

WEST AFRICAN JOURNAL OF ORTHODONTICS

VOLUME 14, NUMBER 2

ISSN 2315-9502

December 2025

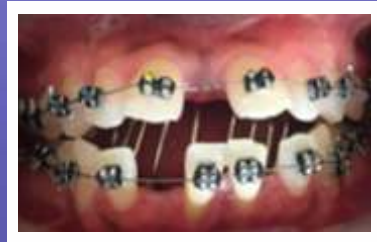
**Cephalometric analysis using a
mobile application**



**Complications associated with
orthodontic treatment**



**Case Report: Management of
Class III malocclusion**



**Abstracts presented at NAO 2025
Annual Scientific Conference**



Orthodontic Treatment of A 35year Old With Class III Malocclusion and A Tongue Sucking Habit: A Case Report

Chukwuma EI^a, Etim SS^b, Onyeaso CO^b

Abstract

Background: A case of a 35-year-old female physician who presented to the department of Child Dental Health, University of Port Harcourt Teaching Hospital with complaints that she has never been caught smiling on camera due to the arrangement of her teeth. She was observed to have Angle's class III sub-division left malocclusion on skeletal base pattern III, complicated by crossbite of all anterior teeth, a tongue sucking habit, severe spacing on both arches and a compromise of her lower anterior periodontal tissues. Baseline cephalometric values were SNA 83°, SNB 91°, ANB -8°, UIFP 136° and LIMP 103°.

Methods: A comprehensive fixed orthodontic therapy of both arches was done using preadjusted edgewise Roth's 022 slot in addition to a fixed tongue rake on the upper arch. The work up to her management involved the preventive and restorative dentists.

Results: At the end of management patient was discharged with class I molar relationship, the anterior crossbites were corrected and all the spaces were effectively closed-up. Cephalometric values at the time of debonding were SNA 85°, SNB 90°, ANB -5°, UIFP 126° and LIMP 85.5°.

Conclusion: After 25 months of management, the patient was satisfied with the aesthetic and psychosocial outcomes of management. Retention was done with both fixed and ESSIX retainers on both arches.

Keywords: Class III malocclusion, Tongue sucking, Anterior crossbite, Spaced dentition, Interarch-elastics.

Authors' affiliations

^a Department of Child Dental Health, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State

^b Department of Orthodontics and Paediatric Dentistry, Faculty of Dental Sciences, University of Port Harcourt, Rivers State

Correspondence:

Chukwuma, Emmanuel Ifeanyi
Department of Child Dental Health
University of Port Harcourt Teaching Hospital, Port Harcourt,
Rivers State
P.M.B. 6173, Port Harcourt
Telephone number +2348023046596
E-mail iceacema@gmail.com

Introduction

Class III malocclusion accounts for the lowest prevalence rates of occlusal abnormalities in African populations with mean values being less than 5%^{1,2}. Here in River State, Nigeria prevalence of class III malocclusion (1.6%)³, similar to rates obtained in Benin City (1.8%)⁴ and in Northern Nigeria (2%)⁵, also accounts for the lowest rate of occlusal abnormalities. Much higher rates (12%) were however recorded among indigenous

populations in the metropolitan city of Lagos State, Nigeria⁶. Among 10-15-year-olds in Calabar metropolis class III recorded a prevalence of 4.1% and still maintained the lowest prevalence among other forms of malocclusion

In the simplest form Class III malocclusion may be defined as a type of malformation characterized by a mesial molar relationship.¹ In more severe cases Class III malocclusion has also been defined with discrepancies of dental or skeletal components in antero-posterior, vertical and sagittal directions⁸. It may be classified as pseudo-Class III malocclusion and skeletal Class III malocclusion⁹. It may also be classified into Dental type, Skeletal type and Functional type of Class III malocclusion.¹⁰

The type or class of Class III malocclusion presented by a patient, plays a vital role in the complexity and Management options open to a clinician, hence the regular evolution and revision of classification with focus on occlusal relationship and treatment planning¹¹. Other integral factors that influence treatment planning include aetiology, chronological age and maturity stage of the patient. The reliable

tools in determining the structural aetiology in class III malocclusion are cephalometric, facial and occlusal analysis.¹²

A practical classification that focuses on aetiology

and occlusal relationship to aid treatment planning classifies it into Dental class III and Skeletal class III, with sub types A, B and C as shown in Table 1 below.

