

EVALUATION OF THE CHANGES IN THE SOFT AND HARD TISSUE PROFILE AFTER ANTERIOR SEGMENTAL OSTEOTOMY OF MAXILLA AND MANDIBLE.

<sup>1</sup> sudhakar Gudipalli	<sup>1</sup> Associate professor
<sup>2</sup> Surekha.K	<sup>2</sup> Professor and Head
<sup>3</sup> Anil Budumuru	<sup>3</sup> Senior Lecturer
<sup>4</sup> Praveen Peramulla	<sup>4</sup> Senior Lecturer
<sup>5</sup> Narendra kumar	<sup>5</sup> Post graduate
<sup>6</sup> Prasanna PVL.	<sup>6</sup> Post graduate

<sup>1-6</sup> Department of oral and maxillofacial surgery, <sup>1,2,5,6</sup> Government Dental College and Hospital,Vijayawada, Andhra Pradesh. <sup>4</sup>Vishnu Dental college and Hospital, Bhimavaram, Andhra Pradesh. <sup>5</sup>Kamineni institute of Dental science,Narketpally,Nalgonda,Telengana.

**ABSTRACT:** Aim of this study is to evaluate the changes in the soft and hard tissue profile after Anterior Segmental Osteotomy of Maxilla and Mandible in Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Vijayawada. Subjects include 10 men and women who were diagnosed as bialveolar protrusion and underwent maxillary and mandibular anterior segmental osteotomy. Statistical analysis showed changes in both soft and hard tissues parameters. A reduction of the labial prominence with increase nasolabial angle was noted subsequent to anterior segmental osteotomies. Long term, prospective, methodology sound clinical trials with larger samples are required to provide sufficient information for predicting the soft and hard tissues changes response to anterior segmental osteotomies.

**KEYWORDS:** Anterior Segmental Osteotomy, nasolabial angle, orthognathic surgery

INTRODUCTION

Orthognathic surgeries are utilized to alter or correct underlying hard tissues abnormalities. Anterior segmental osteotomy is indicated in excess vertical and or anterior posterior dimension of maxilla, bimaxillary protrusion, and anterior open bite and can be combined with other osteotomies to achieve optimal correction of dentofacial esthetics and occlusion<sup>1-4</sup>. Aim of the study is to determine the relationship between the changes of soft and hard tissues after anterior segmental osteotomy of maxilla and mandible and evaluate unintentional facial changes using wolfolds and fields analysis has been used in our study.

Materials and methods

A study was conducted in Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Vijayawada conducted from November 2014 to September 2016 after due approval from hospital ethical committee.

Ten patients aged 18-30 years who underwent anterior segmental osteotomy in were included in the study. Patients who underwent other orthognathic surgery and who were less than 18 years or more than 50years were excluded in the study. Preoperative OPG was taken to rule out any underlying abnormalities like bony lesions,

supernumerary tooth etc. All the patients were assessed cephalometrically. Preoperative lateral cephalogram of the patient is taken and wolfolds and fields analysis was done on it to assess the skeletal and dental discrepancies which will aid in treatment plan. The postoperative follow up after the surgery is on 3 and 6 months. The soft tissue and hard tissue changes for 10 patients who underwent AMO alone or in combination with Lower sub apical osteotomy or Genioplasty were evaluated with the help of wolfolds and fields analysis and were calculated by subtraction of the corresponding preoperative values and calculation of percentage change for each patient. The data gathered was statistically analyzed

The following landmarks were used in the study:

1. Upper incisal angulations
2. Lower incisal Angulation
3. N-A angle
4. 4.N-B angle
5. Lower anterior Dental height
6. N-Pg (mm)
7. Upper lip length
8. Thickness of Upper lip
9. Nasiolabial angulation
10. Labiomental angulation.

Pre operative and post operative pictures of patient Case1 (Fig.1, Fig.2, Fig.3, and Fig.4) case 2(Fig.5, Fig.6, Fig.7, and Fig.8)

Results

Table1: All patients participating in this study were evaluated cephalometrically. (Table.1, Table.2, Graph1 and 2). On an average 40% of the patients undergone surgical procedures(Anterior segmental osteotomy, genioplasty, lower subapical osteotomy)are within the age range of 18-25years and other 40% are of above 24 years of age.

