

SURGICAL RECOMMENDATIONS TO CORRECT SKELETAL OPENBITE

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هناك عدة طرق جراحية لمعالجة العضة المفتوحة، وكانت التوجهات والنصائح معتمدة على نتائج المتابعة على المدى الطويل لمثل تلك العمليات الجراحية.

هذه التداخلات الجراحية قد تكون كما هو معروف على الفك العلوي أو السفلي أو كليهما. هذه الورقة لم تتجه لتقييم نجاح أو فشل تلك الجراحات، ولكن للاشارة إلى الأسلوب الذي ينصح بانتقائه في هذه الطرق الجراحية المذكورة آنفاً لاستخدامها في معالجة كل حالة على حده من حالات علاج العضة المفتوحة، وقد عرض خلال هذه الورقة أربع حالات مع الصور لإيضاح التدخلات الجراحية الضرورية لمثل هذه الحالات.

In the literature, a number of procedures have been recommended for the surgical correction of skeletal openbite. The recommendations have been based on successful long-term follow-up results. These include Le Fort I osteotomy, combined Le Fort and bilateral sagittal split osteotomies and anterior segmented osteotomies. This paper does not assess the success or failure of these procedures but brings attention to the indications and recommendations of which the above procedures can be used in treating a particular case of openbite. Four cases offer illustrations of the procedures.

Introduction

Surgical treatment of skeletal openbite cases is one of the most vexing problems to treat due to the post-surgical aesthetic outcome and the high propensity for relapse of the moved bony segments. A number of procedures have been recommended for the surgical correction openbite.^{1~6} These could be carried-out in the maxilla, mandible or concomitantly in both jaws and, if needed, can be combined with other procedures like genioplasty.

Surgical Techniques

Le Fort I Osteotomy

The success and stability of Le Fort I osteotomy in connection with openbite have been well documented. Its use and the widening of the maxilla in these cases are affected by many factors. These factors include proportion of the facial

height, size and position of the maxillary base in relation to other facial skeletal bases, curvature (curve of Spee) of upper occlusal plane, angulation and position of the anterior dentoalveolar segment, size of the nose, deficiency in the infra-orbital (malar) areas, naso-labial angle, length and thickness of upper lip and relation of anterior teeth to the upper lip. The compensatory mechanism⁷ of the maxilla in attempt to close the skeletal openbite during growth could be either complete or dysplastic. Both situations can be seen clinically and radiographically. An example of the first type is a case of excellent dentoalveolar compensation with fair occlusal relationship but increased vertical height. Example of the other type is the failure of full compensation where there is only occlusal contact in last molars leading to reverse anterior openbite. Superior repositioning of the maxilla will solve the problem of maxillary excess due to the compensatory attempts mentioned early. Typical clinical features of true skeletal anterior openbite or long face syndrome are a narrow nose with prominent nasal dorsum, obtuse naso-lingual angle, short upper lip, stem mandible and deficient soft chin profile and position. Superior repositioning of

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the maxilla [Fig. 1] usually alters upper facial soft tissues favorably. The alar bases widen and nasal tip is raised and thereby improves aesthetic shape of the nose. The naso-labial angle is reduced and length of upper lip increases resulting in improved nasal profile and also reduces the excess of gingivae and upper teeth, respectively.

Following reduction of the facial height by superior intrusion of the maxilla, mandibular plane angle is also reduced subsequently due to the autorotation which helps in reducing facial height discrepancy. The magnitude of intrusion of the posterior portion of the maxilla is usually greater than in its anterior portion. This difference helps to level the palate and maxillary occlusal plane. The superior movement must leave upper anterior teeth exposure of 1-2 mm below the lower lip line when lips are at rest leading to an acceptable amount of upper teeth showing when the patient talks or smiles.

In cases of skeletal openbite, V-shaped maxilla and high vault of the palate are commonly present. In some cases there is a discrepancy in the width of the maxilla complicated by severe posterior crossbite. Simultaneous median antero-posterior osteotomy of the maxilla and bone graft of the gap, left after widening the maxilla, is indicated in such cases.

In planning these cases, two potentially distressing consequences associated with superior repositioning of the maxilla must be borne in mind. The surgical correction changes facial soft tissues negatively in patients with broad nose and in those with thin vermilion and upper lip. This type of patient must be informed before surgery of the possible sequelae of changes to the nose shape and thickness of upper lip and of the best result that can be achieved to overcome these complications.