Table 1: Classification of class III malocclusion¹²

Types	Skeletal Classification	Dental Classification (Dewey)
A	Short or retrognathic maxilla	Molar in Class III with anterior edge to edge
B	Long or prognathic mandible	relationship Molar in class III with crowded mandibular
C	Combination of Both	incisors Molar in class III with anterior crossbite

In situations where anterior crossbite is present in class III malocclusion case, it is generally assumed to further complicate management and is also assumed to tend towards a skeletal crossbite. It is important at this point to differentiate the crossbite into a dental and skeletal one. Some important criteria that help to achieve this differentiation include dental assessment where occlusal features of the maxillary and mandibular arch are examined, profile assessment for the extent of maxillary and mandibular development and functional assessment for centric relation/centric occlusion discrepancy¹² assessment.

The major management options for class III malocclusions are Growth modification, Class III Camouflage and Orthognathic surgery.¹³ When growth modification is no longer and option due age, borderline cases and Moderate cases of skeletal class III can be successfully treated with camouflage¹⁴. Furthermore, proper selection and adequate application of biomechanics and orthodontic appliances can make very difficult cases and severe skeletal class III look easy^{12,13,15,16}. The main objective of orthodontic camouflage involves proclination of the maxillary anteriors and retroclination of the mandibular anteriors by selective extractions, fixed appliance with class III intermaxillary elastics and en masse distalization of mandibular dentition using temporary anchorage devices.¹⁷ The major drawback of very successful orthodontic camouflage is compromised aesthetics due to low maxillary prominence and increased chin prominence due to en mass retraction and retroclination of lower anterior segment. This has given birth to 'Orthognathic camouflage' Orthodontic clockwise rotation of the

maxillomandibular complex for improved facial profile.¹⁸

This case reports the use of a unique inter-arch elastic placement method 'Class III-Cross-Elastic' in addition to management of a tongue sucking habit in the correction of class III malocclusion in a 35-year-old female physician.

Case Report

This is a report that involves a married 35-year-old female family physician that works in University of Port Harcourt Teaching Hospital and resides in the city of Port-Harcourt. Her presenting complain was “I don't like the arrangement of my teeth and you cannot catch me smiling on camera”. There were positive history of Tongue sucking and thrusting Habit and positive history of psychosocial impact due to the malocclusion. There was no confirmed past family history of such malocclusion but presently her children have similar malocclusions.

Extraoral examination revealed a concave facial profile and a class III skeletal pattern. Patient also presented with potentially competent lips with a Jackson score of 3/0 at rest. Intraorally there were high labial frenal attachments and gingival recessions of teeth 31, 41 and 42 with resultant Grade I mobility involving the teeth 31 and 41. All the incisors had minor Ellis Class I trauma apart from teeth 41 and 42. Patient also had dental caries involving teeth 38, 47 and 48.

The lower arch showed an expanded lower arch anteriorly with severe asymmetric spacing of 11mm which was more on the right with resultant deviation of the lower midline to the left by 3mm. There was

distolabial rotation of teeth 41 and 42 in addition to distal and labial tilting involving teeth 31, 41 and 42. The mandibular buccal segment showed only 1mm spacing on the right and left. The maxillary arch also revealed severe spacing of 9mm with a midline diastema of 6mm. There was also distal tilting of all the maxillary incisors and distolabial rotation of the centrals. In occlusion, patient was found to have class III incisor relationship and a negative overjet of 5mm with an anterior crossbite extending from right canine to left canine. The molar relationship was also an Angle's class III subdivision left.