Table.1. Demographic details of the subjects

Sex	No. of patients	Percentage
Female	7	70
Male	3	30

Table 2: The Age distribution of patients in current study

Age	No. of patients	Percentage
18-20	4	40
21-23	2	20
>24	4	40

Based on the surgical procedures performed, patients were separated into two groups:

- Group I:**One group includes only AMSO and  
**Group II:** Another group includes bimaxillary procedures that include (Genioplasty or lower sub apical osteotomy along with AMSO).

Results on continuous measurements are presented on Mean +SD (Min- Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Student t-test has been used to find the significance of study parameters on continuous scale within each group.

Statistical analysis showed changes in both soft and hard tissue parameters. Changes were not uniform for all the parameters. Few parameters had significant changes where as others had suggestive significance or moderate significance

The Pretreatment values of each the patient(n=10), comparison of the groups in correlation with the surgery performed, amount of hard tissue movement and percentage change for each variable.(Table.3 and Table.4) The graph depicts that when AMSO posterior and superior repositioning is done : (Graph :2). Graph that depicts that when AMSO along with Genioplasty / lower anterior subapical osteotomy is done(Graph 3)

Discussion

Anterior segmental osteotomy is indicated in the case where substantial movement of the anterior teeth is required, but where tooth repositioning by orthodontic

treatment alone is impossible because of objective factors such as the amount of tooth movement and periodontal circumstances, and subjective factors such as patient age, treatment time, and economic status.

The specific relationships between the hard tissue structures and soft tissue profiles are variable. For some points, hard and soft tissue structure is closely related, but some are independent<sup>1</sup>. Generally, the changes of the superior and inferior aspects of the profile, such as Nasion and pogonion, have shown to have more predictable patterns than those of the midface areas, such as the nose and lips.<sup>2</sup>. The pair t test is most commonly used for the comparison of preoperative and post operative soft tissue and hard tissue changes.

The parameters which have undergone significant changes were Upper incisal angulations, Upper lip length and Nasolabial angulation. Lines and Steinhauser in their study reported soft tissue changes associated with the maxillary anterior segmental set back osteotomy which included an increase in the nasolabial angle because of posterior lip rotation around subnasale<sup>3</sup>. Our study results are similar to the study of Lew et al who suggested lengthening of the upper lip, decrease in interlabial gap and retraction of the lower lip.<sup>4</sup>

In our study soft tissue changes associated with AMO results in increase nasolabial angel due to which prognense of labial prominence has been reduced.The thicknesses of the upper lip in our study shows no significant change. These results are contrast to the study of Park et al in which thickness of upper lip is increased to 2.6%

Park et al in their study evaluated hard and soft tissue changes after Anterior Segmental Osteotomy on the Maxilla and Mandible. Mean values of Nasolabial angle preoperative was found to be (94.96± 9.67) and postoperative was found to be (109.03 ± 9.08) with a highly significant P value of < 0.0127. Mean value of nasolabial angulation (postoperative) in our study was found to be similar to the above study (110.80±13.4).

The results of the upper incisal angualtion inner study is similar to the study of Kasai kazutaka et al in which upper incisal angulation decreased significantly post surgery from preoperative to post operative in a patient treated orthodontically.<sup>1</sup>The mean preoperative value for Labio mental angulation in cases of lower subapical osteotomy is 119.33 and the mean post operative value is 132.0. The P value is <0.05 depicting significance The mean preoperative value for Labio mental angulation in cases of Genioplasty is 145.5 and the mean post operative value is 128.5. The P value is <0.05 depicting significance.

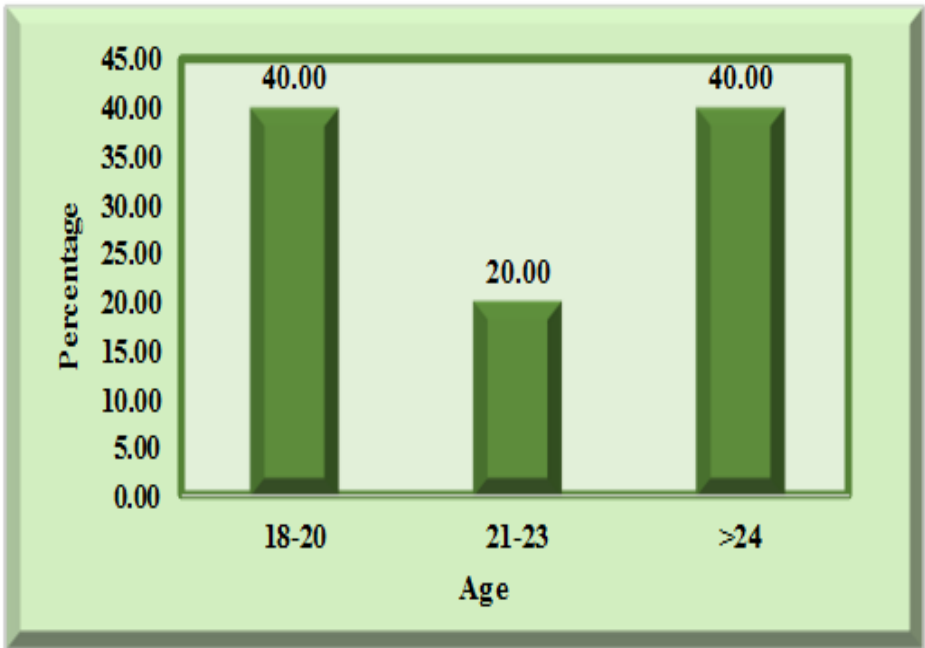
The mean ± SD of preoperative values of Labiomenta angulation in our study are 119.33±0.57 and the postoperative values are 132 ± 2.12 in patients undergoing bimaxillary procedure with upper anterior segmental osteotomy and lower subapical osteotomy. The

