WEST AFRICAN JOURNAL OF ORTHODONTICS

Print ISSN: 2315-9634
E-ISSN: 3141-5822

VOLUME 12, NUMBER 1

JUNE 2023

Artificial Intelligence in Orthodontics

Knowledge and Practice of Oral Habits in Children

Orthodontic Bond Failure Rate using Light Cure Adhesive

Multidisciplinary Management of a Class III Malocclusion

The Spontaneous Correction of Anterior Crossbite

OFFICIAL PUBLICATION OF ORTHODONTIC ASSOCIATIONS IN THE WEST AFRICAN SUB-REGION
"DENTISTRY'S FIRST SPECIALTY JOURNAL IN SUB SAHARAN AFRICA"

West African Journal of Orthodontics

Website: www.nao-ng.com

West African Journal of Orthodontics

Contents

Original Articles

Instructions for Authors

CONTENTS

Artificial Intelligence in Orthodontics

Ernest MA[a], Traore-Shumbusho A[b]

Abstract

Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks that would typically require human intelligence.

In recent years, the integration of artificial intelligence (AI) in orthodontic practice has revolutionized the way orthodontists diagnose, plan treatments, and monitor progress, leading to more efficient and accurate outcomes. AI is being applied in the evolution of Intelligent Aligner Systems, Robot-Assisted Orthodontics, AI-Enhanced Bracket Placement, Adaptive Orthodontic appliances and others.

AI plays a crucial role in improving patient communication and engagement by assisting orthodontists in creating interactive treatment simulations and visualizing potential treatment outcomes. This empowers patients to make informed decisions about their treatment options and fosters a stronger doctor-patient relationship.

There is the need for ethical considerations such as: Patient Data Privacy and Confidentiality, Informed Consent, Accountability and Responsibility and Regulatory Compliance as AI technology is embraced.

The limitations of AI include the need for large datasets, lack of interpretability, limited incorporation of subjective factors, and ethical considerations. In Nigeria, the challenges of constant power outage, rising inflation, lack of good internet connectivity and lack of regulatory compliance compound these challenges.

In conclusion, the integration of AI into orthodontic practice holds immense potential for enhancing treatment outcomes, improving efficiency, and strengthening patient engagement. The decision to embrace AI technology is not just a choice but a necessity for orthodontists and trainees who strive to deliver the highest quality of care to their patients.

Keywords: Artificial Intelligence, Orthodontics

Authors' affiliations

[a]Department of Dentistry, University of Ilorin Teaching Hospital, Ilorin, Kwara State

[b]Smile 360 Dental Specialists, Ikoyi, Lagos

Correspondence:

Ernest M. A.

Department of Dentistry,

University of Ilorin Teaching Hospital, Ilorin, Kwara State

Email: moni.ernest@yahoo.com

ORIGINAL ARTICLE

Introduction

Artificial intelligence is the ability of machines to work like humans. AI has been defined as the ability of a computer to perform tasks intelligently, equivalent to a human being, incorporating understanding and processing language with reasoning skills and problem-solving ability.[1] It is a subfield of computer science that refers to the ability of a machine to imitate the cognitive functions of human intelligence.

Artificial Intelligence (AI) in orthodontics has reached a pivotal juncture, where it is revolutionizing treatment planning. AI-driven software is emerging as a game-changer for orthodontists by significantly enhancing their ability to design individualized treatment plans. This transformative technology considers a multitude of crucial factors such as tooth movement, occlusion, and aesthetics, resulting in treatment plans that are not only more efficient but also tailored to the unique needs of each patient[2]. With the advent of AI, the days are gone of one-size-fits-all orthodontic approaches.

Malocclusion is considered the world's third most prevalent oral disease, and nearly 30% of the population presents with a great need for orthodontic treatment. [3,4] Clinical orthodontic practice often requires a significant amount of time to conduct various analyses that necessitate the extensive clinical experience of orthodontists. These workloads have affected the efficiency of clinical orthodontic practice. A series of studies have shown that AI can significantly enhance the efficiency of clinical orthodontic practice. Several commercially available AI-driven software (3Shape Dental System 2.22.0.0, Uceph 4.2.1, Mastro 3D V6.0 etc.) programs have found widespread applications in orthodontic care19. With the ongoing advancement

of AI algorithms, computing capabilities and the growing availability of datasets, the scope of AI applications in orthodontics is expanding, accompanied by continuous performance improvement.

A New Era

In the digital dentistry era, new tools, algorithms, data science approaches, and computer applications are available to researchers and clinicians. However, there is a strong need for better knowledge and understanding of multisource data applications, including three-dimensional imaging information such as cone-beam computed tomography images and digital dental models for multidisciplinary cases .[3]

The clinician needs to plan the treatment based on state-of-the-art diagnosis for better and more personalized treatment. The tools and approaches presented are toward personalized treatment and better prognosis, following the path to a more automated clinical decision-making system based on multisource three-dimensional data, artificial intelligence models, and digital planning.[4] In summary, the orthodontist needs to analyze each patient individually and use different software or tools that better fit their practice, allowing efficient treatment planning and satisfactory results with an adequate prognosis.[5]

Among the most noteworthy advancements over the past decade are the establishment of universal aesthetic rules and guidelines based on the assessment of natural aesthetic parameters, anatomy, and physiognomy; the development of tooth whitening and advanced restorative as well as prosthetic materials and techniques, supported by the pioneering discovery of dental adhesion[6] the significant progress in orthodontics and periodontal as well as oral and maxillofacial surgery; and, most recently, the implementation of digital technologies in the 3-dimensional planning and realization of truly natural, individual, and aesthetic smiles.

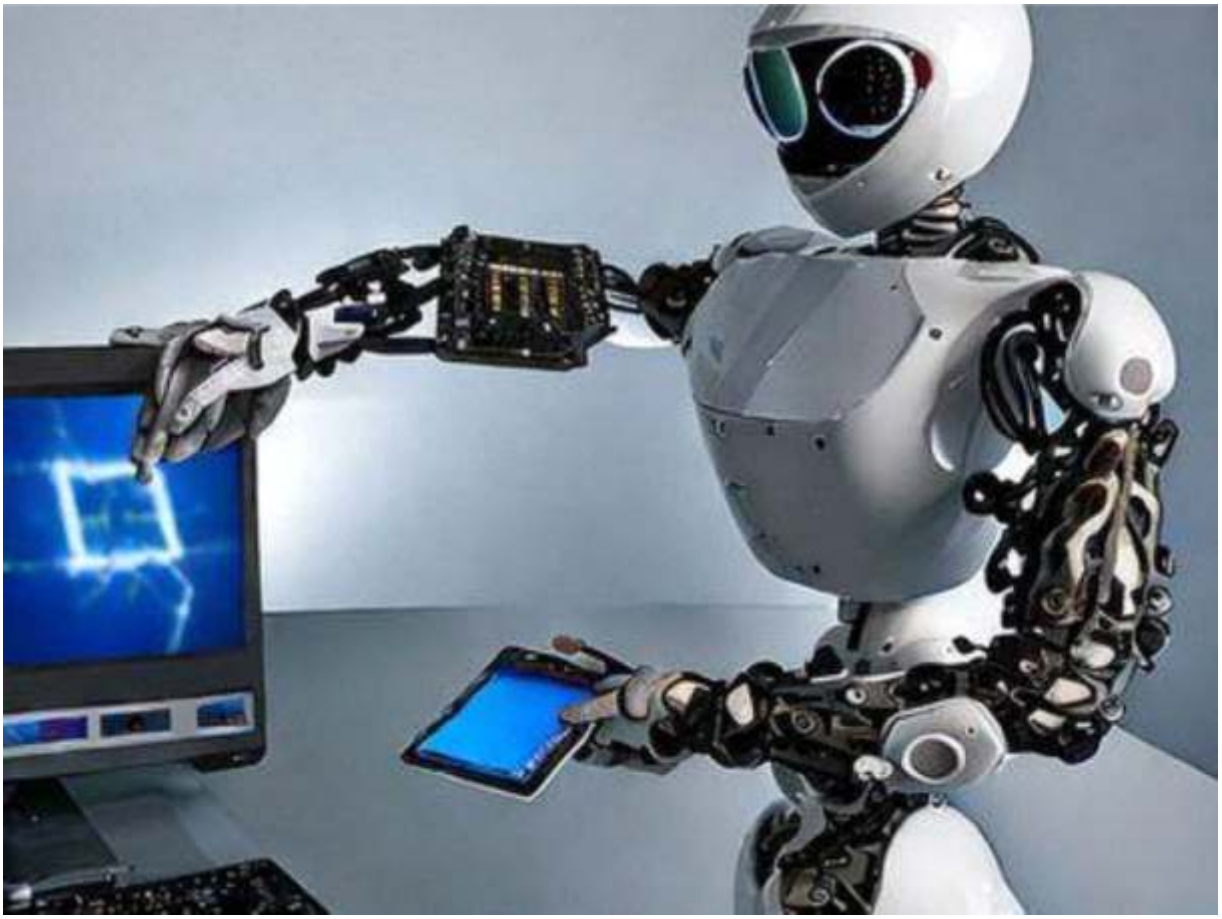

Figure 1

Applications of Artificial Intelligence

AI in Orthodontic Diagnosis

A satisfactory orthodontic diagnosis relies on a series of analyses , like cephalometric analysis, dental analysis, facial analysis, skeletal maturation determination and upper-airway obstruction assessment, to comprehensively evaluate patients' overall profile, including their facial profile, dental and skeletal relationship, skeletal maturation stages and upper-airway patency.[2] Automated Image Analysis and Computer-Aided Diagnosis are also included.

AI in the identification of anatomical /pathological structures and decision support for extraction.

One of the most remarkable aspects of AI in orthodontics is its capacity to generate highly detailed virtual models of patients' dental anatomy. These 3D virtual models serve as invaluable tools for orthodontists and their patients alike. Orthodontists can use these models to meticulously analyze and predict the outcomes of orthodontic treatment, providing a visual representation of the proposed changes.[6] This enhances the communication between orthodontists and their patients, enabling them to have a clearer understanding of the treatment process and expected results. Patients can now embark on their orthodontic journeys with a more informed perspective, fostering a sense of partnership and trust with their orthodontists. In orthodontics, expert systems and machine learning have aided clinicians in making complex, multifactorial decisions. The AI model showed an accuracy of 97.97% for extraction and non-extraction decision-making in borderline complex cases.[8]

AI in Cephalometric Analysis

One of the main uses of artificial intelligence in the field of orthodontics is automated cephalometric analysis. Evaluating whether developmental stages of a dentition, fixed orthodontic appliances or other dental appliances may affect the detection of cephalometric landmarks has been made easier and faster.[9]

Cephalometric analysis, especially landmarking on lateral cephalograms, serves as the foundation of orthodontic diagnosis, treatment planning and treatment outcome assessment. Conventional manual landmarking is time-consuming, experience-dependent and can be inconsistent within and across orthodontists, significantly affecting the efficiency and accuracy of clinical practice. Automated landmark detection was reported as early as the mid-1980s, but the error margin was too high to be implemented in clinical practice. In recent years, with the advancement of AI, numerous studies have been conducted using cephalometric analysis, the reproducibility, efficiency, and accuracy of which are continuously being enhanced Notably, cephalometric analysis has emerged as the most extensively explored domain of AI applications in orthodontics.

There have almost been no statistically significant differences between humans' gold standard and the AI's predictions. Differences between the two analyses do not seem to be clinically relevant. The AI algorithm can analyze unknown cephalometric X-rays at almost the same quality level as experienced human examiners (current gold standard). Cephalometric analysis is one of the first to successfully enable the implementation of AI into dentistry, in particular orthodontics, satisfying medical requirements.[10]

AI use in Aligner Technology

Artificial intelligence remote monitoring of clear aligner therapy has recently gained popularity. It uses deep learning algorithms on a patient's mobile smartphone to determine readiness to progress to the next aligner and identify areas in which the teeth are not tracking with the clear aligners.[11]

Dental Analysis

In orthodontic clinical practice, the utilization of intraoral photographs and orthodontic study models is imperative for dental analysis. These examinations provide clinicians with comprehensive information regarding various aspects, including molar relationships, tooth crowding, dental arch width, overjet and overbite, and oral health status. However, the manual analysis of these examinations is both time-consuming and labour-intensive. Consequently, there is potential for AI to replace human involvement in this analysis. Talaat et al. utilized the YOLO algorithm to detect malocclusion (specifically tooth crowding or spacing, abnormal overjet or overbite, and crossbite) from intraoral photographs. The results showed an exceptional accuracy rate of 99.99% .[12] The development of digital technology has significantly facilitated the adoption of 3D intraoral

scanner images and digital dental models in clinical practice. Some companies, such as Invisalign (Align Technology, Santa Clara, CA, USA), have effectively utilized 3D oral scan data and digital models for automated measurement and analysis.

Facial Analysis

Facial photographs play a pivotal role in evaluating facial asymmetry and proportions. Overall, automated facial analysis is still in its early stages and requires further research to improve its accuracy and applications.

The determination of patients' growth spurt is critical for orthodontic treatment, especially for those that need functional and orthopaedics treatment. Hand–wrist X-rays have been regarded as the most conventional and accurate way to determine skeletal age. In recent years, several studies have reported combining AI with hand–wrist radiographs to predict skeletal age. Several research studies have revealed that the cervical vertebral maturation (CVM) method is also effective for growth estimation and highly correlates with the hand–wrist radiograph method.

Upper-Airway Obstruction Assessment

Skeletal deformity and airway obstruction mutually influence each other. Upper-airway obstruction can alter breathing, which can affect the normal development of craniofacial structures and potentially lead to malocclusion and other craniofacial abnormalities. Screening the presence of upper-airway obstruction, especially adenoid hypertrophy, is critical for orthodontic diagnosis and treatment planning. Detecting adenoid hypertrophy based on lateral cephalograms has been proven to be highly accurate and reliable.

Decision Making for Extractions

Currently, there is no absolute standardized formula for extraction diagnosis and patterns, and the decision depends, to some extent, on the orthodontists' experience. A wrong decision about extraction could cause a series of irreversible problems like an unfavourable profile, improper occlusion and extraction-space closure difficulties. AI can contribute to reducing the likelihood of incorrect tooth extraction protocols.

Decision Making for Orthognathic Surgery

Overall, AI has made some progress in decision-making for orthognathic surgery. However, there is still a need for further improvement in incorporating a more comprehensive type of cases, especially more borderline cases, which holds the promise of enhancing AI's diagnostic capabilities.

