

Upper lip cross sectional area after correction of anterior maxillary segment using three sided mucoperiosteal flap

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Abstract:

All previous studies concerning the soft tissue changes associated with upper jaw osteotomy related to the use of the most common approaches to the anterior maxilla i.e. Wassmund, Wunderer and Cuper approach. Few of these directed to assess the upper lip cross sectional area as a factor in prediction purpose. A new approach by mean of 3-sided mucoperiosteal flap adopted in this study to expose the premaxilla. From the clinical observation, there is slight lengthening of the upper lip after surgery.

This study conducted to assess the upper lip cross sectional area after maxillary segmental setting up osteotomy using this approach (for prediction purpose), and assess the validity of the use of the 3-sided mucoperiosteal flap.

Presurgical and post surgical cephalometric radiographs of (9) patients were compared by superimposition of acetate tracings on special references. Cross sectional lip area then calculated presurgically and at two intervals following surgical intervention (Immediately after surgery i.e. with in 2 days and the longest possible post surgical follow up) using simpson rule.

Analysis of data showed that the cross sectional lip area significantly increased by a mean of 38% ranged (23% - 58%) immediately after surgery. While at about 3 months interval, it became about 17% ranged (2% - 34%) the study showed also an acceptable accessibility with the use of this 3-sided flap.

Keywords:

Upper lip, 3-sided mucoperiosteal flap, cephalometric radiograph, simpson rule.

Introduction:

Aesthetic and beauty is a subject of enormous interest all over the world at all time ⁽¹⁾, this especially true with the awareness of the important role of physical appearance in our society ^(2,3).

The need for orthognathic surgery as a common treatment alternative in correction of dentofacial deformities to overcome the shortcoming result of orthodontic treatment ^(2,3).

The lips considered as the most important aspect of the ⁽⁴⁻¹⁰⁾. Great attention had been made from the

clinicians and orthodontist to preserve favorable lip morphology (not only on profile but frontal aspect) as it considered as a critical factor in assessing the success of maxillary osteotomy surgery. The unesthetic post surgical lips often appear thin and tight this is true in most of approaches to the maxilla ⁽¹¹⁾.

Despite the available information regarding the postsurgical soft tissue predictions based on vertical and horizontal bony movement, accurate prediction of postsurgical lip length and anteroposterior position doesn't ensure a pleasing aesthetic result ⁽¹¹⁻¹³⁾.

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Analysis of lip thickness changes is not possible with simple linear 2-dimensional correlation, thus a cross sectional area is preferable⁽¹⁴⁾.

There are 3 main approaches for exposure of anterior maxilla; the Wassmund approach 1927, Wunderer approach 1963, and the Cupar approach 1954⁽¹⁵⁻¹⁷⁾. (Figure-1).

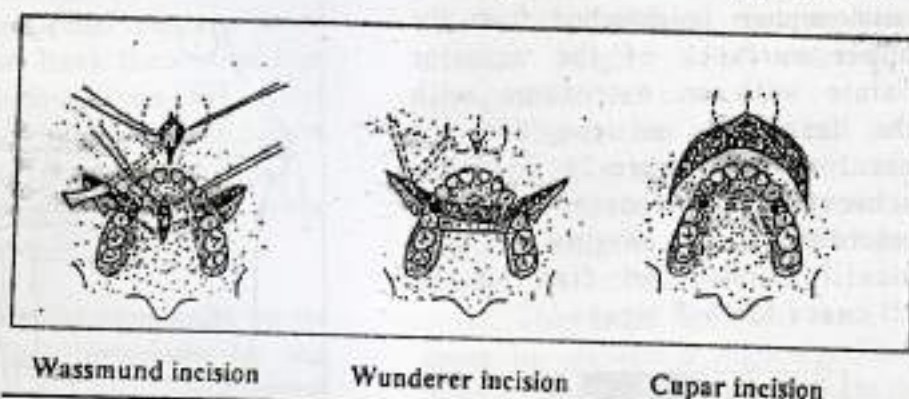


Fig. (1): Approaches for exposure of anterior maxilla.

In the commonest method, the Wassmund approach, the bony cuts (transverse and palatal) are mainly completed by indirect vision beneath mucoperiosteal tunnels and here the soft tissue must be protected. This approach is not recommended for cases required superior repositioning of the premaxilla because of its difficulty.

With Wunderer approach, the removal of alveolar bone and transpalatal cut are performed under direct vision. While the transverse and septal cut are performed under indirect vision. However, the tunneling approach produces a minimal change in lip area⁽¹¹⁾.