Table 3: Comparison of mean between pre and Post in different parameters(AMSO alone) by using paired t-test.

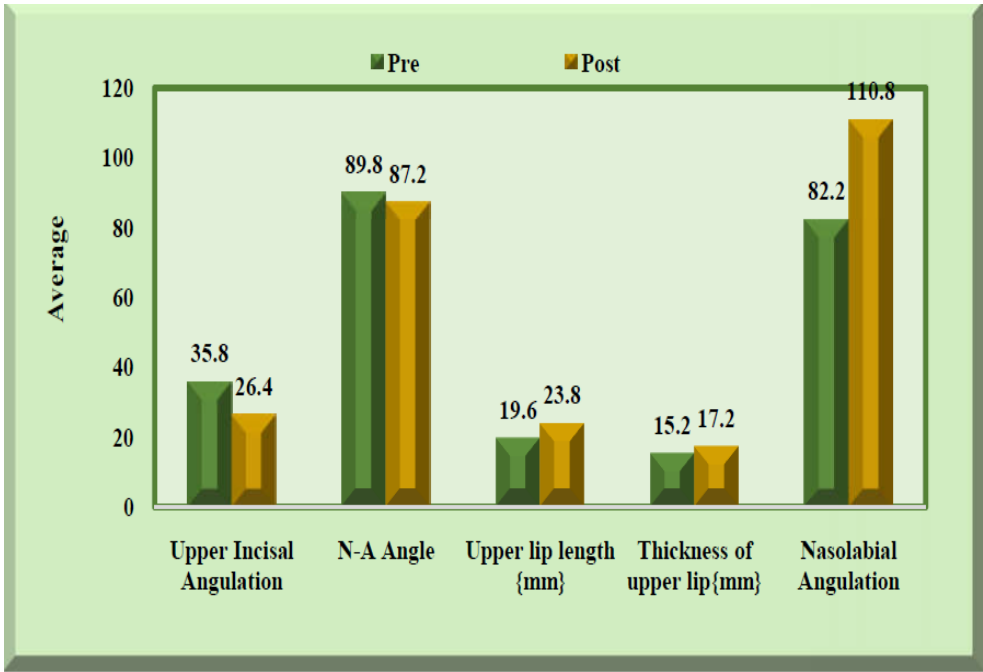
Parameters	Timing	Mean	SD	P- value	Inference
Upper Incisal Angulation	Pre	35.80	9.20	<0.05	S
	Post	26.40	5.43		
N-A angle	Pre	89.80	2.86	0.23	NS
	Post	87.20	3.31		
Upper lip length	Pre	19.60	2.06	<0.05	S
	Post	23.80	3.12		
Thickness of upper lip	Pre	15.20	2.23	0.39	NS
	Post	17.20	2.71		
Nasolabial angle	Pre	82.20	13.06	<0.05	S
	Post	110.80	13.54		

Table 4: Comparison of mean between pre and Post in different parameters by Bimaxillary procedure using paired t-test.