Treatment Outcome Prediction

Predicting treatment outcomes can help orthodontists analyze and treat malocclusions more scientifically, reducing potential risks and complications during and after clinical treatment. Currently, AI can aid in predicting dental, skeletal and facial changes, as well as patients' experience of clear aligners, thereby guiding the treatment planning.

Orthodontic tooth setup, initially proposed by Kesling, enables the visualization of the treatment progress and final occlusion, but manual tasks like tooth segmentation and repositioning are labor-intensive.[13] With the continuous advancements of digital orthodontics and artificial intelligence, automated virtual setups have been widely applied, especially in the field of clear aligners.

Prediction of Treatment Outcomes

In conclusion, the use of AI in orthodontic practice has revolutionized the prediction of treatment outcomes. By analyzing large datasets and training on thousands of cases, AI algorithms can accurately predict how a patient's teeth will move and align during treatment. This enables orthodontists to tailor treatment plans to individual patients and anticipate potential complications. Furthermore, AI can assist in treatment planning by simulating different scenarios and predicting their outcomes, allowing orthodontists to select the most effective treatment strategies. As AI continues to advance, orthodontists can expect even more precise and personalized predictions, leading to improved patient outcomes and satisfaction.

Virtual Treatment Planning

Virtual treatment planning refers to the utilization of AI algorithms and technologies to simulate and predict the outcomes of orthodontic treatments. By inputting patient data such as dental impressions, radiographs, and facial photographs into computer software, orthodontists can generate a three-dimensional model of the patient's dentition. This virtual model allows them to visualize and manipulate various treatment scenarios, making it an invaluable tool for treatment planning. Orthodontic treatment requires cautious decision-making

processes that are the cornerstone of a satisfactory treatment outcome, such as a tooth extraction plan and the possibility of surgical interventions. AI is expected to assist orthodontists, especially those inexperienced in making correct decisions.

The use of AI in virtual treatment planning offers several advantages to orthodontists. Firstly, it provides a more efficient and accurate means of treatment planning compared to traditional methods. With AI algorithms, orthodontists can assess the impact of different treatment options on tooth movement, occlusion, and facial aesthetics, thereby reducing the need for trial and error in real-world treatments.

Furthermore, virtual treatment planning allows orthodontists to involve their patients in the decision-making process. By visualizing the predicted treatment outcomes, patients can better understand the proposed treatment plan and provide their input. This shared decision-making approach improves patient satisfaction and enhances treatment outcomes.

Another significant benefit of virtual treatment planning is its ability to streamline communication among the orthodontic team. With a virtual model, orthodontists can collaborate with other specialists, such as oral surgeons or prosthodontists, to develop comprehensive treatment plans. This multidisciplinary approach ensures that all aspects of the patient's oral health are considered, leading to more successful outcomes.

Virtual treatment planning is not intended to replace the expertise of orthodontists. Rather, it serves as a powerful adjunct tool that enhances their clinical skills and decision-making abilities. Orthodontists should understand the limitations of AI and interpret the results of virtual treatment planning in the context of their clinical expertise and patient needs.

Virtual treatment planning represents a significant milestone in the use of AI in orthodontic practice. By harnessing the power of AI algorithms, orthodontists can optimize treatment planning, engage patients in the decision-making process, and improve interdisciplinary communication. This can elevate orthodontic practice to new heights, benefiting both specialists and trainees in delivering effective and personalized orthodontic care.

Remote Care

Remotely tracks treatment progress and provides timely feedback based on photos or oral scans of the dentition, avoiding unnecessary visits and bringing flexibility and convenience to patients.

Clinical Documentation

Clinical photos and radiographs are routinely taken for diagnosis and treatment planning. AI can aid in classifying and categorizing these images, thereby enhancing the efficiency of clinical practice.

AI in Patient Management

AI is significantly improving patient engagement and compliance. AI-powered apps and virtual assistants have emerged as effective educational tools. These digital companions empower patients by educating them about their orthodontic treatment, its various aspects, and the importance of compliance with prescribed protocols. Furthermore, they provide automated reminders for appointments and home care routines, ensuring that patients remain on track with their treatment plans.[8] This proactive approach to patient engagement has shown promising results, as patients are more likely to adhere to their treatment regimens, leading to better treatment outcomes.

AI in Administrative Process in Orthodontics

AI's impact extends into the administrative sphere of orthodontic practices. Various administrative tasks have been automated, such as appointment scheduling and record-keeping, thereby streamlining the practice's daily operations. This enhances efficiency and also frees up valuable time for orthodontists and their staff to focus on providing high-quality patient care.

AI in Mini Implant Placement

AI systems have shown high accuracy for palatal segmentation and thickness measurement, which is helpful for the determination of available sites and the design of a surgical guide for palatal orthodontic mini implants.[14]

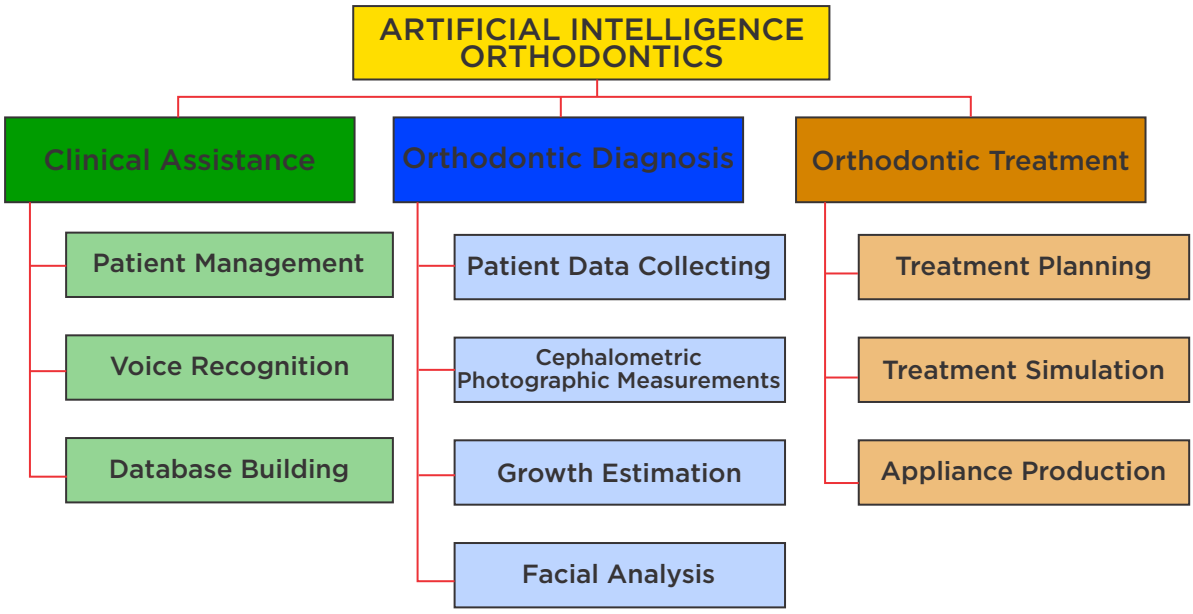

Figure 2: A review of the use of artificial intelligence in orthodontics.

Limitations And Future Perspectives

Currently, AI excels mostly in Orthodontic diagnosis, yet it has limited guidance on the treatment process. Orthodontists may encounter various challenges throughout the entire Orthodontic treatment while correcting deep bites and avoiding bone dehiscence or fenestrations. Using AI to aid in preventing these issues could be a potential area for future development. As clinical data continues to grow and AI computing power improves, there is no doubt that AI will significantly advance the field of Orthodontics. In conclusion, while AI has the potential to revolutionize orthodontic practice, it also has its limitations. The need for large datasets, lack of interpretability, scarcity and low generalizability, no standardization of studies and study design for comparisons, limited incorporation of subjective factors, and ethical considerations are some of the challenges that orthodontists need to be aware of when utilizing AI in their practice. By understanding these limitations, orthodontists can harness the benefits of AI while making informed decisions and providing the best possible care to their patients.

Conclusion

There is growing interest worldwide in AI, Nigeria inclusive. It is a rapidly advancing modality in Orthodontics which is enhancing patient care and management. Soon, AI will become an integral part of Orthodontic analysis and treatment planning. AI can offer many benefits for healthcare in Nigeria, such as: Improving the quality and accuracy of diagnosis and treatment by using data-driven and evidence-based methods. And reducing the cost and time of healthcare delivery by automating tasks and optimizing processes.

References

1. Kulikowski, C.A. An Opening Chapter of the First Generation of Artificial Intelligence in Medicine: The First Rutgers AIM Workshop, June 1975. Yearb. Med. Inform. 2015, 10, 227–233.
2. Siddiqui, T. A., Sukhia, R. H., & Ghandhi, D. Artificial intelligence in dentistry, orthodontics, and Orthognathic surgery: A literature review. JPMA. The J Pakis Med. Assoc., 2022;*72* (2), S91–S96.
3. Cenzato N., Nobili A., Maspero C. Prevalence of Dental Malocclusions in Different Geographical Areas: Scoping Review. Dent. J. 2021;9:117.
4. Borzabadi-Farahani A., Borzabadi-Farahani A., Eslamipour F. The relationship between the ICON index and the dental and aesthetic components of the IOTN index. World J. Orthod. 2010; 11:43–48.
5. Bianchi, J., Mendonca, G., Gillot, M., Oh, H., Park, J., Turkestani, N. Al, Gurgel, M., & Cevidanes, L. Three-dimensional digital

applications for implant space planning in orthodontics: A narrative review. J World Fed Orthod. 2022, 11(6):207-215.
6. Shimizu Y, Tanikawa C, Kajiwara T, Nagahara H, Yamashiro T. The validation of orthodontic artificial intelligence systems that perform orthodontic diagnoses and treatment planning. Eur J Orthod. 2022.16;44(4):436-444.
7. William R. Proffit, Henry Fields, Brent Larson, David M. Sarver. Contemporary Orthodontics.2018, 6th Edition.2 ISBN: 9780323543873.eBook ISBN: 9780323543880
8. Kapoor, S., Shyagali, T. R., Kuraria, A., Gupta, A., Tiwari, A., & Goyal, P. An artificial neural network approach for rational decision-making in borderline orthodontic cases: A preliminary analytical observational in silico study. J. Orthod. 2023 *50*(4) 439–448.
9. Subramanian, A. K., Chen, Y., Almalki, A., Sivamurthy, G., & Kafle, D. Cephalometric Analysis in Orthodontics Using Artificial Intelligence-A Comprehensive Review. BioMed Res. Inter., 2022,
10. Kunz, F., Stellzig-Eisenhauer, A., Zeman, F., & Boldt, J. Artificial intelligence in orthodontics : Evaluation of a fully automated cephalometric analysis using a customized convolutional neural network. J. Orofac. Orthop 2020. 81(1), 52–68.
11. Ferlito T, Hsiou D, Hargett K, Herzog C, Bachour P, Katebi N, Tokede O, Larson B, Masoud MI. Assessment of artificial intelligence–based remote monitoring of clear aligner therapy: A prospective study. American Journal of Orthodontics and Dentofacial Orthopedics. 202. 1;164(2):194-200.
12. Liu, J.; Zhang, C.; Shan, Z. Application of Artificial Intelligence in Orthodontics: Current State and Future Perspectives. Healthcare 2023, 11(20), 2760
13. Harold D. Kesling. The diagnostic setup with consideration of the third dimension. Am. J Orthod. 1956, 42 (11), 740-748.
14. Tao, T., Zou, K., Jiang, R., He, K., He, X., Zhang, M., Wu, Z., Shen, X., Yuan, X., Lai, W., & Long, H. Artificial intelligence-assisted determination of available sites for palatal orthodontic mini-implants based on palatal thickness through CBCT. Orthod. & Craniofac. Res. 2023, *26*(3), 491–499.

Knowledge and Practice of Oral Habits in Children by Medical Practitioners at The Lagos State University Teaching Hospital

Bamgbose AL[a], Yemitan TA[a,b], Odunsi OY[a]

Abstract

Background: Oral habits existing beyond the age of 4 years are a major risk factor for malocclusion, which negatively impacts on the functional and psychosocial well-being of a child. The majority of these patients present first to a physician, which is why their ability to detect these habits and refer them to the orthodontist is crucial. The purpose of this study was to assess the knowledge and practice of medical practitioners at the Lagos State University Teaching Hospital (LASUTH) concerning oral habits in children.

Methods: A survey was conducted among medical resident doctors in LASUTH. Questionnaires were distributed through an online data collection platform. Data collected was analysed using SPSS IBM 2023.

Results: A majority of the respondents (57.8%) were unaware that malocclusions are more likely to develop in children with oral habits. Although 93.3% agreed that patients with oral habits should be referred to paediatric dentists, only 66.7% (n = 120) of the respondents referred their patients.

Conclusion: The results showed inadequate knowledge and practice concerning oral habits in children by medical practitioners. This highlighted the need to educate more medical practitioners about oral habits and their effects on occlusion.

Keywords: Knowledge, practice, medical practitioners, oral habits

Authors' Affiliations

[a]Department of Child Dental Health. Lagos State University Teaching Hospital,

[b]Department of Child Dental Health. Lagos State University College of Medicine.

Correspondence:

Bamgbose A. L.
Department of Child Dental Health,
Lagos State University Teaching Hospital, Ikeja, Lagos
Tel.: +2347011640341
E-mail:deoriike@gmail.com

ORIGINAL ARTICLE

Introduction

Oral habits are repetitive patterns of behaviour involving the oral cavity.[1] These are frequently encountered in dental practices and are regarded as a developmental trait until the age of 4.[2] Thereafter, the persistence of an oral habit may predispose to malocclusion which could negatively impact the morphology of the dentoalveolar structures as well the psychosocial well-being of the child.[3,4] These habits include activities such as digit sucking, tongue thrusting, mouth breathing, nail biting, lip sucking and bruxism.[2]

Malocclusion is an abnormal jaw relationship, it has been reported as the second most common dental issue encountered in children and adolescents.[5] It affects oral health, aesthetics, and functions such as mastication and speech. Medical practitioners play a vital role as the initial point of care for children and parents. Early diagnosis and referral by medical practitioners could improve the psychosocial well-being of the child as well as reduce the need for complex and costly orthodontic treatment later in life. Evaluation of the knowledge and practices of medical practitioners about oral habits could highlight their expertise in the identification and management of children with these habits.

Therefore, the aim of this study was to evaluate the knowledge and practice of medical practitioners in Lagos State University Teaching Hospital (LASUTH) about oral habits in children.