The extent of which the alar base widens can be minimized by removing the anterior nasal spine and reducing the anterior piriform rim projection. However, we do not see much benefit from horizontal mattress sutures bringing together both sides of the alar base submucosally with slow absorbable suture material as has been suggested.⁶ This type of patient must be informed of the possible need of rhinoplasty after raising the maxilla. Rolling in of the upper lip associated with superior repositioning of the maxilla by total maxillary osteotomy or anterior maxillary osteotomy is most likely due to shorten-

ing (deficiency) of the mucosal surface as a result of the surgical upwards movement of the maxilla which acts to separate the mucosal edge at the line of incision. This procedure leads to stretching the mucosal surface upwards during suturing and, subsequently, rolling-in of the upper lip.

Prominent lips are considered a part of facial beauty, particularly in females. This complication appears more distressing in patients with whom such complication is undesirable, some clinicians¹ suggest that a dissection is carried out between the mucosa and the muscle of the upper lip which helps in facilitating relaxation of the mucosal layer. This dissection leads to closure of the incision without tension. Suturing must ensure adequate tissue adaptation without gathering excess tissue within the line of closure. Patients in which clinical and cephalometric analysis reveal anterior openbite with micromaxillism, as in the case of cleft lip and palate, commonly present with acutely reduced naso-labial angle and anterior teeth which are hidden behind the upper lip.

Anterior movement of the maxilla in such cases puts the facial proportions in harmony, increases naso-labial angle, and the nasal tip is raised thus altering the dimensions of the nasal profile aesthetically. When inferior movement is also required, it brings the anterior teeth in a more favorable position in relation to the upper lip.

Anterior Segmental Osteotomy

Correction of anterior openbite by subapical osteotomy of the anterior-dento-alveolar segment is usually performed separately [Figs. 2, 3] or combined with other types of osteotomies [Fig. 1]. Performance of subapical osteotomy of the dento-alveolar segment of anterior teeth alone is often used to correct openbite in cases where dental contact is open merely in the anterior teeth.

The posterior occlusion and skeletal base proportions in such patients are usually within normal. The most common cause of discrepancy in the lower facial height in these cases is due to chin height and position. The factors that rule out whether the upper or lower anterior segment or both should be used for correcting this type of openbite are the angulation of the anterior segment to the rest of the jaw base and the relationship of the anterior teeth to rest of the occlusal plane and to the lips.