Panoramic radiograph showed that patient has all compliment of teeth apart from the maxillary right second molar. The periapical radiograph of the mandibular anterior segment suggested a bone loss that affected the upper third of the roots of incisor teeth. Lateral cephalometric radiograph suggested that the patient's problem maybe due to a horizontal growth pattern as evidenced by Frankfurt mandibular plane angle of 19° (24-26°) and a Y axis angle of 51° (53-66°). The skeletal base was found to be a class III due to ANB of -8° (2-4°) and supported by Witt's of -11mm (+2mm to -2mm). The mandibular skeletal base appeared to be prognathic with SNB value of 91°

(82.7° ± 3°) while the maxillary skeletal base was orthognathic, with SNA value of 83° (85.5° ± 3.5°). In contrast with the skeletal base assessment, the maxillary incisors were proclined with UI/FP of 136° (119-127°) while the mandibular incisor appeared normal with LI/MP of 103° (96-104°).

A multidisciplinary assessment by the Orthodontists, Periodontist, Endodontist and Conservative dentists made a diagnosis of Angle's class III subdivision left malocclusion on skeletal pattern 3 complicated by reverse overjet of (-) 5mm, crossbite of 11, 12, 13, 21, 22 and 23, severe lower anterior spacing of 11 mm, severe upper anterior spacing of 9 mm with mid line diastema of 6mm, mild lower posterior spacing of 1 mm on the right and left, expanded anterior segment of the lower arch, anterior resting position of the tongue and a tongue sucking habit, rotations of teeth 11, 13, 21, 32, 41 and 42, distal tilting 11, 12, 21, 22, 41 and 42, potentially competent lips of 3/0, non-coincident dental midlines with lower deviated 3mm to the left, lisping speech, dental caries of 38, 47 and 48, Ellis class I trauma involving teeth 11, 12, 21, 22, 31 and 32, gingival recession of 31, 41 and 42, Grade I mobility of 31 and 41



Figure 1: Pretreatment Extraoral photographs



Figure 2: Pretreatment intraoral photographs



Figure 3: Pretreatment study models

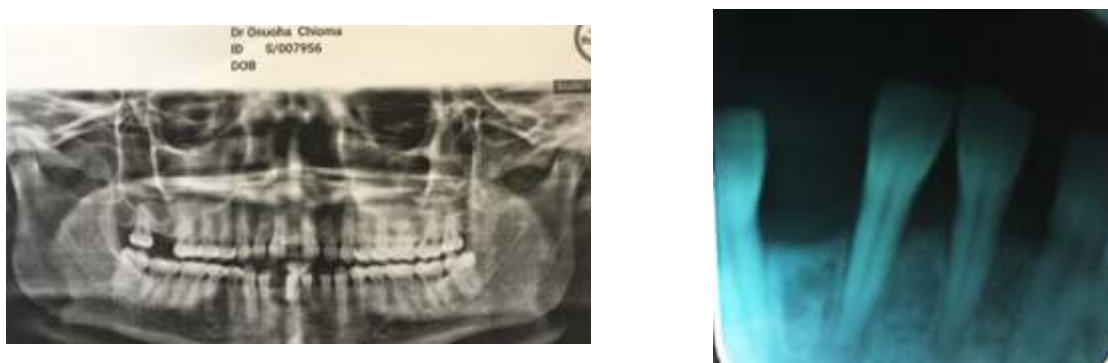


Figure 4: Pretreatment dental panoramic and periapical radiographs



Parameter	Pretreatment values	Ref value
UL- E plane	-2mm	3.21 ± 2.69
LL- E plane	+3mm	6.76 ± 2.83
Nasolabial angle	73°	84.35° ± 13.71°
H angle	17°	7°-15°
Z angle	74°	71°-89°

Figure 5: Pretreatment lateral cephalometric analysis

Treatment objectives

The treatment objectives were to: a) to correct and improve on the antero-posterior relationship, b) improve the lower arch width, c) close-up the spaces in the upper and lower arches, d) to correct the rotated tilted teeth, e) to improve on the tongue habit and speech, f) to effectively retain the treatment outcome.