Materials and methods

The ethical approval for this study was obtained from the Health and Research Ethics Committee of LASUTH. It was a descriptive cross-sectional study carried out among medical resident doctors at Lagos State University Teaching Hospital (LASUTH). A total of 180 medical resident doctors were recruited for this study using convenience sampling. Consenting medical practitioners undergoing residency programs in LASUTH were included in this study. Dental resident doctors, allied health professionals, and non-consenting medical resident doctors were excluded from the study.

Data collection was done using anonymous electronic questionnaires on Google Forms shared via medical resident doctors' WhatsApp platform. Data collected included sociodemographic data, knowledge of oral habits and management of oral habits. Data was analysed using SPSS version 20 (IBM SPSS Inc., Chicago, IL, US).

Univariate analysis was done to determine the response rate, proportions and frequencies.

Results

A total of 228 medical professionals received electronic surveys via the WhatsApp platform, with a response rate of 78.89%. Of these, 57.8% were females while 42.2% were males. The respondents' sociodemographic characteristics are shown in Table 1.

Table 1: Socio-demographic characteristics of respondents

Variable	Frequency(n=180)	Percentage
Age group (Years)		
20-30	34	18.9
31-40	104	57.8
41-50	41	22.8
>50	1	0.6
Gender		
Female	104	57.8
Male	76	42.2
Marital		
Single	52	28.9
Married	125	69.4
Separated	3	1.7
Years of experience		
≤5	37	20.6
6-10	73	40.6
11-15	57	31.7
>16	11	6.1

Specialities		
Family medicine	26	14.4
Internal medicine	22	12.2
Obstetrics and Gynaecology	17	9.4
Paediatrics	16	8.8
Anaesthesia	15	8.3
Ophthalmology	11	6.1
Radiology	10	5.6
General Surgery	9	5.0
Psychiatry	6	3.3
Haematology	4	2.2
ENT	4	2.2
Community medicine	3	1.7
Oncology	3	1.7
Orthopaedics	3	1.7
Emergency medicine	2	1.1
Surgical Emergency	1	0.6
Pathology	1	0.6
Nephrology	1	0.6
Urology	1	0.6
Public Health	1	0.6
CTSU	1	0.6
Behavioural medicine	1	0.6

Concerning knowledge, respondents agreed that oral habits (42.3%), preterm and low birth weight (38.9%) as well as snoring and mouth breathing (45%) could predispose to malocclusion (Figure 1). Fewer respondents (33.3%) agreed that breastfeeding beyond six months may predispose to oral habits while 45% agreed that long-term bottle and breastfeeding may predispose to oral habits (Figure 1).

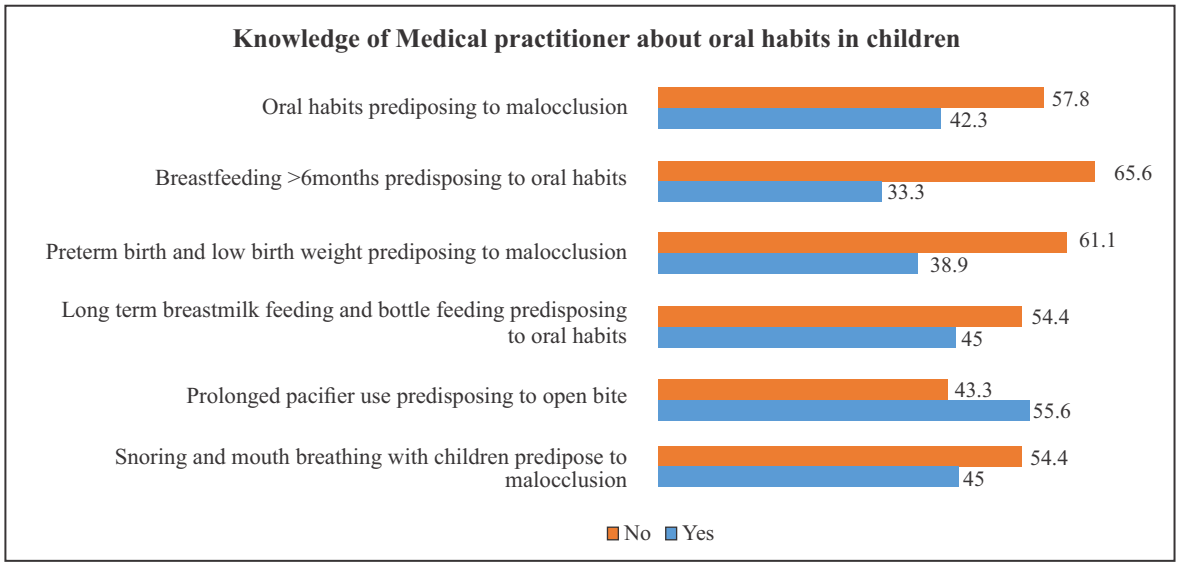

Figure 1: Respondents' knowledge of oral habits in children.

Figure 2 shows the results of the practice of medical practitioners towards oral habits in children. Few respondents evaluate their patients for oral functional habits (25%) and malocclusions (19.4%). However, the majority of respondents refer patients with malocclusion or oral habits to a paediatric dentist (66.7%).

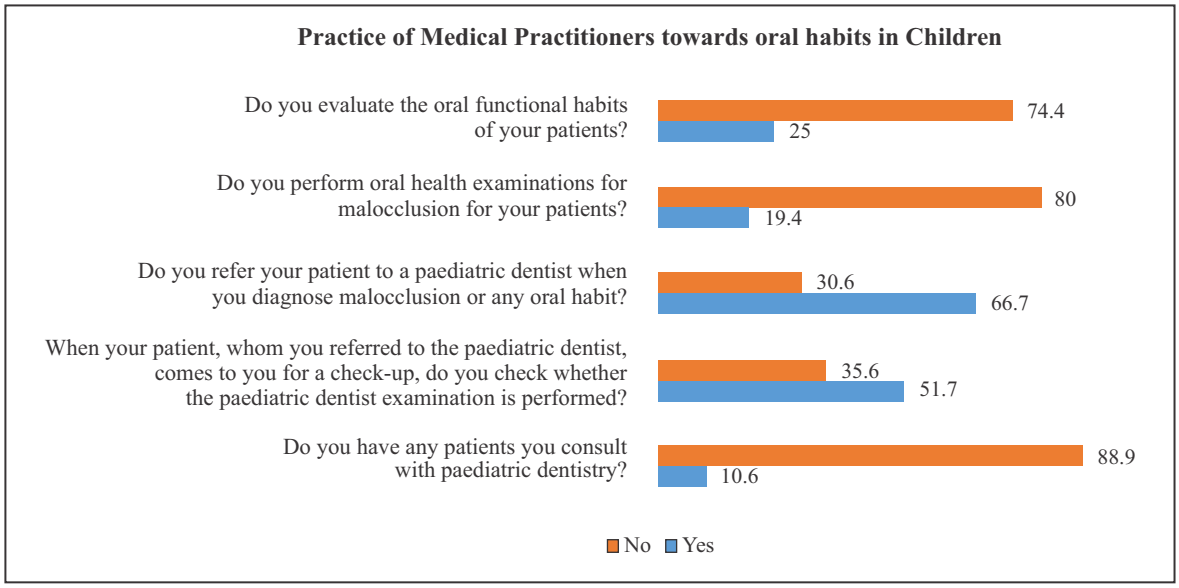

Figure 2: Respondents' practice about oral habits in children

Discussion

Oral health care and preventive education improve the chance for children to have a life free of oral disease; therefore, it is important that medical practitioners have a solid fundamental knowledge of oral habits to build good oral health-seeking behaviour in children and their caregivers, thus providing the patient with the necessary care he or she requires.[6]

This present study was carried out to assess the knowledge of medical practitioners across the different specialties in LASUTH about oral habits in children, as well as their practice towards these habits.

The present study highlighted variations in knowledge and practices among medical practitioners in LASUTH where this study was carried out. The results from this present study showed that the majority of respondents had no knowledge that oral habits such as snoring and mouth breathing and predisposing factors in children such as prolonged breastfeeding and bottle feeding, may cause the development of malocclusions in children. This is similar to findings reported by Maden et al[7] and Sharma et al[8] from their cross-sectional studies carried out among Turkish medical practitioners and Indian paediatricians respectively. Similarly, the majority were unaware that preterm birth and low birth weight may predispose to malocclusions. However, the majority of respondents in this present study agreed that prolonged pacifier use could predispose to the development of malocclusions such as open bite in agreement with findings reported by Maden et al.[7] The low level of knowledge may be attributed to a lack of oral health competencies in the education and training of medical practitioners.[10,11] The findings from this study revealed that the majority of respondents referred children with oral habits to the paediatric dentist consistent with findings reported by Maden et al[7] carried out in

Turkey amongst medical practitioners. However, this was contrary to findings in India reported by Kumar et al[12] from their cross-sectional study among paediatricians in India where 70% of respondents did not refer children with oral habits. This may be attributable to the variations in the population sampled and methods.

Fewer respondents routinely evaluated their patients for malocclusion and oral habits (Figure 2). This behaviour was reported in previous studies by Alshunaiber et al[13] and Di Giuseppe et al[14]. This poor tendency to diagnose malocclusion and oral habits and refer appropriately may be related to limited knowledge of orthodontics as a speciality, among medical specialties or lack of awareness of the impact of malocclusion on the health and general well-being of the patient.[12] However, another study reported by Indira et al[15] found the practice among paediatricians concerning oral habits to be high. These variations may be attributed to differences in the study populations and methods.

Conclusion

This study was able to demonstrate the knowledge gap among medical professionals on oral habits. The results showed poor knowledge and practice of medical practitioners towards oral habits in children. It is essential that medical practitioners who are more likely to see children much earlier than dentists are knowledgeable about the deleterious effects of oral habits.

Recommendations

1. Promote collaboration between medical practitioners and dentists in patient management for a more comprehensive approach.
2. Increase awareness and education among medical professionals about dental-related issues, their impacts, and the benefits of early detection and treatment. This can be achieved by integrating dental education into medical training programs.

Contribution to Authorship: All authors contributed equally to the manuscript.

Funding: Self funded

Conflict of Interest: No conflict of interest declared

References

1. Hoyte TA, Ali A, Bearn DR. A cross-sectional survey to ascertain the prevalence of oral habits among eleven to twelve-year-old children in Trinidad and Tobago. Pediatric Dental Journal. 2020;30:86-91.
2. Kharat S, Kharat SS, Thakkar P, Shetty RS, Pooja VK, Kaur RK. Oral habits and its relationship to malocclusion: A review. J Adv Med Dent Scie Res. 2014:123-6.
3. PS M, Achalli S, Chandragiri S, Shetty S. Management of Oral Parafunctional Habits: A Case Report. Journal of Health and Allied Sciences NU. 2023.
4. Warren JJ, Bishara SE, Steinbock KL, Yonezu T, Nowak AJ. Effects of oral habits duration on dental characteristics in the primary dentition. Journal of the American Dental Association 2001; 132:1685-93.
5. Kozhikode K. Oral Para-Functional Habits–A Hawk-Eye View. 2016.
6. American Academy of Pediatric Dentistry. Perinatal and infant oral health care. Pediatr Dent, 2017; 39: 208–212.
7. Maden E.A, Eker I. Pediatrician's knowledge, attitudes and practices on parafunctional oral habits and orthodontic problems in children. Clin Exp

Health Sci 2021; 11: 834-841

8. Rekha Sharma, Sushil Kumar, Anu Singla et al. Knowledge, attitude and practices of pediatricians regarding malocclusion in Haryana, India. Journal of Indian Association of Public Health Dentistry 2016;14:197.
9. Kohli N, Hugar S.M, Soneta S.P, et al. Assessment of perception about oral habits in children among healthcare professional: a cross-sectional study in Sri Lanka Journal of Child Health, 2022; 51: 196-203
10. Lewis CW, Grossman DC, Domoto PK, Deyo RA. The role of the pediatrician in the oral health of children: a national survey. Pediatrics. 2000;106: e84. doi: 10.1542/peds.106.6. e84. PMID: 11099627.
11. Wender EH, Bijur PE, Boyce WT. Pediatric residency training: ten years after the task force report. Pediatrics. 1992;90:876-80. PMID: 1437428.
12. Kumar V, Shivanna V, Kopuri RC. Knowledge and attitude of paediatricians toward digit sucking habit in children. Journal of Indian Society of Pedodontics and Preventive Dentistry 2019; 37:18-24.
13. Alshunaiber R, Alzaid H, Meaigel S, Aldeeri A, Adlan A. Early childhood caries and infant's oral health; pediatricians' and family physicians' practice, knowledge and attitude in Riyadh city, Saudi Arabia. Saudi Dent J 2019;31(Suppl):96-105.
14. Di Giuseppe G, Nobile CG, Marinelli A, Angelillo IF. Knowledge, attitude and practices of pediatricians regarding the prevention of oral diseases in Italy. BMC Public Health 2006;6:176
15. Indira M, Dhull KS, Nandlal B. Knowledge, Attitude and Practice toward Infant Oral Healthcare among the Pediatricians of Mysore: A Questionnaire Survey.Int J Clin Pediatr Dent 2015;8:211-214

Orthodontic Bond Failure Rate using Light Cure Adhesive in a Tertiary institution in North Central Nigeria.

Ernest MA[a], Adeyemi MF[b], Sanni-Abdullahi SO[a]

Abstract

Background: Orthodontic treatment involves many procedures including direct bonding of an orthodontic bracket to the tooth using a variety of techniques, including the acid etch technique. An orthodontic bracket bond failure is said to have occurred when the bracket attachment to the enamel surface of a tooth ceases to be attached by the adhesive bond.

The aims of this study were to determine the failure rate of Orthodontic brackets bonded using light-cure adhesive and to determine the effect of age and sex on bracket failure rate.

Methods: One hundred and one patients (101) made up of forty-one males and sixty females respectively (41 M, 60 F), with a mean age of 16.52 ± 8.32 years participated in the study, using an interviewer-administered questionnaire. A total of one thousand five hundred and twenty-six brackets were bonded by a single operator using light cure adhesive. Data was analyzed using frequency, percentage, mean statistics, t-test, correlation, and multiple linear regression analyses. A p-value of 0.05 or less was considered statistically significant.

Results: The orthodontic bond bracket failure rate was 10.2%. Age and sex were significant predictors of bracket failure rate (p-values of 0.001 and 0.013) respectively.

Conclusion: The bracket failure rate was similar to other studies. In this study, age and sex had a significant influence on the bracket failure rates of orthodontic brackets.

Keywords: Orthodontic bond, failure, light cure.