The down fracture approach by Cupar is accomplished via a labial horse shoe incision and allows the transverse septal and alveolar cut to be made under direct vision, the palatal cuts completed by feel. On the other hand this approach results in a mean of 14.1% reduction in upper lip area following Lefort I osteotomy⁽¹⁸⁾.

And so due to the above reasons a 3-sided mucoperiosteal flap raised from the labial aspect to expose the anterior maxilla had been made.

Materials and methods:

The sample

Nine patients selected from the maxillofacial department at Al-Shaheed Adnan hospital consisted of (4) males and (5) females with age ranged (18-27) years.

All the patients were non growing adults, and have no developmental deformities i.e. cleft lip and palate patients and post-traumatic deformities.

Surgical technique

The incision for access to the anterior maxilla was a 3-sided mucoperiosteal flap extended from premolar region bilaterally by doing a transcrevicular incision along the gingival papillae from premolar region of one side to the contralateral region then a vertical incision for each side had been adapted deep to the sulcus.

The premolars then removed from each side of the maxilla and the preplanned segments of bone were taken from the alveolar process at the sites of extraction. Laterally, transverse cuts were made from the upper limit of the alveolar osteotomies site above the

apices of the canines and incisor teeth, to the pyriform aperture of the nose. The two alveolar osteotomy sites were connected across the palate, and this was carried out under bilateral palatal mucoperiosteal tunnels. Finally the nasal septum is detached from the upper surfaces of the anterior palate with an osteotome with the fracturing of the anterior nasal spine (Figure-2). Fixation achieved interosseous by interosseous wiring and maxillomandibular fixation in all cases for 6-8 weeks⁽¹⁹⁻²²⁾.

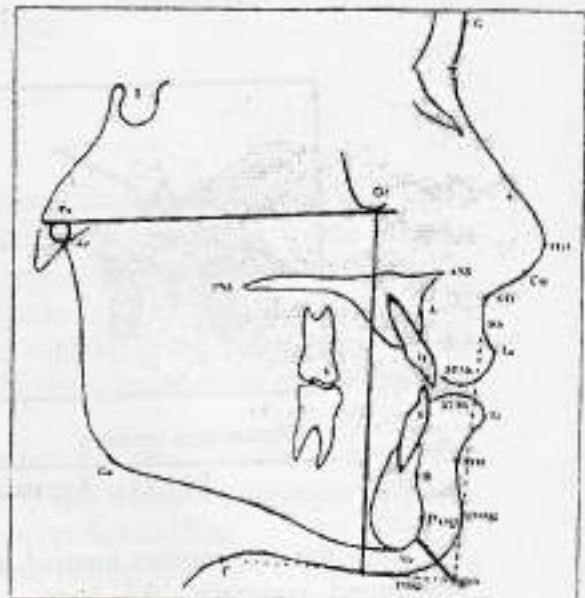


Fig (2): Three-sided mucoperiosteal flap.

The radiography made, by using Planmeca machine, with the patient in rest position (minimal lip activity) in different intervals i.e. immediately after surgery (within 2 days) and the longest possible time after surgery(3 months).

The film was placed on viewer with the image directed to the right^(23,24) and tracing paper was fixed on the radiograph with the patient's name and sex and the date, then tracing the out line of the soft tissue profile contour with external and internal contour of the cranium, orbital outline, maxilla, mandible, upper and lower 1st molar and incisors,

nasal bone and naso-frontal suture, then various landmarks and lines were made as



followed:⁽²⁵⁻²⁷⁾. (Figure-3).

Fig. (3): Cephalometric landmarks.

- Sn (Subnasale):** A skin point at which the nasal septum merges with the upper cutaneous lip in the midsagittal plane.
- Ls (Labrale superius):** the point indicates the mucocutaneous border of the upper lip.
- Stoms (Stomion superius):** the lower most point on the vermillion of the upper lip.
- Or (Orbitale):** the lower most point at the orbit in the radiograph.
- Po (Porion):** the most superior point of the external auditory meatus by using anatomic identification.
- A (Point A):** the deepest midline point in the curved bony out line from the base of the alveolar process of the maxilla.
- I (upper incisal point):** the most anterior point of the upper

central incisor in relation to the upper lip.

FH (Frankfort horizontal Plane): a horizontal plane running between Po and Or (the horizontal reference line).

PO line (Simon line): the vertical line from Or on FH plane according to Paul Simon and Schwarz⁽⁷⁾.