Management Protocol

The sequence and protocol adopted to manage this patient was a multidisciplinary approach which involved the following.

1. A comprehensive pre-orthodontic counselling to explain in details all the procedures, treatment options and timings that may be required in addition to all specialties that may be needed to achieve favourable treatment outcomes.
2. Referral to the Periodontist for general prophylaxis and instruction on hygiene. The periodontist would also assess the high labial frenal attachment to plan the timing for intervention and assess periodontal health of periodontally involved teeth for fitness.
3. Referral to the conservative dentist for caries management of involved teeth and to lay down recurrence prevention plan. The conservative dentist was also expected to plan for the management of the multiple fractured teeth.
4. Referral to the endodontist to assess the endodontic health of the mobile mandibular central incisors with loss of periodontal support. This is to rule-out perio-endo-lesion and need for endodontic treatment.
5. Orthodontic management involves the use of full upper and lower fixed orthodontic appliance (standard preadjusted edgewise Roth .022 x .028- in-

slot prescription) with incorporated fixed tongue rake.

6. Effective retention plan involving upper and lower fixed lingual retention and an upper Hawley's retainer with incorporated tongue rake.

Treatment progress

While there is mention here of some of the important mechanics used in this case management, note that the complete treatment progress is presented on Table 2. At the start of orthodontic management, there was need to counter the force of the tongue and to revert the crossbite, so in addition to the fixed habit breaker, anchorage was enhanced in the lower arch using a lace back to the canine ligature and bend back of the lower wire to forestall any labial pulling force. On the second visit minimal force is added to retract the lower anterior teeth, help correct the cross bite and improve/correct the class III molar relationship. This was done using a unique elastic placement method that combines the effect of cross-elastics and class III elastics placement methods named **Class III-Cross-Elastics methods**. This method requires the placement of lingual buttons on the maxillary first premolars and hooks (Kobayashi ties) on the mandibular lateral incisors. Then inter-arch elastics was used to connect the lingual buttons on each maxillary first premolar to the corresponding hooks on the mandibular canine and lateral incisor. This was done on both the left and right sides. It achieved the objective within six weeks and was discontinued. In some cases, partial and interrupted power chains were used for space closure in addition to ligature ties for anchorage to reduce and resist unwanted excessive forces on the periodontally short-changed mandibular incisors.

Table 2: Treatment progression

Work Done	Time
-referral to restorative -referral to periodontist	
Set up U/L arches, U 012 NiTi + L 012 NiTi, Tongue rake, bend back lace back of the lower	DAY 1
U 014 NiTi + L 014 NiTi	1st Visit
U 016 NiTi + L 016 NiTi, Tongue rake damaged, lingual buttons placed on 14 and 24, bite pads on 36 and 46, class III/ cross elastics prescribed	2nd Visit
U 016 NiTi + L 016 NiTi, Tongue rake delivered, class III/ cross elastics cont'd	3rd Visit
U 018 NiTi + L 018 NiTi, Lingual buttons, bite pads on 36 and 46, class III/ cross elastics all discontinued	4th Visit
U 0.20 NiTi + L 0.020 NiTi	5th Visit

U 0.20 NiTi + L 0.020 NiTi, bend back, lace back of the lower discontinued	6th Visit
U 0.20 NiTi + L 0.020 NiTi, Tongue tamers used to replace tongue rake	7th Visit
U 019 x 025 NITI + L 019 x 025 NITI	8th Visit
U 019 x 025 SSW + L019 x 025 SSW, Ligature ties used away from residual spaces for e-chain	9th Visit
U 019 x 025 SSW + L019 x 025 SSW, Ligature & e-chain maintained	10th Visit
U 019 x 025 SSW + L019 x 025 SSW, Ligature & e-chain maintained	11th Visit
U 019 x 025 SSW + L019 x 025 SSW, Ligature & e-chain maintained	12th Visit
U 019 x 025 SSW + L016 NITI, Brackets rebounded 34 and 45	13th Visit
U 019 x 025 SSW + L019 x 025 NITI	14th Visit
U 019 x 025 SSW + L016 NITI, Brackets rebounded 35, 44 and 45	15th Visit
U 019 x 025 SSW + L019 x 025 NITI	16th Visit
U 019 x 025 SSW + L019 x 025 SSW, Ligature ties & e-chain maintained	17th Visit
U 019 x 025 SSW + L019 x 025 SSW, Ligature ties & e-chain maintained	18th Visit
U 016 NiTi + L 016 NiTi	19th Visit
Patient debonded + Retention	20th Visit