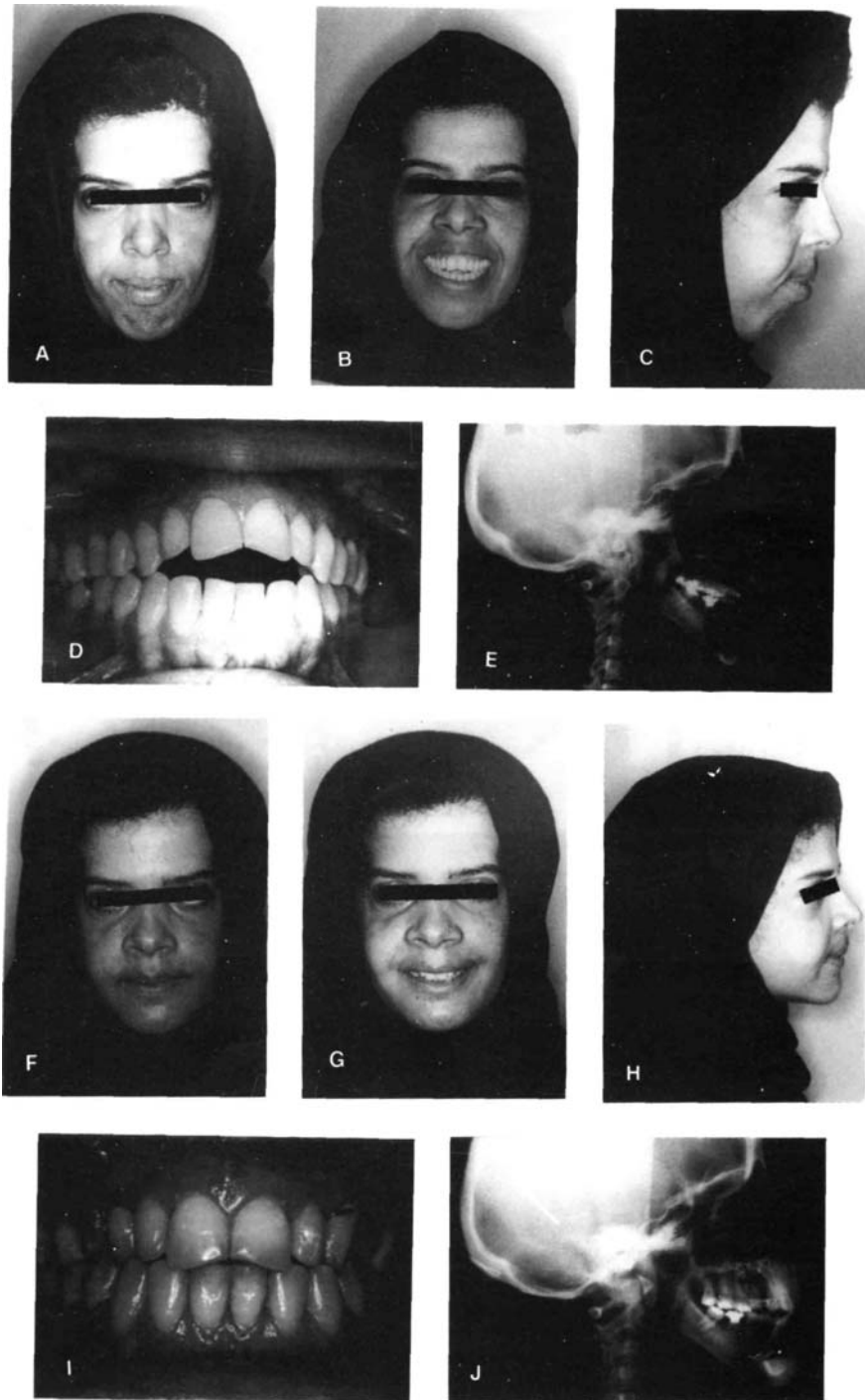


Figure 1. Appearance of a female patient with skeletal openbite before surgery (*a, b, c & d*). Note the gingival excess when patient smiles, lip incompatibility and deficient chin position and obtused nasolabial angle. Presurgical cephalometric view (*e*) shows maxillary excess and severely obtused angle of the upper anterior dentoalveolar segment to the base of the maxilla and chin height. After surgical correction by Le Fort I superior repositioning, anterior upper segmental osteotomy and genioplasty (*f, g, h & i*). Post-surgical cephalometric view (*j*).