Authors' affiliations

[a] Department of Dentistry, University Of Ilorin Teaching Hospital Ilorin, Kwara State.

[b]Department of Dentistry, University Of Ilorin, Ilorin, Kwara State.

Correspondence:

Ernest M. A.

Department of Dentistry,

University of Ilorin Teaching Hospital, Ilorin, Kwara State

Email: moni.ernest@yahoo.com

ORIGINAL ARTICLE

Introduction

The first and most popular bonding resins introduced were the self-curing bonding Systems[1], which consisted of two-paste-mix self-curing polymeric resin adhesives, invented in the 1970s for direct bonding of attachments to etched enamel surface[2]. In 1975, the no-mix self-cure adhesive was invented, this eliminated the clumsiness of the mixing steps in the two-mix system[3]. The first single-paste ultraviolet light-curing adhesive was introduced in 1974, however, its use for orthodontic bonding was not first described until 1979[4]. The evolution of the light source has been from bulky, corded halogen curing lamps to lightweight, portable, light-emitting diodes (LED) lights.[5] Light-cure adhesives polymerize due to a reaction between the catalyst in the adhesive and the photon emitted by the light-curing source.

Orthodontic treatment involves the bonding of an orthodontic bracket to the tooth using a variety of techniques, including the acid etch technique. The bond should last till the end of treatment if all necessary factors are favourable. However, the major challenge of orthodontic bond failure is the negative impact of premature or unintentional debonding on the course of treatment[6]. In good clinical practice, orthodontic bond failure should not exceed 6%[7]. However, an incidence of 0.6 – 28.3% has been reported in a systematic review [8]. An orthodontic bracket bond failure is said to have occurred when the bracket attachment to the enamel surface of a tooth ceases to be attached by the adhesive bond[6]. Failure

of bonded Orthodontic brackets is relatively frequent and this has many negative consequences on the outcome and length of treatment.

Rebonding brackets prolong clinic hours as the orthodontist would have to follow specific protocol each time there is a bond failure[7,8,9]. The overall treatment time is also lengthened and this may also result in treatment fatigue[8,9]. In addition, enamel fracture can occur as a result of orthodontic bracket failure[10] Several reasons account for bracket failure among which are operator-related factors like the bonding technique, patient-related factors including age, sex, general level of cooperation and compliance with dietary and oral hygiene instructions [11,12,13] . There are also material-related factors like the type of etchant or adhesive used alongside the bracket properties[11.]

Previous studies across the world[7,14,15,16] had studied the failure rates of light-cure and self-cure adhesives, with varying reports, including that both adhesive types have different failure rates and some claim similar failure rates[15]. Bishara et al [17] also reported greater use of the light-cure adhesive than the Self-cure adhesive. Several efforts to reduce bracket failure have been geared towards improvement in bonding technique, bracket bases, and adhesive technology[14].

Although there has been much research by adhesive-manufacturing companies regarding new advancement in adhesive technology in order to reduce bond failure[13]. Still, clinical studies are necessary in order to assess other contributory factors[12,18.]

Previous studies have been carried out in other regions of Nigeria on orthodontic bond failure but none has been done in the North Central Region. One of the peculiarities of this region is that it is semi-urban and the indigenes still operate a strong cultural and traditional system that enforces treatment compliance on their children.

The aims of this study were to determine the failure rate of Orthodontic brackets bonded using light-cure adhesive and to determine the effect of age and sex on bracket failure rate.

Materials and methods

The study was carried out at the Dental Department of the University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria.

This was a retrospective study, in which data of patients who had fixed orthodontic treatment done between 2015 to 2020 were used. A total of 101 patients (41 M, 60 F) records were retrieved from the health record and data on age of patients, sex, number of teeth bonded, and the rate of orthodontic bracket failure after using light cure adhesives were collected. The bonding procedure was performed by the same clinician and all teeth were bonded using the light cure adhesive system. Ethical approval was given by the ethical committee and informed consent obtained from the patients. Patients who had completed their treatment where the only ones included the study.

Bonding with light cure adhesive system: The following standard bonding procedure was carried out. The teeth were isolated using gauze roll and cheek retractor. Brush applicator was used to apply 37% of Phosphoric acid gel to the enamel surface of each tooth and left for 15 seconds. After adequate etching, the teeth were rinsed with water and dried with oil-free compressed air, until the enamel surface appeared frosty white.

A thin layer of Light Bond adhesive primer (Reliance Orthodontic Product, Light Bond ™ Sealant) was then smeared onto the etched tooth surface with a different brush applicator. The Light Bond light-cure adhesive was syringed onto the bracket base and placed in position on the tooth surface. Excess resin was removed by running a dental probe around the base of the bracket. The resin was polymerized using the Pow Dec LED-curing light model WP10050E. The light source was brought as close to the bracket as possible, as was recommended by the manufacturer.

Post Set-up Instructions and Reviews: Verbal and written oral hygiene and care of appliance instructions were given to each participant. They were also given an Ortho Survival kit which contained a soft-bristled toothbrush, an interdental brush, dental floss, and orthodontic wax. They were instructed not to tamper with the appliance or manipulate it. Instructions were given on brushing their teeth with a fluoride-containing toothpaste after every meal. Patients were counselled to take soft diet during the duration of the treatment because hard, large, and sticky pieces of food (nuts, crisps, chunky

meat and chewing gum) may damage the appliance. In order to determine bracket failure**,** patients were recalled every six weeks for wires and elastic module changes. During each visit, elastic modules and archwires were removed, brackets were examined, and debonded brackets were documented.

Analysis of the data was carried out using descriptive statistics (frequency, percentage, mean, and standard deviation. Student T-test was used to compare the bracket failure rate among the various age categories. Multiple linear regression analysis was used to ascertain if age and sex were significant predictors of bracket failure rates. A p-value of 0.05 or less was considered statistically significant. Statistical Package of Social Science (SPSS)/Statistical Product for Service Solution (SPSS) version 22.0 was used to analyze the data generated.

Results

As shown in Table 1, the participants were mostly females 60 (59.41%) while the males were 41 (40.59%). The mean age of participants was 16 ± 8.32. More than half of the study participants were less than 20 years of age.

Table 1. Distribution of participants by gender and age groups

Variable	Frequency(n=180)	Percentage
Sex		
Male	41	40.59
Female	60	59.41
Age groups		
≤ 12	37	36.6
13 – 19	39	38.6
20 – 29	19	18.8
≥ 30	6	5.9
Mean ± SD	16 ± 8.3	
Age Range	27 – 50	

Table 2. Gender Comparison of bracket failure

Sex	Frequency (n= 101)	Percentage	Bonded Brackets	Broken Brackets	Percentage
Male	41	40.59	527	69	13.1
Female	60	59.41	999	86	8.6
Total	101	100.0	1526	155	10.2

p-value =0.013

There were more male participants with a high rate of bond failure compared to females. Out of the 1526 teeth bonded using light cure composite, 155 (10.2%) failed, as shown in Table 2.

Table 3. Comparison of bracket failure among the Age group

Age Group	Frequency (n= 101)	Percentage	Bonded Brackets	Broken Brackets	Percentage Failure rate
≤ 12	37	36.6	359	57	15.9
13 – 19	39	38.6	692	69	10.0
20 – 29	19	18.8	367	23	6.3
≥ 30	6	5.9	108	6	5.6
Total	101	100	1526	155	10.2

p-value = 0.001

This indicates that there was statistically significant difference between the age groups in relation to bracket failure. The failure rate was highest in the age group under 12 years and progressively decreased as the age increased as see in Table 3

Table 4. Distribution of the number of brackets broken based on gender

Total broken bracket	0	1	2	3	4	5	6	8	9	12	Total
Male	17	11	3	0	6	2	1	0	0	1	41
Total broken	**0**	**11**	**6**	**0**	**24**	**10**	**6**	**0**	**0**	**12**	**69**
Female	24	14	10	7	1	2	0	1	1	0	60
Total broken	**0**	**14**	**20**	**21**	**4**	**10**	**0**	**8**	**9**	**0**	**86**
Overall	0	25	26	21	28	20	6	8	9	12	155

In Table 4, seventeen (17) out of forty-one (41) patients did not break any brackets while twenty-four (24) out of sixty (60) female patients did not break any bracket at all.

Table 5. Distribution of the number of brackets broken based on age groups

Age groups	0	1	2	3	4	5	6	8	9	12	Total
≤ 12	18	7	3	3	3	1	1	0	0	1	
Broken	**0**	**7**	**6**	**9**	**12**	**5**	**6**	**0**	**0**	**12**	**57**
13 – 19	14	7	7	3	4	3	0	1	0	0	

Broken	**0**	**7**	**14**	**9**	**16**	**15**	**0**	**8**	**0**	**0**	**69**
20 – 29	7	9	1	1	0	0	0	0	1	0	
Broken	**0**	**9**	**2**	**3**	**0**	**0**	**0**	**0**	**9**	**0**	**23**
≥ 30	2	2	2	0	0	0	0	0	0	0	
Broken	**0**	**2**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**
Total broken	**0**	**25**	**26**	**21**	**28**	**20**	**6**	**8**	**9**	**12**	**155**

Table 5 shows the distribution of broken brackets according to age with age group 13-19 years having the greatest number of broken brackets followed by under 12 years age group though in percentage the group has the greatest percentage of broken brackets.

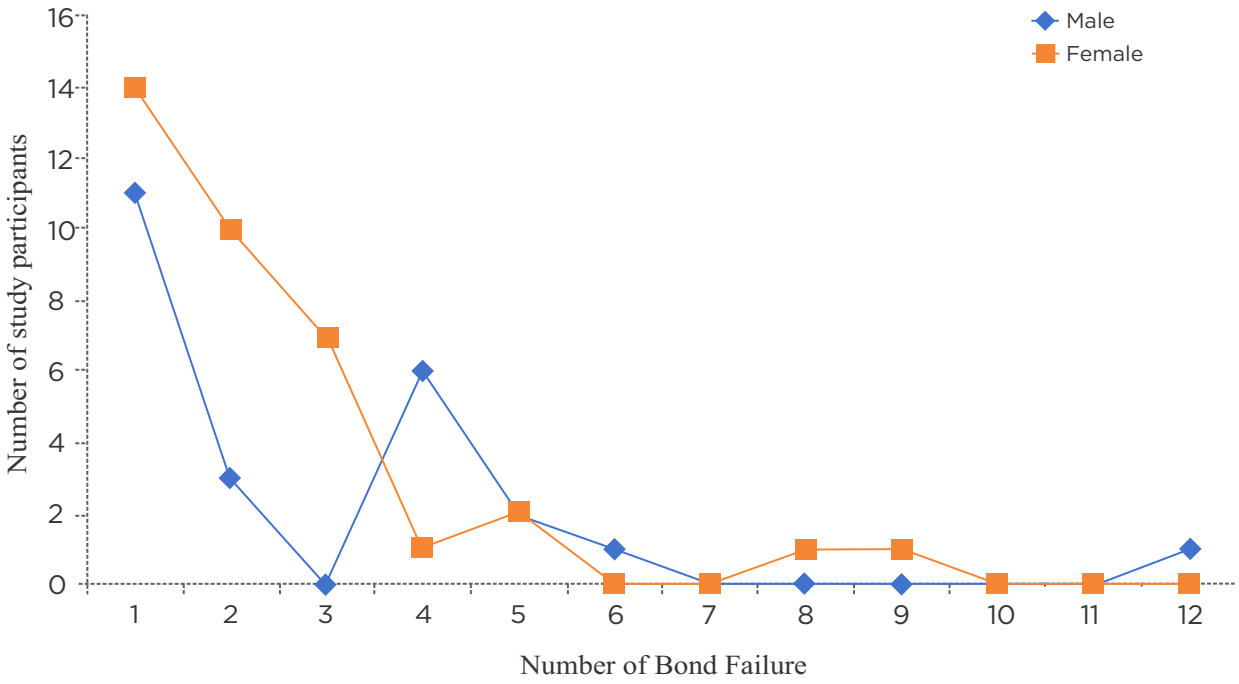

Figure 1: Number of bond failures based on gender. Females had lower bracket failure.

Table 6. Analysis of location of bond failure in male and female

Location Tooth Type	Gender Male (%)	 Female (%)	χ^2	p-value	Odd ratio	95 % C I
Upper right central incisor	6 (85.7)	1 (14.3)	6.350	**0.012**	10.114	1.169 – 87.519
Upper lateral Incisor	5 (62.5)	3 (37.5)	1.729	0.189	2.639	0.594 – 11.720
Upper right canine	2 (50.0)	2 (50.0)	0.153	0.696	1.487	0.201 – 11.006
Upper right first premolar	2 (50.0)	2 (50.0)	0.153	0.696	1.487	0.201 – 11.006

Upper right second premolar	9 (39.1)	14 (60.9)	0.026	0.871	0.924	0.357 – 2.392
Upper central left incisor	9 (69.2)	4 (30.8)	5.074	**0.024**	3.938	1.122 – 13.817
Upper left incisor	3 (50.0)	3 (50.0)	0.234	0.629	1.500	0.287 – 7.827
Upper left canine	2 (66.7)	1 (33.3)	0.873	0.351	3.026	0.265 – 34.516
Upper left first premolar	3 (42.9)	4 (57.1)	0.016	0.899	1.105	0.234 – 5.221
Upper left second premolar	8 (36.4)	14 (63.6)	0.209	0.648	0.797	0.300 – 2.116
Lower central right incisor	2 (40.0)	3 (60.0)	0.001	0.978	0.974	0.156 – 6.104
Lower lateral right incisor	3 (60.0)	2 (40.0)	0.821	0.365	2.289	0.365 – 14.349
Lower right canine	2 (40.0)	3 (60.0)	0.001	0.978	0.974	0.156 – 6.104
Lower right first premolar	1 (16.7)	5 (83.3)	1.514	0.218	0.275	0.031 – 2.446
Lower right second premolar	4 (23.5)	13 (76.5)	2.468	0.116	0.391	0.118 – 1.298
Lower central left incisor	3 (75.0)	1 (25.0)	2.044	0.153	4.658	0.467 – 46.440
Lower left lateral incisor	1 (25.0)	3 (75.0)	0.420	0.517	0.475	0.048 – 4.733
Lower left canine	2 (40.0)	3 (60.0)	0.001	0.978	0.974	0.156 – 6.104
Lower left first premolar	0 (0.0)	4 (100.0)	2.846	0.092	1.732	1.461 – 2.054
Lower left second premolar	2 (33.3)	4 (66.7)	0.139	0.709	0.718	0.125 – 4.115

Males have higher bond failure compared to female in brackets bonded on the upper right and left central incisors with a statistically P value of 0.012 and 0.024 respectively while in the posterior segment as seen in Table 6.