Parameter	Timing	Mean	SD	P-value	Inference
Upper Incisal Angulation	Pre	34.60	8.99	<0.05	S
	Post	23.60	2.19		
Lower Incisal Angulation	Pre	38.40	8.08	<0.05	S
	Post	26.60	4.98		
N-B Angle	Pre	86.00	3.46	0.20	NS
	Post	83.00	3.96		
N-A Angle	Pre	90.40	3.78	0.41	NS
	Post	86.00	3.74		
Lower Anterior Dental Height	Pre	38.60	2.41	0.29	NS
	Post	41.00	3.32		
N-Pg linear distance{mm}	Pre	2.30	0.45	0.78	S
	Post	2.70	0.84		
Upper lip length{mm}	Pre	15.60	2.30	<0.05	NS
	Post	21.60	2.41		
Thickness of upper lip{mm}	Pre	13.60	1.52	0.31	NS
	Post	16.20	2.49		
Nasolabial Angulation	Pre	85.20	11.99	<0.05	S
	Post	102.00	10.20		
LabiomentalAngulation (lower subapical osteotomy)	Pre	119.33	0.57	<0.05	S
	Post	132.00	2.12		
LabiomentalAngulation (Genioplasty)	Pre	145.50	3.46	<0.05	S
	Post	128.50	3.54		



Graph1: depicting the percentage of the patients undergoing the type of and the average range of their ages



Graph 3 : Graph corresponding to table 3 depicting the preoperative and post operative value for each variable in AMO group

Case1.



Fig. 1: Pre  
operative  
photographs  
(frontal and  
lateral view)



Fig. 2: Intraoperative photograph showing down fracture of the maxilla



Fig. 3: Post-  
operative  
photographs  
(frontal and  
lateral view ve  
photographs  
(Frontal &  
Lateral views)

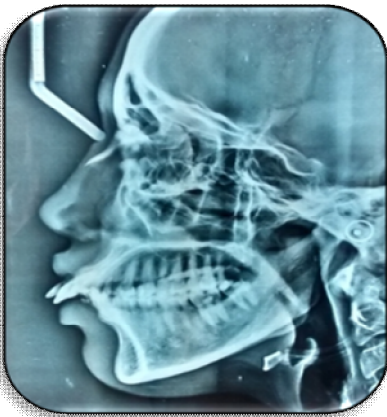
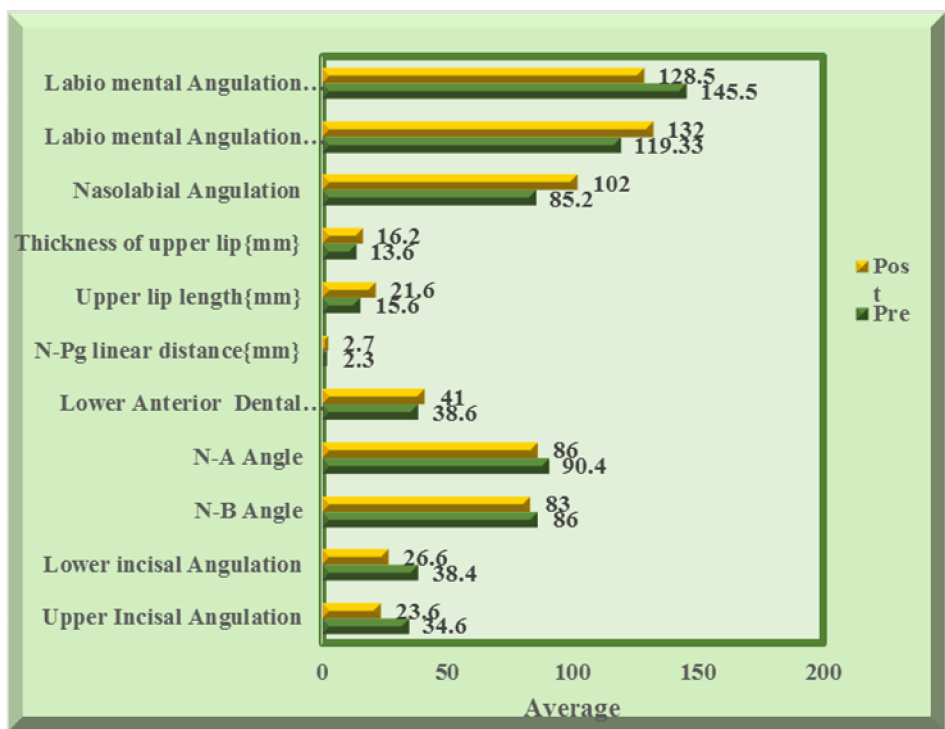


Fig. 4: Pre&  
Post Operative  
Radiographs



Graph 3: This graph corresponding to table 4 depicting the pre operative and post operative value for each variable in bimaxillary group patients

results in our study are similar to studies of **Kasai Kazutaka et al** in which the Labiomental angulation increased significantly post-surgery from preoperative ( $136.7\pm12.9$ ) to postoperative ( $138.9\pm9.5$ ) in patients treated orthodontically<sup>1</sup>. The results obtained in both procedures regarding Labiomental angulation (AMO along with Lower Sub-Apical osteotomy or advancement Genioplasty) is contrary to the studies of **Harshitha et al** in which no significant post-operative changes of Labiomental angulation had occurred<sup>5</sup>. Our study results are also dissimilar to the study of **Park et al.** in which no statistically significant change occurred in Labiomental angle<sup>6</sup>.