Figure 6a: Treatment progress photographs. Set-up



Figure 6b: Treatment progress photographs. Use of Class III-Cross-Elastic (inter-arch) method.



Figure 6c: Treatment progress photographs. Space closure using power-chains



Figure 6d: Treatment progress snap-shorts photographs.



Figure 7: Posttreatment Extraoral photographs



Figure 8: Posttreatment Intraoral photographs



Figure 9: Posttreatment study models



Figure 10: Posttreatment panoramic radiographs



MEASUREMEN	PRE-TREATMENT (°)	POST-TREATMENT (°)
T		
SNA	83°	85°
SNB	91°	90°
ANB	-8°	-5°
SKP	3	3
WITT	-11 mm	-10.8 mm
UI-FP	136°	126°
LI-MP	103°	85.5°
IIA	103°	130°
FMA	19°	18.5°
LFH	60%	59%

Parameter	Pretreatment values	Post treatment value	Ref value
UL- E plane	-2mm	-3mm	3.21 ± 2.69
LL- E plane	+3mm	+0mm	6.76 ± 2.83
Nasolabial angle	73°	95°	84.35° ± 13.71°
H angle	17°	12°	7°-15°
Z angle	74°	77°	71°-89°

Figure 11: Posttreatment lateral cephalometric analysis

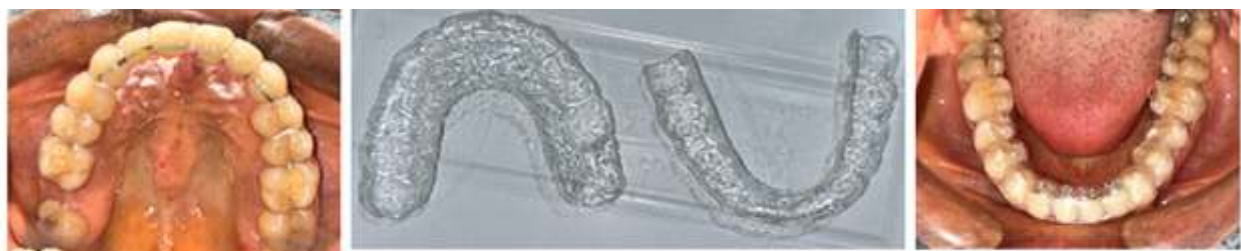


Figure 12: Posttreatment retention



Figure 13: Treatment outcome comparison

Discussion

Psychosocial impact of class III malocclusion, which may result from the compromised facial aesthetics, in addition to the functional disturbances, which is mostly proportional to the magnitude of the discrepancy in these class III malocclusion cases, motivates individuals to seek orthodontic correction.^{11,19} In this report the patient's complain was "I don't like the arrangement of my teeth and you cannot catch me smiling on camera", this means that aesthetic considerations was her major motivation factor.

The patient, a 35-year-old female has attained full maturity hence excluding the possibility of growth modification as a treatment option. The choice for orthodontic camouflage as against orthognathic surgery based orthodontic intervention was due to the patient's peculiar case assessment.