Table 7. Analysis of location of bond failure based on age

Location Tooth Type	Age Group < 20 (%)	 ≥ 20 (%)	χ^2	p-value	Odd ratio	95 % C I
Upper right central incisor	7 (100.0)	0 (0.0)	2.474	0.116	1.362	1.206 – 1.539
Upper lateral Incisor	8 (100.0)	0 (0.0)	2.858	0.091	1.368	1.209 – 1.547
Upper right canine	4 (100.0)	0 (0.0)	1.370	0.242	1.347	1.198 – 1.515
Upper right first premolar	4 (100.0)	0 (0.0)	1.370	0.242	1.347	1.198 – 1.515
Upper right second premolar	20 (87.0)	3 (13.0)	2.192	9.139	2.619	0.707 – 9.705
Upper central left incisor	11 (84.6)	2 (15.4)	0.703	0.402	1.946	0.401 – 9.448
Upper left incisor	6 (100.0)	0 (0.0)	2.098	0.147	1.357	1.203 – 1.530
Upper left canine	3 (100.0)	0 (0.0)	1.017	0.313	1.342	0.196 – 1.507
Upper left first premolar	5 (71.4)	2 (28.6)	0.059	0.808	0.810	0.147 – 4.459
Upper left second premolar	17 (77.3)	5 (22.7)	0.062	0.803	1.153	0.377 – 3.528
Lower central right incisor	4 (80.0)	1 (20.0)	0.064	0.801	1.333	0.142 – 12.518
Lower lateral right incisor	4 (80.0)	1 (20.0)	0.064	0.801	1.333	0.142 – 12.518
Lower right canine	5 (100.0)	0 (0.0)	1.730	0.188	1.352	1.201 – 1.523
Lower right first premolar	2 (33.3)	4 (66.7)	6.017	0.014	0.142	0.024 – 0.829
Lower right second premolar	11 (64.7)	6 (35.3)	1.220	0.269	0.536	0.175 – 1.640

Lower central left incisor	4 (100.0)	0 (0.0)	1.370	0.242	1.347	1.198 – 1.515
Lower left lateral incisor	3 (75.0)	1 (25.0)	0.001	0.991	0.986	0.098 – 9.933
Lower left canine	4 (80.0)	1 (20.0)	0.064	0.801	1.333	0.142 – 12.518
Lower left first premolar	3 (75.0)	1 (25.0)	0.001	0.991	0.986	0.098 – 9.933
Lower left second premolar	4 (66.7)	2 (33.3)	0.252	0.616	0.639	0.110 – 3.718

In Table 7, the brackets bonded on lower right first premolar in patients greater than age twenty have significantly higher bracket failure than patients lower than twenty years with a p-value of 0.014.

Discussion

The bracket failure rate using light-cure adhesive and a single practitioner over a 48-month period in this study was 10.2%. This is similar to that reported by Galindo et al[19] in which the failure rate was 11.3% after a study duration of eleven months. Le et al [20] had also reported a value of 11.3%. However, O'Brien et al [21] and Millet et al[22] reported a relatively much lower bracket failure rate, O'Brien et al[19] reported a failure rate of 3.9%, following a study duration that lasted through the entire treatment time while Millet et al[22] reported a failure rate of 6% over a 48-month study period. The lower value reported in the previous studies[19,20] may be as a result of dietary differences in individual societies, as African communities are known to have more abrasive diets which have also been reported to affect bond failure rate and the longer duration of the study period. The harder the diet, the higher the tendency for failure to occur. Although self-cure adhesive was not used in this study, Okeke et al[21] recorded a failure rate of 7.8%, which is similar to the finding by O'Brien et al[21] in which the self-cure adhesive was 7.5%. However, in a Nigeria-based study carried out in Lagos, South West, Moninuola et al[22] reported a higher failure rate of 24.1%. This higher value of the self-cure adhesive may be attributed to the longer study duration of 24 months.

In the present study, age and sex were found to be significant predictors of bracket failure rate. On the effect of age, there were more bracket failures in children and adolescents aged 7-19 years with a p-value of 0.001. There was a statistical difference between the age groups and bracket failure. This is in agreement with previous studies that reported a higher failure rate in younger age groups than in the adults.[20,23,24,25] This can be attributed to increased self-consciousness and self-motivation in adults while undergoing orthodontic treatment when compared to children and adolescents.[26,27] However, the finding of a more recent study,[28] the effect of sex on the failure rates of the light-cure bonded brackets was also investigated in the clinic study. In the present study, sex significantly affected the bracket failure rates, the failure rate in males was 13.1% while in females it was 8.6% with a p-value of 0.013.

Males were found in this study to break brackets in the upper central incisors compared to females,, and the lower right first premolar had a higher failure rate in the older age group.

This finding agrees with that of previous studies carried out in Nigeria[20,29,30] which reported that males have a higher failure rate for brackets. A Nigerian-based study by Moninuola and Ernest et al[24] reported the bracket failure rate in males as 26.2% and in females 23.4%. Aikins and Ututu[30] in a later study carried out at a tertiary health facility, reported a bracket failure rate of 81.2% for males and 69.2% for females. A similar finding has also been reported in a previous study in Europe[31] with males having a 2.4 times greater chance of bracket failure than females.

The reasons for the greater bracket failure rate in males may be the result of better oral hygiene exhibited by the females, including the fact that females tend to apply lighter masticatory forces than males.[24,32,33] Other possible explanations are that males engage more in physical activities which can predispose to traumatic bracket failure.[34] Males are also said to be involved in bad eating habits than females since they eat more junk food, which may contain hard food particles that may break off brackets.[35] Notwithstanding the findings, contradictory results have been reported in which females were reported as having more bracket failures.[19,24,26] This is similar to the report from several studies[27,31,32,33,34,36] which showed that sex was not a significant predictor of bracket failure rates.

A factor that could also be taken into consideration is the effect of a single practitioner bonding compared to multiple practitioners in bond failure. In a teaching hospital setting where registrars and consultants are involved in bonding brackets, there is greater possibility of higher failure rates.

Lastly, cultural and financial factors can improve patients compliance in following instructions that will prevent bracket failure. The population where the clinic is located is mainly of traditional settings in which parents exert great control and authority over their children to effect compliance. Many of the parents were struggling financially and could not cope with the cost of paying for broken brackets since they were still struggling with paying off the loan they incurred for the treatment. This may increase adherence to instructions and may also be a contributory factor to reduced incidence of bracket failure.

Conclusion

The bracket failure rate using light-cure adhesive was similar to other studies but lower compared to rates in Nigeria. Age and sex had significant influence on the bracket failure rates of orthodontic brackets.

Contribution to Authorship: All authors contributed equally to the manuscript.

Funding: Self funded

Conflict of Interest: No conflict of interest declared

References

1. Markovic E, Glisic B, Scepan I, Markovic D, Jokanovic V. Bond strength of orthodontic adhesives. Metal J Metall 2011; 14:78-88.
2. Manuel T, Raquel O, Estrella O, Alejandro R, Blanca H, Franklin G. Bond Strength of Orthodontic Brackets Using Different Light and Self-Curing Cements. Angle Orthod. 2003;73: 56-63.
3. Turkkahraman HT, Adanir N, Gungor AY, Alkis H. In vitro evaluation of shear bond strengths of colour-change adhesives Eur J Orthod. 2010; 32: 571–574.
4. Gange P. The evolution of bonding in orthodontics. Am J Orthod Dentofacial Orthop. 2015;147: 56-63.
5. Tavas MA, Watts DC. Bonding of orthodontic brackets by trans-illumination of a light activated composite: an in vitro study. Br J Orthod. 1979; 6:207–208.
6. Reis A, Santos JE, Loguercio AD, Bauer JRO. Eighteen-month bracket survival rate: conventional versus self-etch adhesive. Eur J Orthod. 2008; 30:94-99.
7. Brown K. The impact of bonding material on bracket failure. Vital. 2009;6 (4):28-30 doi:10.1038/vital1039.
8. Almosa N. Zafar H. Incidence of orthodontic brackets detachment during orthodontic treatment: a systematic review. Pakistan journal medical

sciences.2018:34(3):744-750.doi;10.12669/pjms.343.150012.
9. Natheer AR. Orthodontic bracket failure rate; a comparative clinical study between light-cured and chemically cured (no mix) bonding systems. J Bagh Coll. Dentistry 2012; 24:137-139.
10. Cook A. Curing lights–are you contributing to your bond failure rate? http://www.andreacookconsulting.com/newsletterarchives/201007/
Chen CS, Hsu ML, Chang KD, Kuang SH, Chen PT, Gung YW. "Failure analysis: enamel fracture after debonding orthodontic brackets," Angle Orthod. 2008; 6:1071–1077.
11. Aljubouri YD, Millett DT, Gilmour WH. Six and 12 months' evaluation of a self-etching primer versus two-stage etch and prime for orthodontic bonding: a randomized clinical trial. Eur J Orthod. 2004: 26:565–571.
12. Vasudevan A, Antony V, Francis P,Parayaruthottam P, Shaloob M, TP MH.Influence of Patient Attitude on Bracket FailureRate: A Prospective Study. J Ind Orthod Soc. 2021:1;1-7
13. Chen CS, Hsu ML, Chang KD, Kuang SH, Chen PT, Gung YW. "Failure analysis: enamel fracture after debonding orthodontic brackets," Angle Orthod. 2008; 6:1071–1077.
14. Krug AY, Canley RS. Shear bond strengths using an indirect technique with different light sources. J. Clin. Orthod. 2005; 39:485-487.
15. Newman GV, Synder WH, Wilson CE Jr. Acrylic adhesives for bonding attachments to tooth surfaces. Angle Orthod 1968; 38: 12-18.
16. Bherwani A, Fida M. Bond failure with a No- Mix Adhesive System. Angle Orthod. 2008;78:545-548.
17. Bishara SE, Laffoon JF, VonWald L, Warren J. The effect of repeated bonding on the shear bond strength of different orthodontic adhesives. Am J Orthod Dentofacial Orthop. 2002; 121: 521-525.
18. Trimpeneers LM, Dermaut LR. A clinical trial comparing the failure rates of two orthodontic bonding systems. Am J Orthod Dentofacial Orthop. 1996; 110:547-550.
19. Galindo HRA, Sadowsky PL, Vlachos CH, Jacobson A, Wallance D. An in-vitro comparison between a visible light-cured bonding system and a chemically cured bonding system. Am J Orthod Dent. Orthop. 1998; 113: 271-275.
20. Le PT, Weinstein M, Borislow AJ, Braitman LE. Bond failure and decalcification: A comparison of a cyanoacrylate and a composite resin bonding system in vivo. Am J Orthod Dent. Orthop. 2003; 123:624-627
21. O'Brien KD, Read MJF, Sandison RJ, Roberts CT. A visible light-activated direct bonding material: an in-vivo comparative study. Am J Orthod Dentofacial Orthop. 1989; 95: 348-351.
22. Millett DT, Hallgren A, Cattanach D, McFadzean R, Pattison I, Robertson M, Love J. A 5-year clinical review of bond failure with a light-cured resin adhesive. Angle Orthod. 1998; The Angle Orthodontist. Vol. 68 No. 4 1998. 355. Page 6.
23. Okeke AC1*, Folaranmi N2, Utomi IL3 Orthodontic Bracket Failure Rates in South-Eastern Nigeria ARC JDS. 2021; 6(1):29-36. DOI: https://doi.org/10.20431/2456-0030.0601005
24. Moninuola AE, daCosta OO, Isiekwe MC. A review of orthodontic bond failure using a chemical cure adhesive. Odontostomatol Trop 2010; 33:35-40.
25. Rachala MR, Yelampalli MR. Comparison of shear bond strength of orthodontic brackets bonded with light emitting diode (led). Int J Orthod Milwaukee. 2010; 21:31-35
26. Rasool G, Raza HA, Afzal F, Ijaz W, Shah SS. Frequency of bracket breakage and bond failure in patients undergoing fixed orthodontic treatment at Khyber College of Dentistry, Peshawar. Pak Oral Dent J 2013; 33:299-302.
27. Aikins EA, Ututu C. An audit of bonding failure among orthodontic patients in a tertiary hospital in South-South Nigeria. Int J Orthod R Millett DT, Gordon PH. A 5-year clinical review of bond failure with a no-mix adhesive (Right on). Eur J Orthod. 1994; 16:203-211
28. Sukhia HR, Sukhia RH, Mahar A. Bracket debonding and breakage prevalence in orthodontic patients. Pak Oral Dent J. 2011;31:73-77 Rehabil. 2017; 8:91-95.
29. Ogbonna CM. A comparative evaluation of two orthodontic bonding systems [Unpublished dissertation]. West African College of Surgeons; 2018.
30. Murfitt PG, Quick AN, Swain MV, Herbison GP. A

randomized clinical trial to investigate bond failure rates using a self-etching primer. Eur J Orthod. 2006; 28: 444-449.

31. Al Duliamy MJ. The effect of oral hygiene status on the bond failure rate of the orthodontic bracket: An in-vivo clinical study. J. Dent. Res. 2018; 5: 1-12
32. Adolfsson U, Larsson E, Ogaard B. Bond failure of a no-mix adhesive during orthodontic treatment. Am J Orthod Dentofacial Orthop. 2002;122: 277-281. Elekdag-Turk S, Isci D, Turk T, Cakmak F. Six-month bracket failure rate evaluation of self-etching primer. Eur J Orthod. 2008; 30; 211- 216.
33. Pandis N, Polychronopoulos A, Eliades T. Failure rate of self-ligating and edgewise brackets bonded with a conventional acid etching and self-etching primer. Angle Orthod. 2006; 76:119-122.
34. Elekdag-Turk S, Cakmak F, Isci D, Turk T. 12-month self-ligating bracket failure rate with a self-etching primer. Angle Orthod. 2008; 78: 1095-1100.
35. Umeh OD, Eniola AS, Ndukwe AN. A 3-year audit of the failure rate of first molar buccal tubes among orthodontic patients in a Nigerian population. Niger J Med 2021;30:205-209.
36. Linklater R, Gordon P. Bond failure patterns in vivo. Am J Orthod Dentofacial Orthop. 2003; 123:534–539

Multidisciplinary Management of a Class III Malocclusion with Congenitally Missing Maxillary Lateral Incisor using a one-couple force system approach: A Case Report

Pobee RD[a,b], Amoah GK[a], Newman-Nartey M[a], Toledo Mayari Yabang G[a]

Abstract

A case of a 12 year old female who presented at the Orthodontics and Paedodontics Department of the University of Ghana Dental School. She was diagnosed with a Class III malocclusion on a Class 3 skeletal base with reduced vertical proportions and a congenitally missing upper right lateral incisor. Treatment involved the extractions of mandibular second molars and the use of a one-couple system to correct the malocclusion, followed by the prosthetic replacement of the upper lateral incisor.

