-fold reduction of oropharyngeal airway resistance as compared to a 3-fold reduction by DOME, and an 8-fold reduction of hypopharyngeal airway resistance as compared to a 3-fold reduction by DOME. Moreover, EASE does not result in an excessively widened maxilla compared to DOME/SARPE, thus eliminating the need for mandibular widening.

#### 4. Conclusions

The goal of surgical maxillary expansion is to enlarge the nasal cavity to reduce the airway resistance. Since there is no physiologic basis or data that demonstrates mandibular widening improves OSA, an airway centric surgical expansion technique such as EASE can achieve a much greater airway impact without needing excessive maxillary widening, thus eliminating the necessity MSDO.

#### Links of interest

The authors declare that they have no interest in the data published in this article.

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