The patient's extraoral assessment revealed a concave facial profile that corresponds with the class III skeletal pattern on examination of the skeletal bases. The facial profile and skeletal pattern were confirmed by cephalometric analysis. The relative positions of the skeletal bases in relation to the base of the skull was markedly significant and consistent with a pattern III with ANB angle of -8° (2° to 4°) and supported by a markedly significant Witt's analysis of -11mm ($+2\text{mm}$ to -2mm). Separate assessment of the skeletal bases showed that maxillary skeletal base 83°

($85.5^{\circ} \pm 3.5^{\circ}$) was orthognathic while the mandibular skeletal base 91° ($82.7^{\circ} \pm 3^{\circ}$) was significantly prognathic. This prognathic mandible was supported by anterior or horizontal growth pattern of the mandible in addition to closed bite pattern and counter clockwise rotation of the jaws as affirmed by FMA, Y-Axis and Jarabak ratio results of 19° (24° - 26°), 51° (53° - 66°) and 68.5% (62% to 65%) respectively. This is consistent with a Skeletal classification type B and Dental Classification (Dewey) type C¹².

The above parameters have so far been consistent with classical Class III malocclusion, but when compensation of occlusion due to the malocclusion takes its course one expects the maxillary labial segment to be proclined and their mandibular counterpart to be retroclined. In this case while the maxillary anterior teeth proclination, 136° (119° to 127°) is in line with the expected dental compensation, the mandibular counterpart was normal, 103° (96° - 104°).

This patient's case was however complicated by severe labial segment spacing of 11mm on the mandible and 9mm on the maxilla. This may be as a result of the patient's tongue sucking habit that in this case has in addition to the horizontal and counter clockwise growth pattern resulted in a crossbite of all the anterior segment. This may also be accentuated by the high attachment of the maxillary and mandibular labial frena, which in addition to the

tongue habit has also resulted to gingival recession and grade I mobility of teeth.

The treatment for most borderline mild to moderate class III malocclusion was orthodontic camouflage. This is a procedure that in some cases selectively entails extraction some teeth (especially mandibular premolar teeth), class III elastics and TAD assisted distalization of the mandibular teeth.

Despite the convincing skeletal components of this patient's class III malocclusion, the excessive spacing recorded in the anterior segment of both arches, resulting in arch width discrepancies which was more prominent in the mandible, and possible aetiologic impact of the Tongue and labial frena, there was therefore need for a patient tailored treatment planning.

This case was treated as a multidisciplinary one in which the Conservative dentist, the Endodontist and the Periodontist helped to prepare the mouth for fixed appliance, ensure tissues are healthy enough for to receive treatment prepare the patient for multidisciplinary treatment to enhance aesthetic and retention plan.

At this point there may be need to update the classification of Class III malocclusion to not just include the aetiologic impact of the tongue function and size to this pathologic process²⁰ but to also include its management as part of procedures for effective management of Class III malocclusion

In this case the orthodontic treatment included the following;

1. Full upper and lower fixed orthodontic appliance (standard preadjusted edgewise Roth .022 x .028-in-slot prescription)
2. Incorporated fixed tongue rake.
3. Enhanced anchorage in the lower arch using a lace back to the canine ligature and bend back of the lower wire to retract the anterior segment
4. Inter-arch elastics in this case was done using a unique elastic placement method that combines

the effect of cross-elastics and class III elastics placement methods named **Class III-Cross-Elastics methods**.

In 25 weeks, which corresponds to the 20th visit of the patient, favourable results were achieved. The following were recorded

1. Improved psychosocial confidence
2. Reverse overjet/Anterior crossbite corrected
3. Closure of all Spaces
4. Expanded lower anterior arch segment was corrected
5. Alignment of dental midlines
6. Derotation of rotated teeth
7. Competent lips
8. Improved speech
9. Improved periodontal support

Conclusion

After 25 months of management, the patient was satisfied with the aesthetic and psychosocial outcomes of management. Retention was done with both fixed and ESSIX retainers on both arches. There may be need to update the classification of Class III malocclusion to not just include the aetiologic impact of the tongue function and size to this pathologic process²⁰ but to also include its management as part of procedures for effective management of Class III malocclusion. Further work should be encouraged on the use of Class III-Cross-Elastics placement technique.

Conflict of interest

The authors declare that they have no conflict of interest

Funding

No funding was received for this study

Authors' contributions

CEI conceptualized and wrote the study, while OCO and ESS reviewed the final draft.