Key words: class III malocclusion, one-couple force system, multidisciplinary orthodontic treatment.

Authors' Affiliations

[a]Department of Orthodontics & Paedodontics, Dental School, College of Health Sciences, University of Ghana.

[b]Dental department, LEKMA Hospital Teshie.

Correspondence

Dr Gyaami Kwabena Amoah Department of Orthodontics & Paedodontics, Dental School, College of Health Sciences, University of Ghana Contact: +233243301626, email: kgamoah@ug.edu.gh, gyaami@yahoo.co.uk

Introduction

The congenital absence of one or more permanent teeth is known as hypodontia. Congenitally missing teeth are common dental anomalies with multifactorial aetiology. Apart from third molars, the third most common congenitally missing teeth are the maxillary lateral incisors[2]. It may be unilateral or bilateral and is more frequently seen in females.

The management of congenitally missing lateral incisors usually requires a multidisciplinary approach[2]. Treatment aims to establish a functional and an esthetic occlusion[3]. Two main treatment options are generally employed: either space is opened up for the prosthetic replacement of the missing tooth, or by orthodontic space closure[4], together with extractions in the lower arch

The treatment choice is based on the anteroposterior occlusal relationship, the profile and the tooth size arch length discrepancy. In cases where canine substitution is considered, the morphology, size and colour of the canine are considered[5]. According to Paduano et al.[5], space opening and prosthetic replacement of the missing tooth/teeth are recommended in low-angle cases and patients with retruded profiles.

Class III malocclusion may be skeletal and due to mandibular prognathism, maxillary retrognathia or a combination of both[6]. Pseudo class III relationship may occur in normal skeletal jaw relationship with reverse overjet as a result of centric relation (CR)–centric occlusion (CO) discrepancy[6].

Dental Treatment modalities used in managing class III malocclusions include orthopaedic, orthodontic camouflage or orthognathic surgery methods. Treatment choice usually depends on the patient's age, skeletal pattern, the severity of the skeletal problem and patient preference[7,8].

The present case report describes the multidisciplinary management in a class III malocclusion patient complicated by unilateral congenitally missing right maxillary lateral incisor using a one-couple system mechanics approach.

Case Report

A 12-year-old female presented at the Orthodontics and Paedodontics department of the University of Ghana Dental School with a complaint of spacing in her upper anterior teeth and protruded lower jaw. She was in permanent dentition with all teeth present except 12,18,28,38, and 48. She had a prognathic profile with average lower anterior facial height.

An intra-oral assessment revealed a class III incisor,

ORIGINAL ARTICLE

canine and molar relationship with about 12mm and 3mm spacing in the maxillary and mandibular arch, respectively. The overjet was -5mm, 20% overbite, and the mildly increased curve of spee with 11,21 and 22 in crossbite with the lower anterior teeth. The centrelines were non-coincident, with a 2mm maxillary midline shift to the right and a 2mm mandibular midline shift to the left of the maxilla. There was no abnormality with the temporomandibular joints, and the oral soft tissues were healthy.

The orthopantomogram showed no apparent bony pathology. However, tooth #12 was congenitally missing whilst the third molars were present and in the normal developing stage. The cephalometric analysis pointed to a class 3 skeletal base with an ANB of -3.87 and a Wits appraisal value of -7.2. The SNB was increased (89.05), confirming the cause of the class III malocclusion was due to mandibular prognathism. The upper incisors were proclined, and the inter-incisal angle and the vertical proportions were normal.

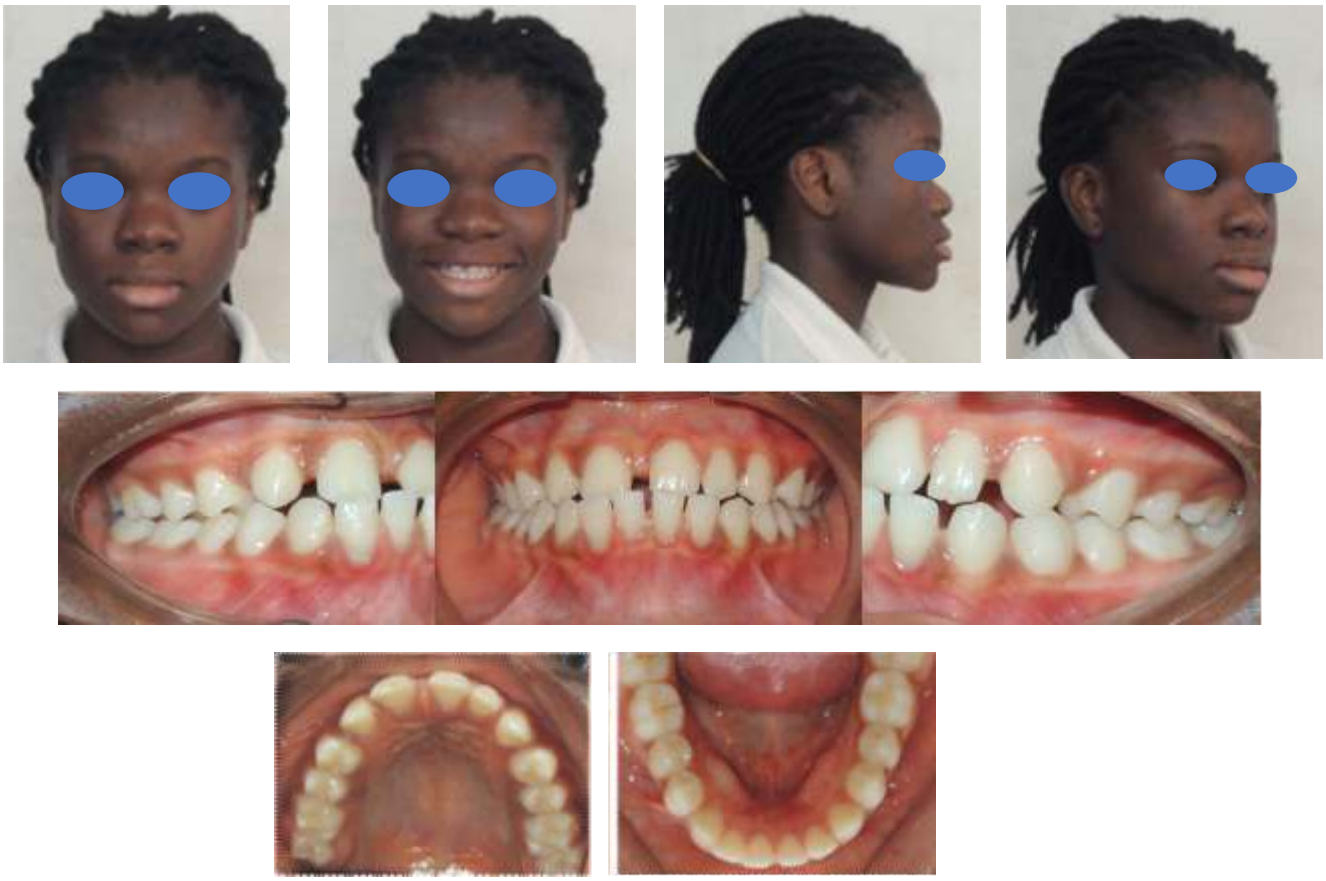

Figure 1: Pretreatment photographs of the patient

Figure 2: Pretreatment orthopantomogram, Lateral cephalometric radiograph and cephalometric tracing

Figure 3: Pretreatment study models

Table 1. Cephalometric summary of pretreatment and post-treatment results
Sources of normal values:(Fadeju et al., 2012)

	Parameters	Pre-treatment	Post-treatment	Change	Ref(Ghana)
SAGITTAL	SNA	85.18^0	85.18^0	+2.56	89^0 (+/-4)
	SNB	89.05^0	85.90^0	-3.15	83^0 (+/-4)
	ANB	-3.87^0	1.84^0	+5.41	5^0(+/-2)
DENTAL	UIMXP	135.24^0	123.01^0	-12.23	121^0(+/-8)
	LIMd	92.35^0	93.28^0	+ 0.93	99^0(+/-8)
	I-I Angle	111.69^0	117.96^0	+6.27	114^0(+/-6)
VERTICAL	MMPA	20.72^0	25.75^0	+5.03	28^0(+/-12)
	LAFH	55.73%	56.81%	+1.08	57% (+/-2)
	Wits	-7.23mm	0.95mm	+8.18	4mm (+/-3)

Treatment aims, Progress and Results

The patient's chief concern was the prognathic mandible; she wanted all the mandibular spaces closed but requested that a 1mm maxillary midline diastema be maintained. Treatment aimed to correct the class III incisal, canine and molar relationships to a class I relationship, consolidate the maxillary spaces for prosthetic replacement of tooth # 12, leave the 1mm diastema requested by the patient, correct the centre lines, close all the mandibular anterior spaces and improve the facial profile.
The case was managed by orthodontic camouflage using a fixed orthodontic appliance. The treatment involved the extraction of the mandibular 2nd molars, slight intrusion and retraction of the lower anterior segment and space regaining and prosthetic replacement of the maxillary lateral incisor.

Consent was obtained from the patient, and scaling and polishing was done. The maxillary and mandibular teeth were bonded with pre-adjusted edgewise Roth prescription brackets with 0.022 x0.028"inch slot size and molar bands cemented on the first molars. The mandibular canine brackets were swapped to change the inherent mesial crown tip to a distal crown tip to facilitate the distal tipping of the lower labial segment. After leveling and alignment with 0.014 and 0.018 nitinol wires, a Connecticut intrusion arch (CIA) with a 60g force was tied over a 0.017X0.025 stainless steel (SS)base archwire from teeth #42 and #32 in the mandibular arch to form the one couple force system. Lower second molars were extracted to provide more space for the mandibular molars to tip back and the lower labial segment to retract, thus correcting the anterior crossbite.
A 0.018 SS was placed in the maxillary arch, and a push coil was placed between teeth # 13 and #11 and secured with metal ligatures. This was done to consolidate the anterior maxillary space and create space for the congenitally missing tooth #12.
About six months into the treatment, the space for the congenitally missing #12 was regained, and an acrylic pontic was fabricated to replace the gap created.
Residual space closure in the mandible was completed using a 0.018SS archwire and power chain. About 26 months into the treatment, the mandibular third molars erupted and were protracted to replace the extracted mandibular 2nd molars. The maxillary third molars remained unerupted until the patient was debonded. The patient was, however, informed about the need to extract the maxillary third molars when they finally erupted. Per the patient's wishes, a 1mm midline diastema was left in the maxilla.
A resin-bonded bridge was fabricated to replace the congenitally missing #12, with the aim to provide an implant after the slowing down of craniofacial growth. Full alignment of the 3rd molars could not be attained because the patient relocated abroad for further studies, however the patient was pleased with the outcome.

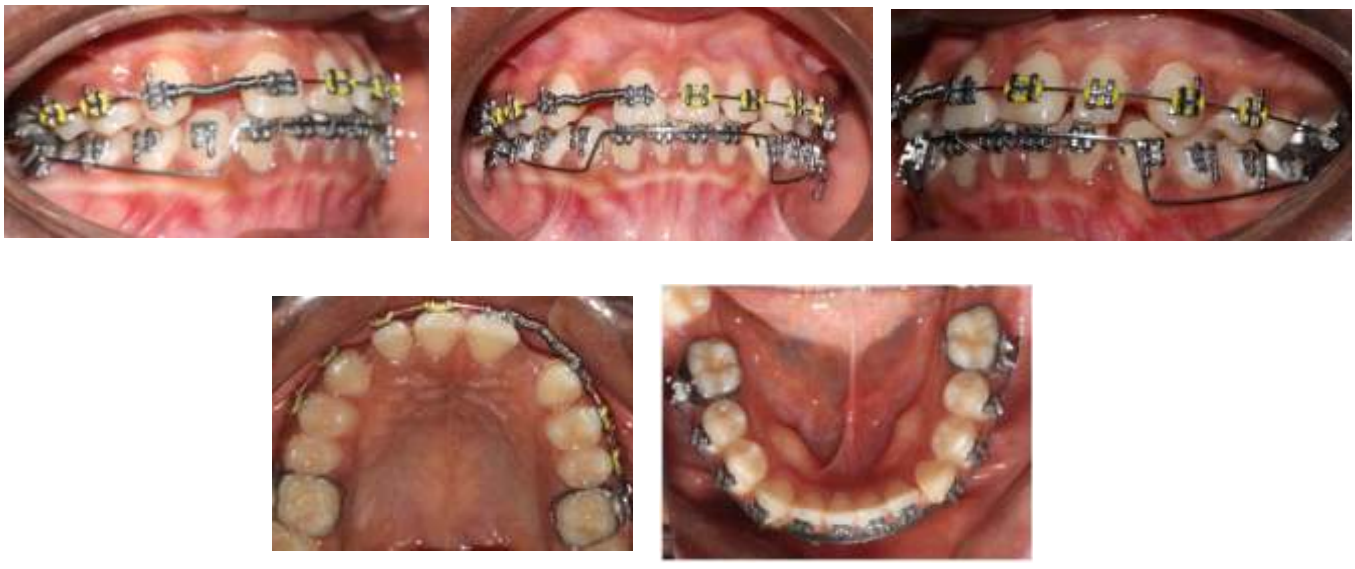

Figure 4: Mid-treatment photographs of the patient

Figure 5: Post-treatment photographs of the patient

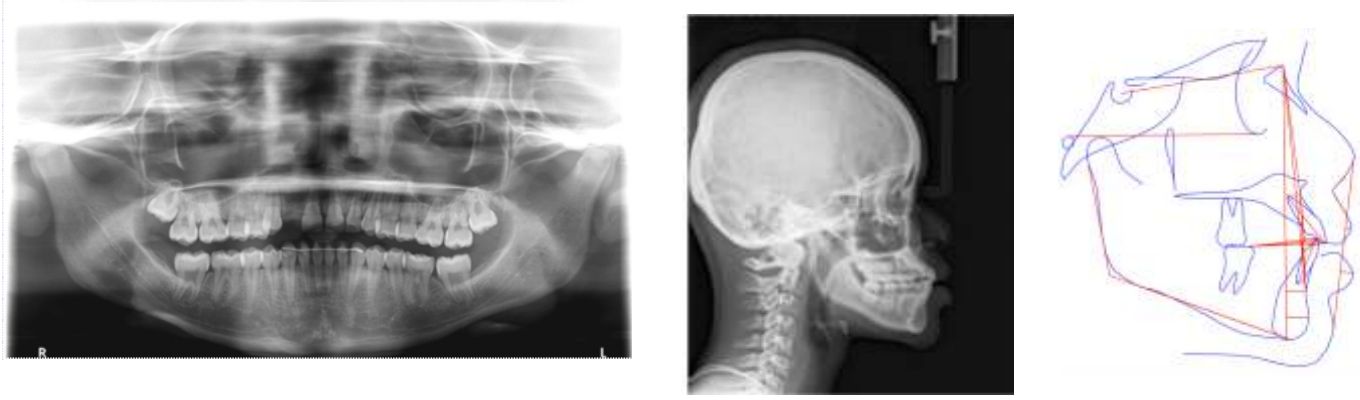

Figure 6: Post-treatment orthopantomogram, Lateral cephalometric radiograph and cephalometric tracing

