

## Ultra-Short Study and Remarks on Dentoskeletal Deformities (formerly known as Dentofacial Deformities), Nasopharyngeal Depth and Soft Palate Dimensions (Need's Ratio - PD/SPL) for OMS Residents

Eber Luis de Lima Stevao\*

<sup>1</sup>Post Doctoral at Baylor University Medical Center and Texas A&M College of Dentistry, Dallas - TX, USA; Private practice at TMJ, Jaws and Aesthetic Surgery Center, Ohio - USA.

\*Corresponding Author: Eber Luis de Lima Stevao - TMJ, Jaws and Aesthetic Facial Surgery Center, Ohio - USA.

Email: drstevao.ohio@gmail.com

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### Abstract

Patients with dentoskeletal deformities might need Orthognathic surgery to correct their condition. In a few cases, further adjunctive minor procedures such as uvulopalatopharyngoplasty, adenoidectomy, inferior turbinectomies have to be concomitantly performed in order to improve the oral pharyngeal airway space. The authors on this mini review, aiming the Oral and Maxillofacial residents and/or young surgeons, intend to make ready available to them the most important topics on Cephalometric evaluation when Orthognathics is the treatment option.

**Keywords:** Need's Ratio, Orthognathic Surgery, Pharyngeal Airway Space, Adenoidectomy, Uvulopalatopharyngoplasty.

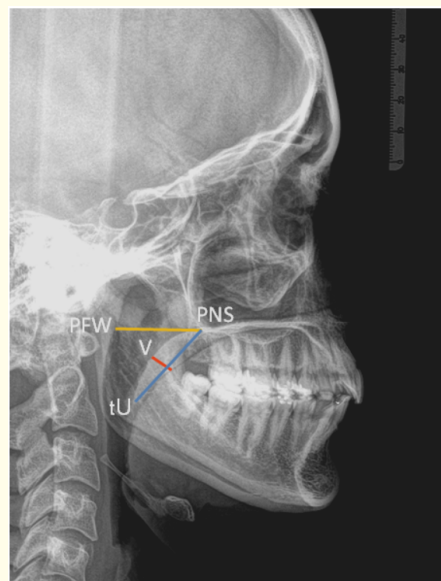
### Introduction

Several adult patients seeking orthodontic treatment may require orthognathic surgeries as well. Therefore, pre-surgical assessment of the Need's ratio is vital and it will help Oral and Maxillofacial surgeons during planning the correct jaw movements on VSP (Virtual Surgical Planning) for orthognathic surgeries, mostly when treating underlying horizontal, vertical and sagittal facial and dental skeletal asymmetries.

It is known that moderate to severe skeletal class II malocclusion patients presenting with pre-existing enlarged adenoids/tonsils, allergies, asthma or obesity may develop obstructive sleep apnea (OSA) in the future [1]. OSA syndrome is a condition which needs very close attention not only from the orthodontic viewpoint but also from surgical intrinsic aspects. Knowledge about the difference in soft palate length and width, as well as nasopharyngeal dimensions and Need's ratio in different skeletal malocclusions will assist in better understanding the etiology of OSA syndrome.

Velopharyngeal function can be determined by the relationship between soft palate length (SPL) and nasopharyngeal depth (PD) known as Need's ratio (PD/SPL). This ratio can be influenced by uvulopalatopharyngoplasty (UPPP), adenoidectomy [2], dentofacial orthopedic appliances and maxillary advancement surgeries [3].

Need's ratio should be ranging from 0.6 to 0.8 mm in normal subjects [4-6]. Increase greater than eighty percent (80%) of those above presented numbers, patient may be at risk to developing velopharyngeal insufficiency [7,8].



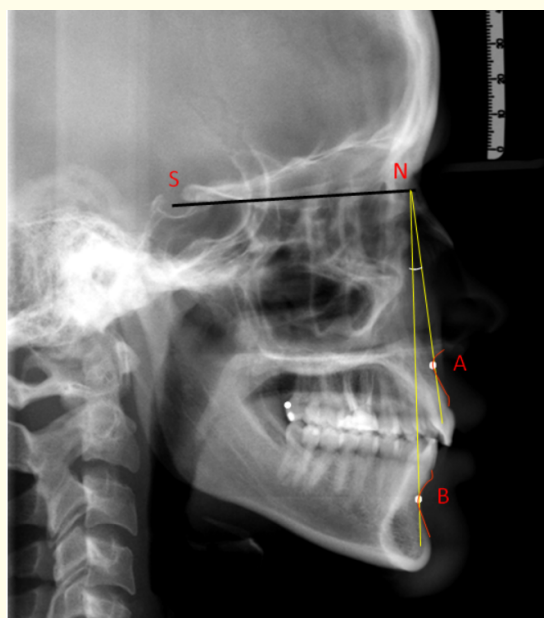
**Figure 1.** Normal Lateral Cephalogram with posterior airway measurements. *Blue line:* The soft palate length (SPL) is measured as a linear distance from the posterior nasal spine (PNS) to the tip of the uvula (tU) of the resting soft palate. *Red line:* The velar width (VW) is measured at the thickest section of the velum. *Orange line:* The nasopharyngeal depth (PD) is taken as a linear measurement from the posterior nasal spine (PNS) to the posterior pharyngeal wall along the palatal plane.

