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Vertical Maxillary Excess Treatment Modalities: A Review Article

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Abstract: Vertical Maxillary Excess (VME) is a common dentofacial deformity characterized by excessive vertical growth of the maxilla, often resulting in a gummy smile and facial disproportion. This review explores the various treatment modalities available for VME, ranging from conservative orthodontic approaches and minimally invasive procedures to orthognathic surgery, the gold standard for severe cases. Each modality's indications, procedures, advantages, and limitations are discussed to provide a comprehensive understanding for clinicians aiming to achieve optimal functional and esthetic outcomes. Recent advances in surgical planning and patient-centered treatment strategies are also reviewed.

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I. INTRODUCTION

Excessive lower vertical facial height is the primary symptom of the long face syndrome, a clinically identifiable facial morphology. Despite the fact that this shape is most frequently categorized as skeletal open-bite.

It is clear that the syndrome has been covered under a wide range of different headings. The excessive vertical growth of the maxilla is a common characteristic of severe clockwise rotation, high angle type, adenoid faces, idiopathic long faces, complete maxillary alveolar hyperplasia, and vertical maxillary excess.

This syndrome has many different names, in part because the traditional anteroposterior classifications have trouble describing vertical skeletal dysplasias and have not put enough effort into describing the frontal or full-face esthetic aspects of dentofacial deformities. We have coined the term "long face syndrome" to combine the many more comparable facial forms because they share numerous esthetic and cephalometric characteristics. specific titles that describe a certain facial type.[1]Figure 1 showing diagrammatic representation of vertical maxillary excess before and after correction.

Fig 1 showing vertical maxillary excess before and after correction

II. ETIOLOGY

Research on the environmental and genetic elements that affect vertical dimension growth is representative of samples, not necessarily of specific people. Furthermore, the degree to which a trait is influenced by hereditary determinants may not have a significant impact on the effectiveness of environmental (therapy) interventions. The reaction to an intervention aimed at changing a trait may be impacted by the same genetic variables that influenced that trait, or the response may be influenced by other genetic factors[2].

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Therefore, even among people with a relatively large hereditary influence on the vertical dimension, it is theoretically conceivable to change the environment to gain a more favorable dimension.

III. DIAGNOSIS OF VERTICAL DIMENSION

Analyzing the vertical dimension's development is relevant to clinical practice because it first establishes whether the malocclusion has a vertical dimension component and then identifies the elements that have the biggest impact on the vertical dimension issue.

The diagnosis involves identifying the different components of an aberration in vertical dimensions and comprehending how the components of vertical malocclusion interact with one another. Determination of the vertical proportion of the face is the first step in the diagnosis of vertical malocclusion[3]. Clinically, vertical facial dimensions can be seen in both profile and frontal views. By using horizontal lines to divide the face into equal thirds, Frakas and Munro presented the ideal facial proportions.

- The upper face (from the nasal bridge to the hairline)
- The midface (the area between the nose and the ala)
- The lower face, from the nose to the chin
- The upper third (from the nose to the upper lip)
- Lower two thirds (from the bottom lip to the chin)

Mid face should ideally equal lower face. If a vertical facial height malocclusion occurs in the midface, lower face, or both, it can be

- Short - (deficiency of the vertical maxilla)
- Excess- (long face syndrome)

The function of the skeletal-dental relationship Dentoalveolar abnormalities can affect the skeletal pattern, and poor skeletal patterns might result in dentoalveolar compensations. Vertical discrepancy malocclusions are multifaceted.

- The variations listed below may exist separately or in combination:
- Maxilla: inferiorly positioned maxilla and excess maxillary posterior alveolar
- Mandible: short mandibular rami and mandibular posterior alveolar excess.
- The vertical discrepancy malocclusion may be caused by any of these problems, with or without abnormal mandibular rotation.

IV. CEPHALOMETRIC ANALYSIS

- *Wylie & Johnson's Analysis:*

This analysis measures the vertical proportions of a normal face using the Nasion–Menton line. The Anterior Nasal Spine (ANS) is used as the dividing point between the upper and lower facial segments. The Upper Facial Height (UFH) to Total Facial Height (TFH) ratio is calculated.

- Normal values:
- Males: 0.436
- Females: 0.432

- *Nohaum's Ratio (Henry I. Nohaum, 1975):*

Compares the vertical proportions of the face using the following measurements:

- N–ANS: Upper facial height
- ANS–Me: Lower facial height
- Normal ratio: 0.810
- Deviations indicate vertical discrepancies:
- Open bite tendency: Ratio around 0.700
- Deep bite tendency: Ratio around 0.900

- ✓ ODI – Overbite Depth Indicator (Kim)
- ✓ The ODI is calculated by combining two angular measurements:
- ✓ The angle between the AB plane and the mandibular plane (AB-MP)

- *The angle between the palatal plane and the Frankfort horizontal plane (PP-FH) Calculation Method:*

- If PP-FH is positive, add its value to the AB-MP angle.
- If PP-FH is negative, subtract its value from the AB-MP angle.
- Interpretation of ODI values:
- Normal bite: Mean value of 74° ± 6°
- Open bite tendency: ODI < 68°
- Deep bite tendency: ODI > 80°

V. TREATMENT MODALITIES

Treatment should comprehensively address the three-dimensional dentoalveolar and skeletal discrepancies in both jaws. Most clinicians acknowledge that malocclusions associated with significant vertical facial imbalances are particularly challenging to treat and maintain, primarily due to their high tendency for relapse[4].