Figure 7: Post-treatment study models

Discussion

The aims of the treatment were met at the end of treatment, and the patient was pleased with the result. Class I incisal, canine and molar relationships were achieved with a positive overjet and a good overbite. The occlusal and aesthetic effects were enhanced, and the facial profile significantly improved. As requested by the patient, a 1mm maxillary midline diastema was left. Although maxillary diastemas are a common aesthetic complaint in some races, in some African cultures, it is seen as a sign of beauty.[9,10]

Though many orthodontists are critical with 2nd molar extractions as they are noted to be poorly replaced by the 3rd molars, extraction of mandibular 2nd molars was employed in this case.[11] Comparing cases of lower second molar extraction to those of premolar or lower third molar extractions, Lin et al.[11,6] found that lower second molar extractions gave more space for the anterior teeth to move back to rectify anterior crossbites. This makes it easier for a class I molar relationship to be achieved and enables the eruption of the third molars into the extraction space to ensure that all eight premolars occlusally lock together, enhancing stability[11]. However, the timing is crucial when extraction of 2nd molars is being considered. Good third molar alignment is more likely if the second molars are extracted before the third molar roots are about one-third formed.[12] As in this case, the authors have come up with a novelle method for correcting mild skeletal class III malocclusions in patients with average to reduced lower anterior facial heights (LAFH) using the one couple system of forces. The intrusion arch (with a tip-back bend placed mesial to the molar) is ligated to a single point between the lower central incisors or between the lower central and lateral incisors. The posterior section of the intrusion arch is passed through the accessory tube on the molar bands and tightly cinched back. The one-couple system produces a pure intrusive force on the anterior segment and a distal tip back (anticlockwise) moment, and an extrusive force on the molars(posterior segment). The distal tipping of the posterior segment is enough to also tip the lower labial segment distally, thus correcting the crossbite. A resin-bonded bridge was fabricated by the restorative department to temporarily replace the congenitally missing # 12.

At the end of the treatment, anterior crossbite was corrected, Class I canine and molar relationship was obtained, and space for tooth #12 was regained and replaced by a prosthesis.

The orthopantomogram at the end of treatment showed good root parallelism and no iatrogenic root resorption. However, the alveolar bone was slightly

blunted in the lower molar region.

The patient's profile was noticeably improved with favourable treatment effects in cephalometric analysis. SNA and ANB increased while SNB decreased.

Interincisal angle, MMPA and LAFH increased slightly. A positive Wits appraisal value was obtained.

A fixed lingual retainer from 33-43 was bonded, and a mandibular thermoplastic retainer was given to maintain the achieved result. A maxillary Hawley retainer was given for the maxillary retention. The patient relocated abroad for further studies and thus was lost to recall.

Conclusion

This class III case was successfully managed with the one-couple system approach and extraction of lower second molars. Remarkable soft-tissue change and skeletal changes were achieved. The one-couple force system is often employed in the Department of Orthodontics and Paedodontics to treat mild to moderate class III patients with average to reduced facial proportions with reverse overjet. This has the advantage that premolars are left intact, and in cases where the third molars are erupted at the time of treatment, they are extracted instead of the second molars. The interdisciplinary approach in managing this patient ensured good occlusion, aesthetic smile, and long term stability.

Contribution to Authorship: All authors contributed equally to the manuscript.

Funding: Self funded

Conflict of Interest: No conflict of interest declared

References

1. Durey K, Cook P, Chan M. The management of severe hypodontia. Part 1: Considerations and conventional restorative options. Br Dent J. 2014;216(1):25-29.
2. Almeida RR de, Morandini ACF, Almeida-Pedrin RR de, Almeida MR de, Castro RCFR, Insabralde NM. A multidisciplinary treatment of congenitally missing maxillary lateral incisors: a 14-year follow-up case report. J Appl Oral Sci. 2014;22(5):465-471.
3. Committee O, Council R. Guideline on Management of the Developing Dentition and Occlusion in Pediatric Dentistry. 2014:253-265.
4. Sun Y-T, Chang T-W, Yang P-Y, Lee T-H. Orthodontic Treatment Management for Congenitally Missing Maxillary Lateral Incisors. Taiwan J Orthod. 2018;30(4):196-199.
5. Paduano S, Cioffi I, Rongo R, et al. Case Report Orthodontic Management of Congenitally Missing Maxillary Lateral Incisors: A Case Report. Case Rep Dent. 2014:1-7.
6. Zere E, Kumar Chaudhari P, Sharan J, Dhingra K, Tiwari N. Class III malocclusions: challenges and solutions. Clin Cosmet Investig Dent. 2018;10:99-116.
7. Jacobson A, Evans WG, Preston B, Sadowsky PL. Mandibular prognathism. Oral Surgery, Oral Med Oral Pathol. 1974;66(2):140-171.
8. Miguel JAM, Zanardi G. Class III camouflage using skeletal anchorage and Pendex appliance. Prog Orthod. 2011;12(1):73-83.
9. Kerosuo H, Hausen H, Laine T, Shaw WC. The influence of incisal malocclusion on the social attractiveness of young adults in finland. Eur J Orthod. 1995;17(6):505-512.
10. Newman-Nartey M, Sackeyfio J, Hewlett S, Nartey SA, Otu-Nartey N. Prevalence, Aetiology, Management and Retention of Midline Diastema in Orthodontic Patients in Ghana. West African J Orthod. 2016;5(1):16-22.
11. Lin J xiang, Gu Y. Preliminary investigation of lower second molar extraction in correction of severe skeletal class III malocclusion. Zhonghua Kou Qiang Yi Xue Za Zhi. 2006;41(9):537-541.
12. Travess H, Roberts-Harry D, Sandy J. Orthodontics. Part 8: Extractions in orthodontics. Br Dent J. 2004;196(4):195-203.

The Spontaneous Correction of Anterior Cross Bite in an Eleven-Year-Old Boy

Babalola A[a], Shubhita S[a] , Agrawal N[a] , Nwadiani A[a], Traore-Shumbusho A[a]

Abstract

Anterior cross-bite, a malocclusion affecting the alignment of upper and lower incisors, poses significant challenges necessitating early diagnosis and intervention to mitigate potential complications. This case study presents an eleven-year-old Nigerian boy exhibiting anterior cross-bite involving teeth 11, 12, 21, and 22, diagnosed as Angle's Class III malocclusion on skeletal pattern 1. Of particular interest was the spontaneous correction observed within six months. This unexpected self-correction stands in contrast to conventional orthodontic patterns recommended in numerous studies, including removable appliances, fixed bracket systems, and clear aligners. In conclusion, this case study underscores the significance of early diagnosis and intervention in anterior cross-bite cases while shedding light on the rare occurrence of spontaneous correction, potentially attributable to distinct physiological factors in individual cases.

Keywords: Anterior Cross-Bite, Malocclusion, Spontaneous, Correction.

Authors' Affiliations:
[a]Smile 360 Dental Specialists, Lagos, Nigeria.

Correspondence:
Adetola Emmanuel Babalola
Mail: adetolababalola5@gmail.com
ORCID: 0000-0002-5660-4917
Smile 360 Dental Specialists, Lagos, Nigeria.

ORIGINAL ARTICLE

Introduction

Early diagnosis and treatment planning of children with orthodontic needs require skilled efforts of dental practitioners, most especially orthodontic specialists.[1] Anterior cross-bite is a type of malocclusion involving the reverse relationship of the upper and lower jaws.[2] Anterior cross-bite is seen when one or all maxillary (upper) incisors bite on the lingual side of the mandibular (lower) teeth, causing a functional shift of the jaws.[3]

Numerous factors have been linked to causing anterior crossbite; which include a lingual eruption path of the maxillary anterior incisors; trauma to the primary incisor resulting in lingual displacement of the permanent tooth germ; supernumerary anterior teeth causing crowding, retained deciduous teeth and oral habits such as tongue thrusting. [4–6]

Onyeaso et al found out that the prevalence of reverse bite was 11.9% in the Lagos and Ibadan Nigerian communities.[7] The prevalence of anterior cross-bite is 5.5% in the Calabar Nigeria sample population of 10–15-year-olds.[8] It is important to diagnose and create a management plan early due to the complications that can arise when left untreated. Complications in aesthetic appearance, mastication, speech, and possible soft/hard tissue trauma to oral tissues are consequences of leaving this type of malocclusion uncorrected. This relationship can be seen in deciduous teeth or permanent teeth, and they require orthodontic correction.[9]

Case Presentation

The patient was an eleven-year-old Nigerian boy who presented at our facility with his parents. In his words, he said, "I want braces to arrange my teeth." His parents were concerned with his wrongly positioned front teeth. His medical and dental histories were non-contributory. The patient and parents also reported no oral habits. On extraoral examination, his face was symmetrical with competent and full lips as seen in Figure 1. Intraoral examination revealed teeth 11, 12, 21, and 22 in

anterior cross-bite as illustrated in Figure 2. The teeth present in the oral cavity were 11, 12, erupting 13, 14, 55, 16, 21, 22, 63, 24, 65, 26, 31, 32, 33, 74, 75, 36, 41, 42, 43, 84, 85 and 46 as shown in Figure 3.

The patient was in mixed dentition and all other teeth appeared to be in regular positions. Panoramic radiographic examination also showed all permanent teeth erupting normally, as seen in Figure 4. A diagnosis angle's class III malocclusion on skeletal pattern 1 complicated by anterior cross-bite was made. The patient also had a reverse overjet of 3mm, and the overbite was normal.

Teeth 11 and 21 still had open apices and early orthodontic treatment may result in short roots[10]. Also, teeth 34 and 44 were erupting, and the orthodontic team decided to review the patient after six months before orthodontic treatment. The patient was also asked to do a routine prophylaxis cleaning (scaling and polishing). After six months, the patient returned for review, and it was found that the cross-bite was completely corrected without intervention, as seen in Figure 5. At this presentation, the teeth present in the oral cavity were, 11, 12, 21, and 22 in anterior cross-bite as illustrated in Figure 2. The teeth present in the oral cavity were 11, 12, 13, 14, erupting 15, 16, 21, 22, 63, 24, 25, 26, 31, 32, 33, 34, 75, 36, 41, 42, 43, erupting 44, 85 and 46 as shown in Figure 6. The patient also appeared to smile more enthusiastically as seen in the facial profile photos shown in Figure 7.

Since we had no further plan to intervene, the team decided not to do any intraoral digital scans or study models. We asked the patient's parents to present for follow-up after an additional 6 months to monitor his occlusion.

Figure 1 Showing Facial Profile of the patient (L-R Lateral, Frontal Smile and Frontal views)

Figure 2. Intraoral Images at Presentation

Figure 2.1 Enlarged Intraoral Centre Image.

Figure 3 Intraoral Occlusal Photos at Initial Presentation

Figure 4. Orthopantomogram taken at initial presentation

Figure 5. Facial Profile on follow-up after 6 months

Figure 6. Six months Update Intraoral photographs.

Figure 6.1 Enlarged 6 months Update Intraoral Centre Photograph

Figure 7. Intraoral Occlusal Photos 6 months after Follow-up

Discussion

Multiple studies have shown various ways in which anterior cross-bites can be corrected. Removable appliances fixed or, more recently, clear aligners are all viable methods of correction[11–16]. Also, few studies have reported spontaneous or self-correction of the condition after months of follow-up[3,17].

The condition can be skeletal or dental in origin. The lateral cephalometric radiograph as shown in Figure 8**,** shows that it was more of a dental-related condition which also corroborates the self-correcting nature. The cephalometric radiograph was taken at the second presentation to properly assess the relationship of the incisors to the jaws which was now deemed satisfactory. This sagittal problem did not accompany a traverse or vertical component. It was, however, important to closely monitor or possibly intercept in phases to prevent occlusal wear or gingival damage[18].

The tongue could have propelled the maxillary incisors into normal occlusion as also reported by Mok et al[3]. In this case, the erupting canines and premolars could have given the needed clearance/space for this to occur.

Figure 8. Lateral Cephalometric Radiograph showing a Class 1 skeletal Pattern after 6 months.

Conclusion

This case study not only emphasized the importance of early diagnosis and intervention in anterior crossbite but also shed light on the rare occurrence of spontaneous correction, possibly attributed to physiologic tongue push on the maxillary incisors. We have also shown the importance of proper records and follow-up so as to compare orthodontic visits at intervals.

Data availability

Every data concerning this case is available upon request to the corresponding author of the manuscript.

Contribution to Authorship: All authors contributed equally to the manuscript.

Funding statement

We received no funding for this work.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgements

All acknowledge the team members of the Orthodontic department including, the call centre, customers relations centre, nurses and treatment coordinators of Smile 360 Dental Specialists, Lagos Nigeria are all appreciated.