Calculation of upper lip cross sectional area

Lip was defined extraorally by its skin profile and intraorally by the anterior outline of the maxillary central incisor and maxilla; the superior border was defined by a line parallel to Frankfort plane from subnasale and the cross-sectional area then calculated by.

The data were subject to statistical analysis using descriptive analysis (mean and standard deviation) and inferential analysis using (Paired t. test).

Results:

Nine patients subjected to anterior maxillary osteotomy using 3-sided mucoperiosteal flap. All the cases had increased in maxillary alveolar height with mandibular retrognathism in 5 cases.

The anterior maxilla had been setted up by a mean of 2.5mm, with backward movement by a mean of 2.95mm change in point A and 3.3 mm change in point I (table I).

The cross sectional area of upper lip showed a high significant increase with a percent of (38%) in the immediate follow up interval (table II, IV).

However, the area of upper lip decreased dramatically after about (3) months i.e. after removal of the intermaxillary fixation with a mean change of 17%, but it showed a significant increase from the presurgical state (table III, IV) and (Figure 4).

(Table I): Summery of data from nine patients treated using 3-sided mucoperiosteal flap.

Patient Sex	Diagnosis *	Surgical change in point A (mm)	Change in point I (mm)	Follow up time (month)
M	1,2	3	3.5	3
M	1,2	1.2	2.7	2.5
F	1	3.2	4.8	2.5
M	1,2	2.6	3.6	4
F	1	3.3	3	3
M	1	3.4	3	6
F	1,2	2.3	2.7	3.5
F	1	3	2.8	2
F	1,2	4.3	4.2	2.5

* 1= maxillary excess, 2= mandibular retrognathism

(Table II): Comparison between presurgical upper lip area and immediate postsurgical lip area.

Upper lip area presurgical state (mm ²)	Lip area immediately after surgery (mm ²)	% of change
381	557	46
259	344	32
348	551	58
470	612	30
268	374	39
290	357	23
281	390	38
311	402	29
240	346	44

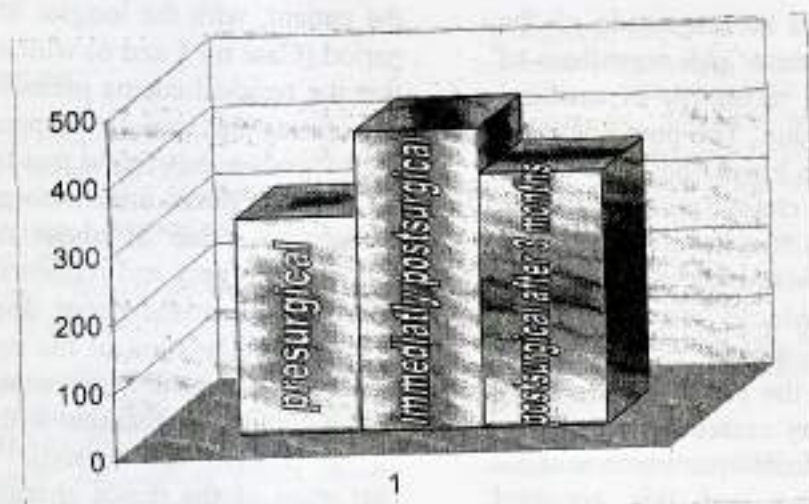
(Table III): Comparison between presurgical and postsurgical (after 3 months) upper lip area.

Upper lip area presurgical State (mm ²)	Postsurgical Lip area (mm ²)	% of Change
381	428	12
259	315	21
348	468	34
470	535	11
268	323	20
290	298	2
281	354	25
311	334	7
240	294	22

(Table IV): Comparison between the mean lip area of the presurgical and postsurgical state.

Lip area presurgical state	Postsurgical state (mm ²)	% of change	t-test	Sig.
316	437 (immediately)	38	8.11	***
316	372 (after about 3 months)	17	3.5	*

* significant ($p < 0.05$)** highly significant ($p < 0.01$)



(Figure 4): Comparison between different lip areas in different intervals.

Discussion:

All the patients selected were treated by the same surgeon. The anterior maxilla had been lifted upward with backward movement in a mean value of (2.5) and (3.3) respectively (in respect with Incisor point).

All previous studies as (12,27,28,34) studied the soft tissue changes with bony movement using the main approaches (Wassmmd, Cuper and Wundrer). In this study a 3-sided mucoperiosteal flap was used exposing the anterior maxilla.

The benefits of this access were:

1. Adequate exposure.
2. Good post operative cosmesis.
3. Good post operative function.
4. Preservation of essential structures.