The parameters which underwent significant changes were upper incisal angulation, lower incisal angulation, nasolabial angulation and Labiomental angulation and upper lip length value has undergone a highly significant change in our study

For the patients who underwent advancement Genioplasty a moderately significant increase in chin prominence was observed. This shows that there is significant change in the chin which is in agreement with the following studies.

**Krekmanov and Kahnberg**<sup>7</sup> reported that the soft tissue changes following horizontal advancement Genioplasty depend on the magnitude and direction of the positional change of the genial segment and minimal soft tissue

stripping. The profile became straighter after advancement Genioplasty procedures. Anterior segmental osteotomy might be recommended as treatment modality of choice in patient with bimaxillary and or dentoalveolar protrusion. The technique is simple, post operative complications are minimal, relapse is limited and soft tissue changes in response to surgery are more predictable.it may take atleast six months for post surgical edema and hematoma to resolve and soft tissue to stabilize.

CONCLUSION

On the basis of this study conducted in the Department of Oral and Maxillofacial Surgery, Government Dental College and Hospital, Vijayawada, we have made an attempt to assess the soft and hard tissue profile changes after Anterior segmental osteotomy of maxilla and mandible surgical procedures. This study was conducted on 10 patients and following conclusions were drawn.

In Anterior segmental osteotomy of maxilla alone by posterior and superior repositioning there is increase in the Nasolabial angle, Upper incisal angle, and upper lip length. Whereas N - A angle and thickness of upper lip doesn't show significant change.



Case-2.



Fig. 5: Pre operative photographs (frontal and lateral view)

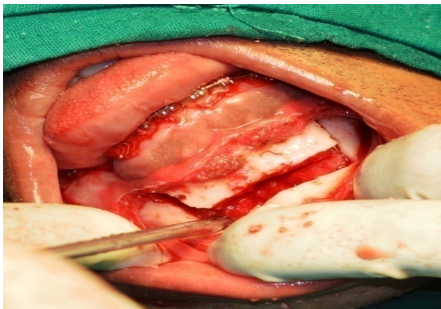
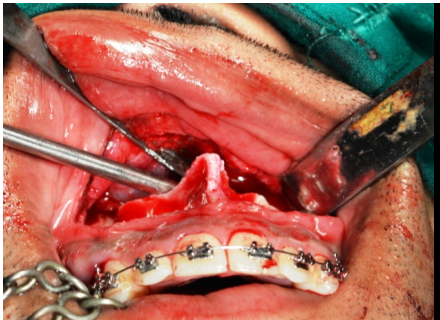


Fig. 6: Intraoperative photographs showing ASO of Maxilla and Anterior Sub apical osteotomy of mandible.



Fig. 7. Post-operative photographs (frontal and lateral view ve photographs (Frontal & Lateral views)

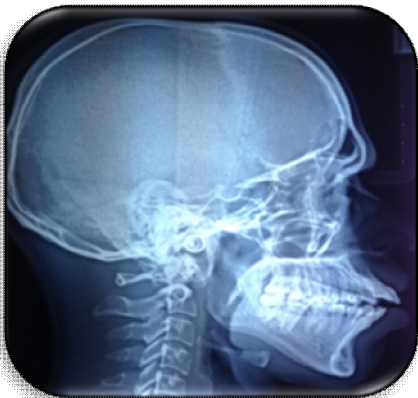


Fig. 8: Pre& Post Operative Radiographs

For Anterior segmental osteotomy of maxilla along with anterior mandibular subapical osteotomy there is increase in Upper incisal angulation and Lower incisal angulation, Upper lip length, Nasolabial angle, Labio mental angulation.

For Anterior segmental osteotomy of maxilla along with Advancement Genioplasty there is increase in Upper incisal angulation and Lower incisal angulation, Upper lip length, Nasolabial angle and decrease in Labio mental angulation was seen.