This paper is not focused on reviewing the scientific literature or further expanding the research in this specific topic but is solely focused on providing the necessary information, making it readily available and at the same time offering a fresh recapitulation on airway topics for young players entering the captivating field of orthognathic surgery.

### Radiographic Case Study

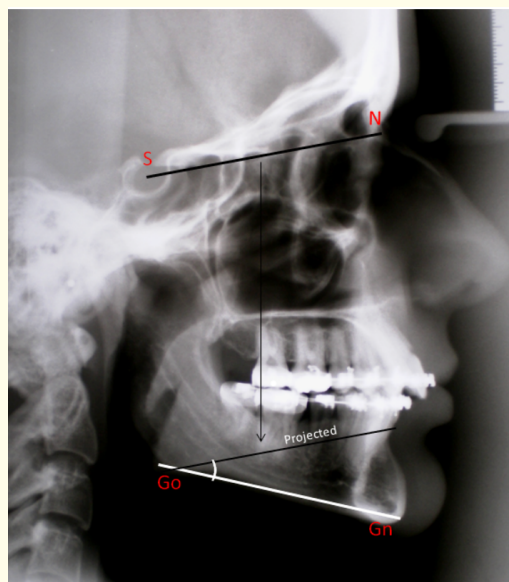
The posterior airway measurements can be observed on figure 1.

A Lateral Cephalogram helps to define skeletal patterns in sagittal and vertical planes: a) Sagittal (class I, II and III) pattern - measurement of ANB (A point, Nasion, B point which represents the angle between the maxilla and the mandible) angle on pre-treatment with lateral cephalometric tracings. The ANB angle is set at 1-4°, >5° and < 0° for skeletal class I, II and III malocclusions, respectively; b) Vertical skeletal patterns (normodivergent, hypodivergent and hyperdivergent) on the basis of ANB and SN-MP (Sella-Nasion-Mandibular Plane) angles, respectively.



**Figure 2.** Lateral Cephalogram showing S, N, A, and B points being marked and traced. Their encounter will form different angles: 1) SNA which is the angle formed between Sella-Nasion and supspinale point A; 2) SNB which is the angle formed between Sella-Nasion and supramentale point B; and 3) ANB which is the angle formed between maxilla and mandible.

The angle between maxilla and mandible is named ANB (A point, Nasion, B point) and it is formed by the lines which connect those points. The angle ANB can be observed on figure 2.



**Figure 3.** Lateral Cephalogram showing the SN plane (superior bold black line) projected (black line) over the MP which is composed by Go-Gn (Gonion-Gnathion) plane (inferior bold white line).

The SN-MP angle, which is found on the projection of the SN plane over the MP. The MP is composed of a line connecting Gonion point to Gnathion point. The SN-MP angle is appreciated on figure 3.

The vertical malocclusion is categorized by measuring SN-MP angle into normodivergent (SN-MP = 33- 37°), hypodivergent (SN-MP < 32°), and hyperdivergent facial patterns (SN-MP > 38°).



**Figure 4.** Lateral Cephalogram showing an example of a Class II hypodivergent type of patient, also termed as brachyfacial. Plane SN (superior bold black line) is projected (red line) over Go-Gn plane (inferior bold black line). The angle formed between SN projected and Go-Gn is the one which defines patient's vertical growth.

Patients with Class II malocclusion may be hyperdivergent and are termed as dolychofacial and they show a long vertical face better appreciated on patients' facial frontal view. (Figure 4)

Correct head orientation with the Horizontal Frankfurt plane parallel to the floor when taking Lateral Ceph x-ray is very important because it can alter the SN-MP angle.

### Final Considerations

Residents in the specialty of Oral and Maxillofacial surgery should be aware of the basic details presented on this paper when Orthognathic surgery is the option for patients with dentoskeletal deformities because the posterior nasal spine and the posterior pharyngeal wall will be changed with the surgery modifying the nasopharyngeal depth. Adding adjunctives procedures such as uvulopalatopharyngoplasty and adenoidectomy will further alter Need's ratio. Therefore surgeons have to be alert about temporary and/or permanent velopharyngeal incompetence and this condition be discussed with the patient, in depth explained, also have it written in the consent form, the possibility for further treatment with speech therapy, speech-orthodontic appliances or even additional surgery.

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