References

1. Alhammadi, M. S., Halboub, E., Fayed, M. S., Labib, A. & El-Saaidi, C. Global distribution of malocclusion traits: a systematic review. *Dent. Press J. Orthod.* 23, 40.e41–40. e10 (2018).
2. Yemitan TA, Oyapero AO. Prevalence of malocclusion in Africa: A systematic review and meta-analysis. *Magna Scientia Adv Res Reviews.* 2022;05(01):030–5.
3. Aikins EA, Onyeaso CO. Prevalence of malocclusion and occlusal traits among adolescents and young adults in Rivers State, Nigeria. *Odontostomatol Trop.* 2014 Mar;37(145):5-12.
4. Ajayi E.O. Prevalence of malocclusion among school children in Benin city, Nigeria. *J Med Biomed Res.* 2008;7(1&2):58-65.

5. Da Costa O. O. The prevalence of malocclusion among a population of northern Nigeria school children. *West Afr J Med* 1999; 18: 91-6.
6. Sanu O.O. The Epidemiology of malocclusion in Nigerians of Yoruba ethnic group. F.W.A.C.S. Thesis, Lagos University Teaching Hospital, 1994
7. Adekoya MN, Ayedun OS, Adeyemi TE. The prevalence of Malocclusion in children between the age of 10-15 years in Calabar Metropolis, Cross Rivers. *West Afr J Med*. 2021 Nov 30;Vol. 38(11);1095-1100. PMID;34922409.
8. Perez-Varela JC, Campoy MD, Lopez-Villa M, et al. Management of skeletal class III discrepancies using temporary anchorage devices. *Clin cases rev biomed considerations Sem Orthod* 2024 Dec 30; (5):572–590
9. Tweed CH. *Clinical Orthodontics*. St Louis: Mosby; 1966:715–726.
10. Park, J. U. & Baik, S. H. Classification of Angle Class III malocclusion and its treatment modalities. *Int. J. Adult Orthodon. Orthognath. Surg.* 16, 19–29 (2001).
11. Sobral MC. Compensatory treatment of angle class III malocclusion with anterior open bite and mandibular asymmetry. *Dent Press J Orthod*. 2012;17(3):138-145.
12. Maruswamy K et al. Management of class III malocclusion - A review with report of four cases. *Ann Dent Spec*. 2018 Oct;6(4);464-71.
13. Saloni P, Isha SM, Merry A, Parveen A. Treatment of Adult class III Malocclusion with Orthodontic Camouflage. A 2 Case report. *J Dent. Oral. Biol.* 2023;8:1-7.
14. Troy BA, Shanker S, Fields HW, Vig K, Johnston W. Comparison of incisor inclination in patients with Class III malocclusion treated with orthognathic surgery or orthodontic camouflage. *A m J Orthod Dentofac Orthop*. 2009;135(2):146–7.
15. Sarangai H, Namdev R, Garg S, Saini N, Singhai P. Treatment modalities for early management of class III skeletal malocclusion: a case series. *Contemp clin dent*. 2020 Jan 1;11(1):91-6.
16. Carriere L. Nonsurgical correction of severe skeletal class III malocclusion. *J Clin Ortho*. 2016 April;50(4):216-30.
17. Baik HS. Limitations in orthopaedic and camouflage treatment for Class III malocclusion. *Sem Orthod*. 2007;13(3):158–74.
18. Liou EJ, Wang YC. Orthodontic clockwise rotation of maxillomandibular complex for improving facial profile in late teenagers with Class III malocclusion: A preliminary report. *APOS Trends Orthod* 2018;8:3-9.
19. Bittencourt MA. Early treatment of patient with Class III skeletal and dental patterns. *Dental Press J Orthod*. 2015;20(6):97–109.
20. Deshkar M, Thosar NR, Kabra SP, Yeluri R, Rathi NV. The fluence of the tongue on the development of dental malocclusion. *Cureus*. 2024 may 29;16(5):e61281. Doi:107759/cureus.61281. PMID 38947580; PMID: PMC11211712.