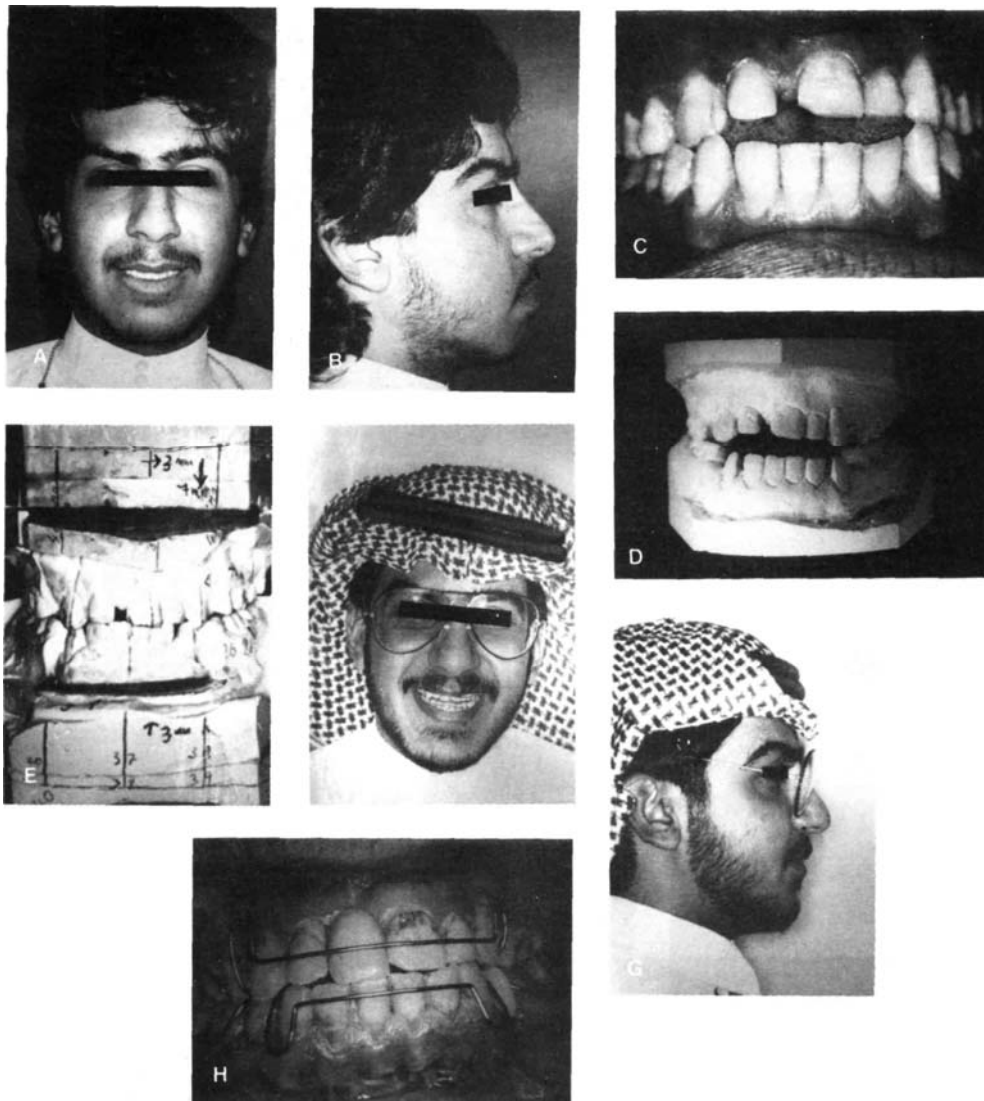


Figure 2. A male patient with open bite before surgery (*a, b & c*). Occlusion is merely open in the anterior teeth. Note upper anterior teeth are hidden when patient smiles and deviated to the right side. The profile view shows unaesthetic lip position and chin deficiency. Planning surgical models (*d & e*) show anterior upper segment was rotated to the left side to correct midline of upper teeth and inferiorly repositioned to close the openbite and shows an acceptable part of the upper anterior teeth when the patient talks or smiles. Lower anterior segmental osteotomy was performed to correct angulation with the base of the mandible. Genioplasty with advancement to correct chin deficiency and complete aesthetic of lower facial height. Note the post-surgical appearance (*f, g & h*), patient's smile, lips relationship and chin position after genioplasty.