To achieve successful outcomes in managing vertical facial discrepancies, careful consideration must be given to the timing of treatment, the selection of appropriate appliances or mechanotherapy, and the implementation of effective vertical control, regardless of the treatment approach used.

Vertical Maxillary Excess (VME) is characterized by an increased vertical height of the maxilla, often resulting in a gummy smile, lip incompetence, and facial esthetic concerns. Treatment depends on the severity of the condition and the patient's functional and esthetic needs.

- *Orthodontic Treatment*

- *Intrusion of Maxillary Teeth:*

For mild cases, orthodontic tooth intrusion can reduce the gummy smile by moving the teeth upward.

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- *Use of Temporary Anchorage Devices (TADs):*
  Mini-implants or screws can assist in controlling vertical tooth movement without affecting other teeth.

- *Limitations:*
  Orthodontics alone is usually insufficient for moderate to severe vertical maxillary excess because the skeletal discrepancy remains unaddressed.

➢ *Orthognathic Surgery*

- *Le Fort I Osteotomy (Maxillary Impaction):*
  The most common surgical procedure for VME. The maxilla is surgically repositioned superiorly to reduce vertical height[5].

- *Segmental Osteotomy:*
  Used when differential movement of certain maxillary segments is required.

- *Combined Orthodontic-Surgical Approach:*
  Orthodontic treatment is used pre- and post-surgery to align teeth and optimize occlusion.

- *Advantages:*
  Provides stable, predictable correction of skeletal deformity and significant improvement in facial aesthetics.

- *Considerations:*
  Requires hospitalization, general anesthesia, and a longer recovery time.

➢ *Adjunctive Procedures*

- *Lip Repositioning Surgery:*
  A soft tissue procedure to limit upper lip elevation, reducing gummy smile appearance; often used in conjunction with skeletal treatments. Lip repositioning surgery is a less invasive surgical option aimed at limiting the upward movement of the upper lip by repositioning the mucosal tissue. This procedure can provide immediate improvement in gummy smile and is often recommended for patients with mild to moderate VME or those unwilling to undergo orthognathic surgery. However, long-term stability remains a concern, and recurrence rates have been reported

- *Botulinum Toxin (Botox) Injection:*
  Temporarily reduces hyperactivity of the upper lip elevator muscles, useful for mild cases or as a diagnostic tool. Botulinum toxin type A injections have gained popularity as a minimally invasive treatment to reduce excessive gingival display caused by hyperactive upper lip muscles. By temporarily paralyzing the elevator muscles of the upper lip, the smile line is lowered, resulting in reduced gum exposure. Although effective for mild cases or as an adjunct therapy, the effects are temporary, typically lasting 3-6 months, necessitating repeat treatments.

- *Crown Lengthening:*
  In some patients, gingival hypertrophy or altered passive eruption can mimic VME. Crown lengthening procedures surgically remove excess gingival tissue and reshape the bone to expose more of the tooth crown, improving esthetics. This modality is not suitable for true skeletal VME but can be valuable in differential diagnosis and management of gingival excess.

VI. RECENT ADVANCES AND RESEARCH TRENDS

Advancements in three-dimensional imaging and virtual surgical planning have revolutionized the management of VME, allowing for precise assessment and simulation of treatment outcomes. Additionally, ongoing research into minimally invasive techniques and patient-specific protocols aims to optimize esthetic results while minimizing morbidity. Emerging approaches combining orthodontics with less invasive surgical procedures are gaining attention for their potential to balance efficacy and patient comfort.

Table 1 Comparison of Modalities

Treatment Modality	Indication	Invasiveness	Duration of Effect	Advantages	Limitations
Orthodontic Camouflage	Mild VME	Non-surgical	Permanent	Conservative, no surgery	Limited skeletal correction
Botulinum Toxin Injections	Mild VME with hyperactive lip	Minimally invasive	Temporary (3-6 months)	Quick, outpatient procedure	Requires repeat treatments
Crown Lengthening	Gingival excess mimicking VME	Minor surgery	Permanent	Improves crown exposure	Not suitable for skeletal deformity
Lip Repositioning Surgery	Mild to moderate VME	Minor surgery	Variable	Less invasive than orthognathic	Possible relapse, limited scope
Orthognathic Surgery	Moderate to severe VME	Major surgery	Permanent	Definitive correction	Surgical risks, longer recovery

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VII. CONCLUSION

The choice of treatment for VME depends on the degree of vertical maxillary excess. Orthodontics can address dental components, but moderate to severe cases typically require surgical intervention, primarily Le Fort I maxillary impaction, to achieve lasting functional and esthetic results. Multidisciplinary evaluation ensures personalized treatment planning and optimal outcomes.

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