In designing access incision for these type of surgery it was more appropriate to think in term of pedicle supply to the segment after mobilization⁽¹⁹⁾.

The arterial blood supply to the maxilla is traditionally seen in terms of several arteries derived from the internal maxillary artery with collateral channels between adjacent areas in head and neck.

All intercommunications are not irreversible committed to the centrifugal pattern of flow after

disturbance of the intramedullary haemodynamic balance, which occurs as a result of osteotomy, but the most important pedicle is that derived from the palate (but even that is not dependent of greater a palatine artery which is not essential).

However the palatal pedicles are better than the vestibular pedicles as more attachment and so superior blood supply. The main risk area of ischemia is the canine region but with intact palatal mucosa this risk is greatly minimized^(29,30).

The healing at the surgical wound occurs by primary intention with out complication which prove the idea that the palatal pedicles are better than the vestibular one.

The effect of the 3-sided flap on upper lip cross sectional area

The location and direction of the soft tissue incision considered as an important factor in prediction of postoperative lip area⁽¹¹⁾.

However the immediate postsurgical lip area significantly change with a percent of (38%) when compared with the presurgical state, which is greater than that found by⁽¹¹⁾ who found that the lip area increased to 27.8% but agreed with his state that the cross-sectional area reduced regardless

of the direction or magnitude of the surgical movement and regardless of incisal incision technique or mucosal suturing technique. The post operative edema diminish significantly with in 3 months but the change still statistically significant and the lip shape became stable. At 3-month interval the percent of change reduced markedly and became 17% which is completely different from the result found by ⁽¹⁸⁾ when maxillary osteotomy done by down fracture technique which is about 14.1% reduction and this occurred regardless of the direction and dimension of maxillary surgical movement.

While (Tomlak et al, 1984) found that the upper cross sectional area increased to about (3.3%) which is statistically significant when compared with the presurgical state.

The reduction in lip area in down fracture technique, probably occur due to the resultant scar tissue when a horizontal mucoperiosteal incision used which also allows the periosteum to be retracted superiorly and posteriorly while with tunneling approach, the muscles of facial of expression and the associated tissue remain intact which effect greatly the edema following the surgery.

In the 3-side flap there will be a posterosuperior migration of the soft tissue following the reflected flap i.e. periosteum and associated structures, and so, new attachment with minimum scar tissue occurs and this certainly has a new prediction result as supported by ^(18,31). In addition to that tension relief that was previously applied by the proclined anterior maxillary incisors considered as a recognizable factor and this especially true because all the cases treated without presurgical orthodontics which is supported by ⁽³²⁾.

From the table (III) it found that the percent of the lip area change decrease to a non significant level with

the patient, with the longest follow up period (Case no 4 and 6) which reflects that the residual edema present even at that time, this greatly supported by ^(11,12,18) when they found that the upper lip cross-sectional area returns to the presurgical value at about 6 month following surgery and remain constant. Perhaps this might occur due to the functional adaptation of the lip tissues with the new hard tissue arrangement which comes in agreement with ^(14,25).

Busquet and Sassoni, ⁽³³⁾ found that most of the major changes occur with in the first 2-3 months, they mentioned also that the postsurgical edema gradually diminished with in 3 months and after that the change is statistically non significant with a non significant clinical result. However, long term follow up is mandatory but this is difficultly achieved because most of the patients would not come again when they had improved facial appearance.

Conclusion:

- 1- The use of 3-side flap to expose the premaxilla has great benefits with an acceptable satisfaction for the surgeons.
- 2- There is minimal change in upper lip cross section area when compared with the presurgical state and so favorable lip morphology can be preserved to a considerable extent.
- 3- Lip area decrease significantly with in the first 3 month then after the residual edema has a non significant effect on the lip area changes but with longer follow up interval further reduction may occur.
- 4- Greater increase in upper lip cross section area with the 3-side mucoperiosteal flap (17%), when compared with the increased lip area by tunneling approach (3.3%) and with reduced lip area (14.1%) area by down fracture (Cuper approach).