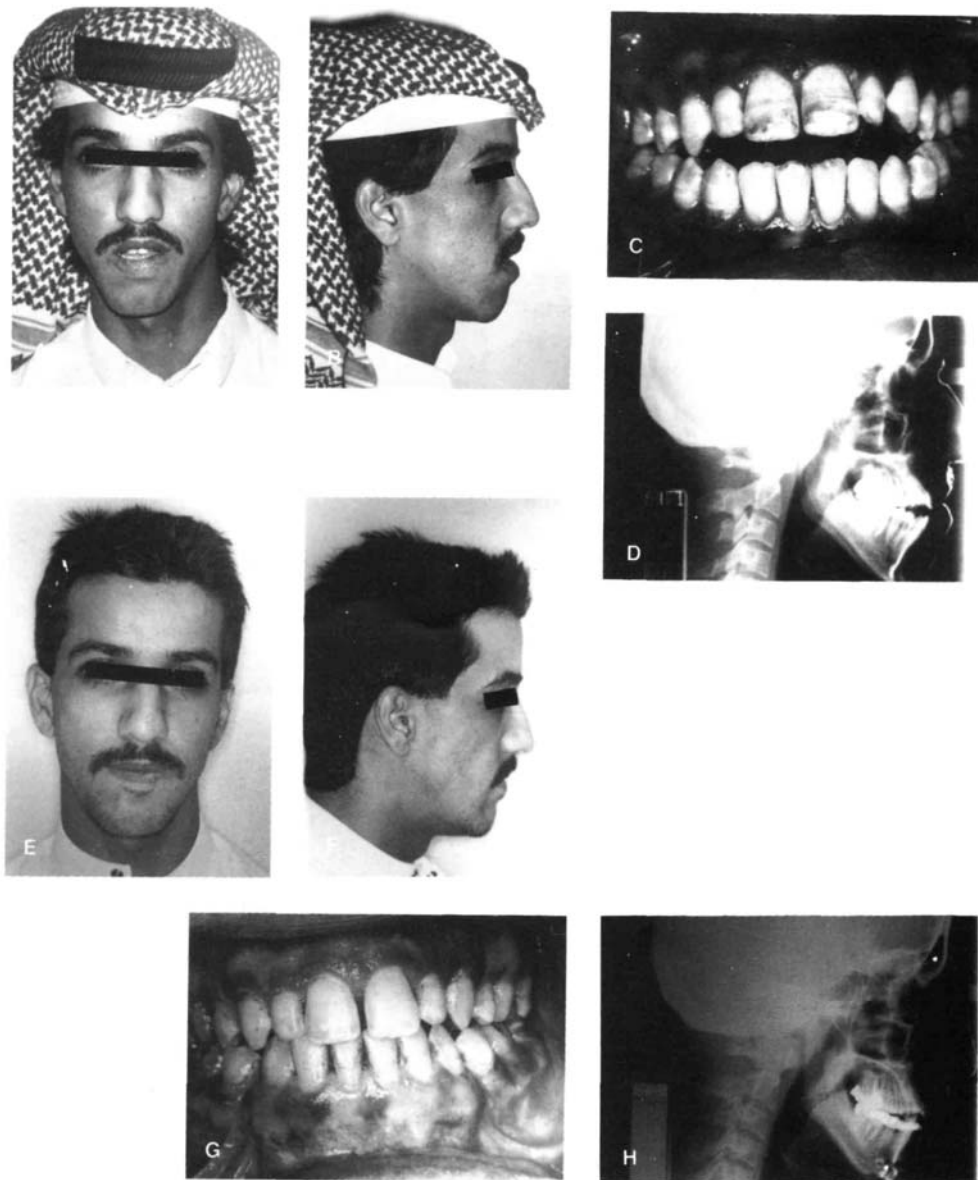


Figure 3. A male patient with openbite in the anterior teeth without maxillary access. Patient's appearance before surgery (a, b&c). In the pre-surgical cephalometric view (d), note the dentoalveolar part of upper anterior teeth which shows acceptable angulation with the base of the maxilla and the upper lip line at rest. The lower anterior dentoalveolar segment is lower than the normal curvature plane of the lower teeth and an acceptable lip embrasure relationship. After surgery, patient's appearance (e, f& g). In the post-surgical cephalometric view (h), note the facial height discrepancy reduced by genioplasty, advancement and reduction of the chin by 5 mm. The reduced bone segment was used to bridge the gap created after raising the lower anterior dentoalveolar segment to close the openbite.

Combination of anterior segmental osteotomies with Le Fort I and sagittal splitting osteotomies, in cases of true or complete skeletal openbite, is also influenced by the above-mentioned factors. Example of this type of openbite is where there is a maxillary excess and severely obtused angle of the anterior dentoalveolar segment [Fig. 1]. The deformity in the upper anterior part of the maxilla plays an important role in affecting the naso-labial angle, upper lip and curve of Spee. However, combination of these two osteotomy procedures in such circumstances seems to do everything at once.

Combine Le Fort I Osteotomy and Bilateral Sagittal Split of the Mandible:

Simultaneous superior repositioning of the maxilla and mandibular advancement by means of Le Fort I osteotomy and bilateral sagittal splitting of the mandibular rami are frequently indicated for surgical correction of openbite associated with vertical maxillary excess and absolute mandibular deficiency. The deficiency of the mandible is clearly detected clinically and correct mandibular position is easily simulated by prediction cephalometric tracing.

The mandible in these cases has growth pattern directed more posteriorly causing increased divergence of the mandibular plane angle. The other openbite cases which benefit from combined Le Fort I and bilateral sagittal splitting osteotomies are cases associated with deviation of the mandible and/or maxilla [Fig. 4] and cases of hemimandibular elongation,⁹ atrophy or otomandibular dysostosis¹⁰.

Genioplasty

The direction of mandibular growth in openbite cases as expressed at the chin is frequently vertical⁷ which increases the problem of facial height discrepancy. Most of these cases benefit from horizontal advancement of the chin with reduction of chin height [Figs. 1,2,3].

The concomitant genioplasty in the surgical correction of openbite share in the reduction of the facial height, improves labiomental angle and improves soft chin profile.