In both the bimaxillary groups N-A angle, N-B angle, Lower anterior dental height, Thickness of upper lip, N-Pog distance didn't show significant change.

The post operative changes in the soft tissue profile were understood better by the patients by comparing pre and postoperative cephalograms during the follow up.

The limitations of the present study include relatively smaller sample size with short term follow up and the methodology used for measurement of some of the parameters is manual rather than software based and purely based on observer skills in tracing cephalograms. It is anticipated that, a larger sample size with long term follow up study, would enable a more detailed output with definitive conclusion.

References:

1. **Kasai K.** Soft tissue adaptability to hard tissues in facial profiles. American journal of orthodontics and dentofacial orthopedics. 1998 Jun 30;113(6):674-84..  
2. **Proffit WR, Epker B.** Treatment planning for dentofacial deformities. In: Bell WH, White RP, editors. Surgical correction of dentofacial deformities. Philadelphia: WB Saunders; 1980. p. 183–7.  
3. **Lines PA, Steinhäuser E.** Soft tissue changes in relationship to movement of hard tissue structures in orthognathic surgery: a preliminary report. Journal of Oral Surgery 1974; 32:891–6.  
4. **Lew KKK, Loh F, Yeo JF.** Profile changes following anterior subapical osteotomy in Chinese adults with bimaxillary protrusion. Int J Adult Orthodon Orthognath Surg 1989; 4:189– 96.  
5. **Harshitha KR, Srinath N, Sunil Christopher H.** Evaluation of soft and hard tissue changes after anterior segmental osteotomy. Journal of clinical and diagnostic research: JCDR. 2014 Sep;8(9):ZC07.  
6. **Park JU, Hwang YS.** Evaluation of the soft and hard tissue changes after anterior segmental osteotomy on the maxilla and mandible. Journal of Oral and Maxillofacial Surgery. 2008 Jan 31;66(1):98-103.  
7. **Krekmanov L, Kahnberg K.** Soft tissue response to genioplasty procedures. Br J Oral Maxillofac Surg 1992; 30:87–91.  
8. **Johan P Reyneke.** Essentials of Orthognathic Surgery. Quintessence Publishing Co. Inc, 2003.

9. **Burstone C J , James R B , Legan H , Murphy G A , Norton L A** Cephalometrics for orthognathic surgery. J Oral Surg 1978; 36: 269 77.  
10. **Peter ward booth.** Surgical planning in orthognathic surgery. Elsevier publications, second edition, volume 2, 2007.  
11. **Athanasious and Athanasiou.** Orthodontic Cephalometry. Mosby – Wolfe.95.  
12. **B.Rosenquist** .Anterior segmental maxillary osteotomy . IJOMS 1993; 22; 210  
13. **Edward Hui,** soft tissue changes following maxillary osteotomies in cleft lip and palate and non cleft patients.  
14. **Pedersen GW.** The versatility of mandibular subapical procedures. Oral Surgery, Oral Medicine, Oral Pathology. 1973 Apr 30;35(4):448-61.  
15. **Pedersen GW, Blaho DM.** Correction of mandibular dentoalveolar retrusion by anterior segmental advancement. Oral Surgery, Oral Medicine, Oral Pathology. 1976 Mar 31;41(3):281-92.  
16. **Radney LJ, Jacobs JD.** Soft-tissue changes associated with surgical total maxillary intrusion. American journal of orthodontics.1981 Aug 1;80(2):191-212  
17. **Holland GR, Robinson PP.** Reinnervation of teeth after segmental osteotomy. International journal of oral and maxillofacial surgery.1986Aug31;15(4):437-43.  
18. **Martis C, Martis K, Papadogeorgakis N.** A modified anterior maxillary osteotomy: 15 years experience. British Journal of Oral and Maxillofacial Surgery. 1991 Jun 1;29(3):213-4.  
19. **Rosenquist B.** Anterior segmental maxillary osteotomy: A 24-month follow-up. International journal of oral and maxillofacial surgery. 1993 Aug31;22(4):210-3.  
20. **Harshitha KR, Srinath N, Sunil Christopher H.** Evaluation of soft and hard tissue changes after anterior segmental osteotomy. Journal of clinical and diagnostic research: JCDR. 2014 Sep;8(9):ZC07

Corresponding Author

Dr.Surekha.K  
Professor and Head  
Department of oral and maxillofacial surgery  
Government Dental College and Hospital,  
Vijayawada- 520004  
Phone no : 8008372713  
E-mail:gsletterbox@gmail.com