References:

- Roskil W, Marks ES: What art history. 1976; 1st ed Thomas and Hundson London.
- Dion KE, Berscheid F, Walster F: What is beautiful is good. *J personal and soci Psycho* 1972; 24: 285-290.
- Kalick MS: Toward an interdisciplinary psychology of appearance. *J psychiatry* 1977; 41: 243-253.
- Negar M: A quantitative method for the evaluation of the soft tissue facial profile. *Am J orthod* 1956; 45: 738-751.
- Anderson JP, Joondeph D, Turpin DL: A cephalometric study of profile changes in orthodontically treated cases, 10 years out of retention. *Angle orthod* 1973; 43(3): 324-336.
- Waldman BH: Change in lip contour with maxillary incisor retraction. *Angle orthod* 1982; 52(2): 129-134.
- Grabber TM, Swain BF: Current principle and techniques of orthodontics. 2nd ed Saunder comp 1985; 56-69, 105-135.
- Bishara SE, Jackobsen DM: Morphologic basis for extraction decision. *Am J ortho* 1995; 64(3): 129-135.
- Thony D, Viazis D: Cephalometric analysis based on natural head position. *J clinic Orthod* 1991; 25(2): 172-181.
- Thony D, Viazis D: A new measurement of profile esthetic. *J clinic Orthod* 1991; 25(6): 15-20.
- Tomlak A, Picuch T, Weinstein S: Upper lip area following maxillary osteotomy via tunneling approach. *Am J orthodontic* 1984; (86): 488-493.
- Radney LT, Jacobs JD: Soft tissue changes associated with surgical total maxillary intrusion. *Am J orthodontic* 1981; 80: 191-212.
- Schendel SA, Eisenfeld JH, Bell WH, Epker BN: Superior repositioning of the maxilla: Stability and soft tissue osseous relations. *Am J orthod* 1976; 70(6): 663-674.
- Weinstcin S, Harris EF, Archer SY: Lip morphology and area changes associated with surgical correction of mandibular prognathism. *J oral Rehab* 1982; 9: 335.
- Wassmund 1927 Quoted by Henderson D: A colour atlas and textbook of orthognathic surgery. 1985; 4: 123 wolf med Public ltd London.
- Wunderer 1963 Quoted by Henderson D: A colour atlas and textbook of orthognathic surgery. 1985; 4: 123 wolf med Public ltd London.
- Cuper I 1954 Quoted by Henderson D: A colour atlas and textbook of orthognathic surgery. 1985; 4: 123 wolf med Public ltd London.
- Ingersoll SK, Peterson LJ, Weinstein S: Influence of horizontal incision on upper lip morphology: *J Dent Res* 1982; 61: 218.
- Hershy HG, Smith LH: Soft tissue profile changes associated with surgical correction of the prognathic mandible. *Am J orthodontic* 1974; 65(5): 483-502.
- Killey HC, Seward GR, Kay LW: An outline of oral surgery, Part II, 1975; Bristol John Wright and Sons Ltd.
- Killey HC, Seward GR, Kay LW: An out line of oral surgery. 1998; Bristol John wright and sons ltd.
- Sarver DM: Esthetic orthodontics and orthognathic surgery. 2000; Skinner Printing Comp.
- Rakosi T: Atlas and manual of cephalometric radiology. 1982; Wolf Med Pub
- Jacobson A Caufield P. Introduction to radiographic cephalometry. 1985; Lea and Febiger Philadelphia.
- Burston CJ, James RB, Legan HL, Murphy GA, Norton CA: Cephalometric for orthognathic surgery. *J Oral Surg* 1978; 36: 269-277.
- Legan HL, Burston CJ: Soft tissue cephalometric analysis for orthognathic surgery. *J Oral Surg* 1980; 38: 744-751.
- Rosen HM: Lip nasal esthetics following Lefort I osteotomy. 1988; *Plastic Reconst Sury* 81: 180-182.
- Sarver DM, Weissman SM: Long term soft tissue response to Lefort I maxillary superior repositioning. *Angle orthodontic* 1991 ;61: 267-276.
- Henderson D: A colour atlas and textbook of orthognathic surgery. 1985; Wolf med Public ltd London.
- Bell R, Klyak HA, Joondeph DR, McNeill RW, Terry RW: Perception of facial profile and their influence on the descision to undergo orthognathic surgery. *Am J orthodontic* 1985; 88(4): 323-332.
- Dancaster JT: The sagittal soft tissue changes related to the surgical correction of maxillary deficiency, Class III malocclusion. M Dent thesis 1999; University of Wit Waterstrand.
- Hack GA, Otterioo JJ, Nanda R: Long term stability and prediction of soft tissue changes after Lefort I osteotomy. *Am J orthodontic* 1993; 93: 544-555.
- Busquets CJ, Sassouni V: Changes in the intgumental profile of the chin and lower lip after genioplasty. *J Oral Surg* 1981; 39: 499-504.
- Assis EA, Stark WS, Epker BN: Cephalometric analysis of profile nasal esthetics. Post operative changes after isolated superior repositioning. 1998; 11(4): 279-288.