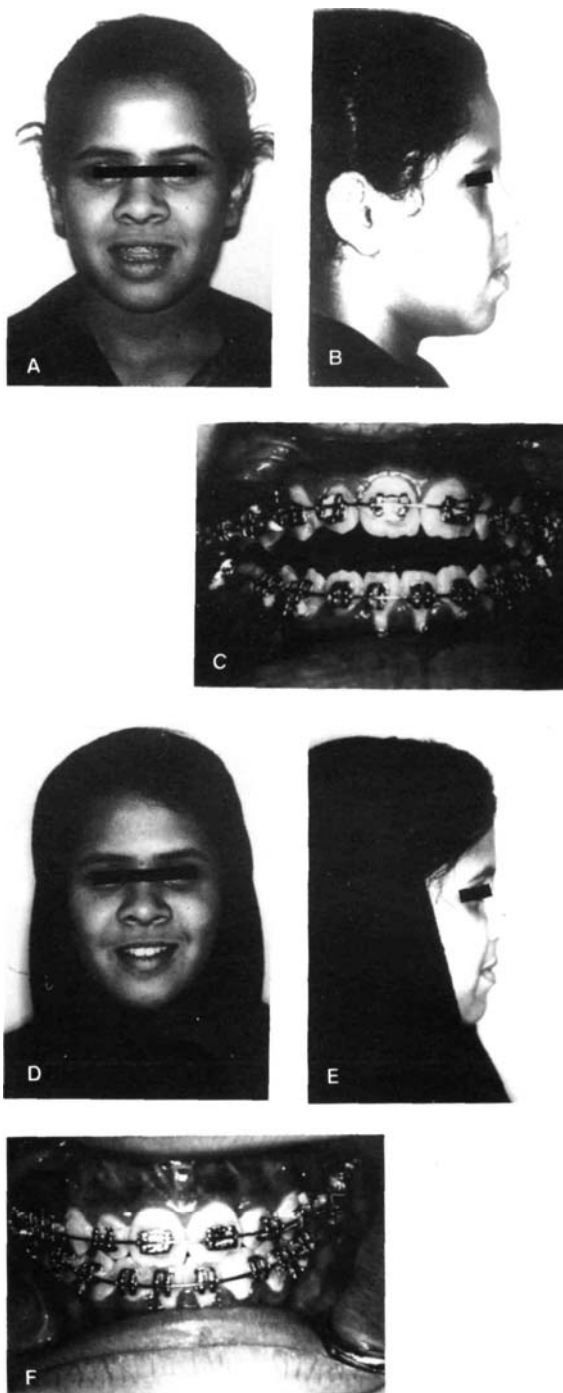


Figure 4. A female patient with openbite. Before surgery (a, b & c), the midline of upper jaw was deviated to the right side by 4 mm. The openbite and maxillary excess were corrected by Le Fort I superior repositioning and rotating the upper jaw to the left to correct the midline of the upper jaw to the midline of the facial soft tissue. The lower jaw was put in harmony by bilateral sagittal splitting osteotomy. Appearance of patient after surgery (d, e & f).

Discussion

A successful treatment of skeletal openbite depends on acceptable aesthetic results and harmonious proportions of the face that satisfy the patient on one hand and stability of the moved segments on the other. In order to achieve these goals, it is essential for the surgeon to locate the deformity and establish correct diagnosis.¹¹ There are different surgical procedures available to treat the deformity, but no one procedure is suitable for all types of openbite cases. Selection of an appropriate method of treatment is entirely influenced by correlating the soft tissue discrepancies to the hard tissue discrepancies.⁸ Variations in the soft tissue covering the facial skeleton-like type of the patient's facial profile, size of the nose, thickness and length of the lips and vermilion, naso-labial angle, soft tissue chin, etc. can produce unacceptable aesthetic result if diagnosis and planning are based on dental and skeletal measurements alone. In other words, soft tissue must first be considered before skeletal parts are moved. When this equation is understood well, selection of the appropriate method of surgery comes out satisfactorily. Needless to say that a tendency of the moved segment to relapse must be borne in mind in choosing a particular surgical procedure.

Skeletal openbite is primarily a problem of vertical relationship. Therefore, establishing harmonious proportions of facial height is one of the main reasons for treatment.

Several methods for predicting the surgical correction of the facial discrepancies have been advocated. However, analysis of the problem should be

clinically practical and reduced to its most relevant and significant measurements. This means, a prediction formula that is relatively simple and easily understandable should be used.

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