References

1. Dimond HDJ. Anterior crossbite correction. J Clin Orthod. 1983 May;17(5):326–7.
2. Lee BD. Correction of crossbite. Dent Clin North Am. 1978 Oct;22(4):647–68.
3. Mok CW, Wong RWK. Self-correction of anterior crossbite: A case report. Cases J. 2009;2(7):3–5.
4. Vadiakas G, Viazis AD. Anterior crossbite correction in the early deciduous dentition. American Journal of Orthodontics and Dentofacial Orthopedics.
5. Hannuksela A, Vaananen A. Predisposing factors for malocclusion in 7-year-old children with special reference to atopic diseases. American Journal of Dentofacial Orthopedics. 1987;92(4):299–303.
6. Heikinheimo K, Salmi K, Myllärniemi S. Long-term evaluation of orthodontic diagnoses made at the ages of 7 and 10 years. Eur J Orthod. 1987;9(2):151–9.
7. Onyeaso CO, Sote EO. A study of Malocclusion in the primary dentition in a population of Nigerian children. Niger J Clin Pract [Internet]. 2002 Jan 12];5(1):52–6.
8. Adekoya MN, Ayedun OS, Adeyemi TE. Prevalence of Malocclusion in Children between the Age of 10-15 Years in Calabar Metropolis, Cross River. West Afr J Med . 2021; Vol. 38(11):1095–100.
9. Estreia F, Almerich J, Gascon F. Interceptive correction of anterior crossbite. J Clin Pediatr Dent. 1991;15(3):157–9.
10. Hendrix I, Carels C, Kuijpers-Jagtman AM, Van 'T Hof M. A radiographic study of posterior apical root resorption in orthodontic patients. Am J Orthod Dentofacial Orthop. 1994 Apr;105(4):345–9.
11. De Brito GM, Simões D, Flores PS, Machado AW. An Effective Approach to Correcting Anterior Crossbite in a Class III Patient. J Clin Orthod. 2020 Nov;54(11):705–10.
12. Staderini E, Patini R, Meuli S, Camodeca A, Guglielmi F, Gallenzi P. Indication of clear aligners in the early treatment of anterior crossbite: a case series. Dental Press J Orthod. 2020;25(4):33–43.
13. Pellegrino M, Caruso S, Cantile T, Pellegrino G, Ferrazzano GF. Early Treatment of Anterior Crossbite with Eruption Guidance Appliance: A Case Report. Int J Environ Res Public Health. 2020 May;17(10).
14. Cheng H Chung, Shih M ju. ScienceDirect Dentofacial changes after anterior crossbite correction using a lingual arch with finger springs. J Dent Sci . 2017;12(1):70–7.
15. Zhang J, Yang Y, Han X, Lan T, Bi F, Qiao X, et al. The application of a new clear removable appliance with an occlusal splint in early anterior crossbite. BMC Oral Health. 2021 Jan;21(1):36.
16. Pereira da Silva HCF, de Paiva JB, Rino Neto J. Anterior crossbite treatment in the primary dentition: Three case reports. Int Orthod. 2018 Sep;16(3):514–29.

17. Rosa M, Lucchi P, Mariani L, Caprioglio A. Spontaneous correction of anterior crossbite by RPE anchored on deciduous teeth in the early mixed dentition. Eur J Paediatr Dent. 2012 Sep;13(3):176–80.

18. Wiedel AP, Bondemark L. Stability of anterior crossbite correction: a randomized controlled trial with a 2-year follow-up. Angle Orthod. 2015 Mar;85(2):189–95.

Instructions for Authors

West African Journal of Orthodontics is a peer-reviewed journal published by affiliated Orthodontic Groups and Associations in the West African Sub region. The journal gives priority to reports of outstanding clinical and experimental and epidemiological works on malocclusion, dento-facial defects as well as important contributions related to common orthodontic problems in children, adolescents and adults worldwide.

Submission

Manuscripts and registered letters should be sent to: the Editor, West African Journal of Orthodontics, Department of Child Dental Health, Faculty of Dentistry, College of Health Sciences Obafemi Awolowo University, Ile-Ife, Osun State. Nigeria.

Manuscripts in MS word attachments may also be submitted via Email to wajoeditorinchief@yahoo.com, in addition to hard copies. Tables, figures and text should be included in the same file if possible. Authors may submit their research works by email only; such manuscripts need not be simultaneously sent by post. However, photographs and/or figures need to be sent separately as hard copy (under figures and illustrations).

Acceptance

Manuscripts should meet the following criteria: original material, clear writing, appropriate study methods, valid data, and reasonable conclusions supported by the data, in short, they should contain important information on topic of general orthodontic interest.

Peer-review Process

All the manuscripts that adhere to its style and Instructions for Authors are referred to peer-review. Some of them are rejected immediately after an inhouse review. The rejection at this stage is due to insufficient originality, serious scientific flaws or absence of message. The remaining articles are sent to at least two reviewers who are. experts in the subject. Manuscripts are reviewed with due respect for authors' confidentiality, and the identity of peer reviewers is also kept confidential. A decision is made from 6 to 12 weeks according to the response from reviewers, revision by the author(s) and reappraisal on the revision.

The accepted manuscripts are subjected to editorial revision to comply with the requirements on language and style of the journal. The rejected manuscript is not returned to authors but its copies are kept for 3 months to answer any queries. The copyright of the accepted and published articles is held by the journal and all the published materials cannot be reproduced or published elsewhere, in whole or part, without the written permission from the editor.

Duplicate Submission

Manuscripts are considered with the understanding that they have not been published previously and are not under consideration by another publication. The author should alert the editor if the work includes subjects about which a previous report has been published. A research paper submitted to this journal should not overlap by more than 10% with the previously published material or work submitted elsewhere, which would be considered as duplicate publication. If in doubt, authors may forward copies of the published work or material submitted elsewhere to this journal for decision making.

Proofs and Reprints

The corresponding author of the accepted article shall be supplied with the proof. Corrections on the proof should be restricted to errors only and no substantial additions/deletions should be made. No addition or deletion in the names of the authors is permissible at this stage. A copy of the issue carrying the article is supplied free of charge to the authors.
Reprints may be ordered on payment in advance.

Categories of Articles

Articles can be sent as editorials, original articles, review articles, special communications, brief reports, case reports, letters to editor, commentaries, or for images section.

They are mostly included under Events of Interest free of cost. This journal reserves the right to be selective in publishing these announcements.

Preparing Manuscripts

Manuscripts should be prepared in accordance with the Uniform Requirements for Manuscripts submitted to Biomedical Journals. 2 A summary of technical requirements for preparing the manuscript is provided below:

- Three copies of the manuscript should be submitted.
- Use 1 side of standard size 21.6x27.9 cm A4, white bond paper, with margins of at least 2.5 cm on each side.
- Double-space throughout including title page, abstract, text, acknowledgements, references, tables and figure legends. Start each of these sections (in same order) on a new page, numbered consecutively in the upper right hand corner, beginning with the title page.
- Use at least 12 point font size (Times New Roman or Arial).
- Submit photographs and transparencies in a separate heavy paper envelope (enclosed in cardboard, to prevent bending during mail handling).
- Conventional units are preferred with SI units in parenthesis, if available. The metric system is preferred for the expression of length, area, mass and volume.
- Use nonproprietary names of material rugs, devices and other products.
- All manuscripts should be accompanied by a signed statement by all authors regarding authorship, responsibility, financial disclosure and acknowledgements, as per standard format (Appendix J)[23 1 Those sending their manuscript through email are also required to submit this form by post with original signatures.

Manuscripts not fulfilling the technical requirements shall be returned to the authors without initiating the peer-review process.

Title Page

The page should contain (i) the title of the article: which should be concise but informative (simpler the title the better; preferably it should contain all the key words to help electronic retrieval reliably); (ii) a short running title of less than 40 characters placed at the foot end of the title page; (iii) initials and surname of each author with the highest academic degree(s) and designation at the time when the work was done; (iv) details of the contribution of each author; (v) name of department(s) and institution(s) to which the work should be attributed; (vi) disclaimers, if any; (vii) name, address, telephone, fax, email address of the corresponding author, (viii) source(s) of support in the form of grants, equipment, drugs or all of these; and (ix) declaration on competing interests.

Authorship

All persons designated as authors should qualify for the authorship. Authorship credit should be based on substantial contributions to (i) concept and design, or acquisition of data, or analysis and interpretation of data; (ii) drafting the article or revising it critically for important intellectual content; and (iii) final approval of the version to be published. Conditions 1, 2 and 3 must all be met. Participation solely in the acquisition of funding or the collection of data does not justify authorship. All such people who contributed to the work but do not satisfy all the conditions should be listed in the acknowledgements.

Authors are responsible for obtaining written permissions from everyone acknowledged by name. One of the authors shall act as guarantor of the paper and he/she should take the responsibility for the integrity of the work as a whole, from its inception to published article.

Authors should provide a description of what each author contributed on the title page. Subsequently, no names can be added or deleted without written permission of the editor. Written consent of authors whose names are being deleted should be obtained.

This journal reserves the right to satisfy itself regarding the specific role of each listed author to justify authorship. All authors must give signed consent to publication (Appendix 1).

Competing Interest

Competing interest for a given manuscript exists when the author has ties to activities that could inappropriately influence his or her judgment, whether or not judgment is in fact affected. Financial relationships with industry for example, through employment, consultancies, stock ownership, honoraria, expert testimony, either directly or through immediate family, are usually considered to be the most important competing interests. However, conflicts can

Original Article

Original articles should report original research relevant to basic and clinical orthodontics including randomized trials, intervention studies, studies of screening and diagnostic tests, cohort studies, cost effectiveness analyses and case control studies. While reporting randomized controlled trials (RCT), authors must attempt to be in conformity with the consolidated standards of reporting trial.

(CONSORT) statements

Each manuscript should be accompanied with a structured abstract (divided into background, methods, results and conclusions) in no more than 250 words. Four to five key words to facilitate indexing should be provided in alphabetical order along with the abstract. The text should be divided in sections on introduction, methods, results, discussion and conclusion.

Acknowledgment section may be included where necessary. Number of tables and figures should be limited to the very relevant ones and may be compressed if necessary. The typical text length for such contributions is 2500-3 500 words (excluding title page, abstract, tables, figures, acknowledgments and references).

Brief Report

Short accounts of original studies are published as brief reports. The text should be divided into sections, i.e., abstract, introduction, methods, results and discussion.

Abstract should be of 100-150 words highlighting the aims, methods and main results along with 3-4 key words.

The text should contain no more than 1500 words, 3 illustrations or tables and up to 20 references, preferably recent publications.

Review Article

State-of-the-art review articles or systematic, critical assessments of literature are also published. Normally a review article on a subject already published in the West African Journal of Orthodontics is not accepted for a period of 3 years.

The typical length for review articles is 2000-3000 words, excluding tables, figures, and references.

Authors submitting review manuscripts should include a structured abstract of around 200 words describing the need and purpose of review, methods used for selection, extraction and synthesis of data, and main conclusions.

Clinical cases highlighting uncommon malocclusion condition, orthodontic treatment techniques are published as case reports. Single case reports are usually not accepted, unless some new or unusual aspect regarding aetiopathogenesis, diagnosis or management is brought out that adds to the existing body of knowledge. The text should not exceed 1000 words and is divided into sections, i.e., abstract, introduction, case report and discussion. The number of tables/figures should be limited to 2. Ten recent references are acceptable. A maximum of 3 or 1 author is permitted from the principle and each of the associated departments respectively. Thus, case reports from only one investigative department can have a maximum of 3 authors.

Letter to Editor(s)

Letters commenting upon a recent article in the West African Journal of Orthodontics are welcome.

Such letters should be received within 6 months of the article's publication. At the editorial board's discretion, a letter may be sent to authors! experts for comments and both letter and reply may be published together. Letters may also relate to other topics of interest to orthodontists and others, and/or useful clinical observations. Letters should not be more than 400 words. The number of authors should not exceed 2, including the authors' reply in response to a letter commenting upon an article published in this journal.

Images Section

A short text of about 150 words depicting the condition with color photographs (vide infra) is needed.

Normally only clinical photographs are accepted but accompanying skiagrams or pathological images could also be considered for publication.

Photographs should be of high quality, clearly identify the condition and preferably add to the existing knowledge.

Personal Viewpoint

Such articles are published on topical orthodontic issues including social aspects. It is expected that the authors have sufficient credible experience on the subject for giving viewpoints. These should not exceed 1500 words.

Notes, News and Events of Interest

Announcements for conferences, symposia, meetings or courses may be sent for publication in advance. The announcements should provide title, date(s) and place of the event and contact address, telephone, and email

occur for other reasons, such as personal relationships, academic competition and intellectual passion. If any of the authors have accepted reimbursement for attending symposium, a fee for speaking, fee for organizing educational reach, funds for a member of the staff of consultation fees from an organization that may in: way gain or lose financially from the result of the study, review, editorial or letter, a competing interest would be deemed to exist. If any of the authors had been employed by an organization that may in any way gain or lose financially from the publication, or if any of them hold stocks or shares in such an organization, competing interest would be deemed to exist. If competing interest exists, the author(s) must disclose them while submitting the manuscript.

Abstract and Key Words

The second page should carry an abstract in case of original article (250 words), review article (200 words), brief report (100-150 words), and case report (50 words), respectively. For original article and reviews, the abstract should be structured as detailed earlier. For brief reports, the abstract should state the purpose of the study, basic methodology, main findings (giving specific data and statistical significance) and key conclusion(s). Below the abstract, authors should provide 3-5 key words for indexing; terms from the Medical Subject Headings (MESH) list of Index Medicus should be used. The basic structure of a paper follows the well known acronym IMRAD, which stands for Introduction (what questions was asked), Methods (how was it studied), Results (what was found) and Discussion[4].

Introduction

The introduction must clearly state the question that the author(s) tried to answer in the study. It may be necessary to briefly review the relevant literature.

Only cite those references that are essential to justify the proposed study.

Materials and Methods

The methods section should describe, in a logical sequence, how the study was designed (e.g., how randomization was done), carried out (e.g., how subjects were chosen or excluded, ethical considerations, accurate details of materials used, exact drug dosage and form of treatment, etc.) and data were analyzed (e.g., an estimate of the power of the study, exact test used for statistical analysis, etc.).

For standard methods, appropriate references are sufficient, but if standard methods are modified these should be clearly brought out.

Authors should provide complete details of any new methods or apparatus used (manufacturer's name and address in parentheses).

Ethics

When reporting experiments on human subjects, authors should indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1964, as revised in 2000.

They should indicate whether the study was approved by the Institutions' Ethical Committee, and whether informed consent was obtained from the study participants. They should not use patients' names, initials, or hospital numbers, especially in illustrative material. This journal reserves the right to reject a manuscript on ethical grounds, on the basis of recommendations of its "Ethical Committee", even if the research has been cleared by the institutional ethical committee. Moreover, when reporting experiments on animals, authors should indicate whether the institutional and national guide for the care and use of laboratory animals was followed.

Statistics

Authors should describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, they meet to quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Actual P values are provided rather than stating as just <0.05 or >0.05 etc. References for the design of the study and statistical methods should be to standard works when possible (with pages stated) rather than to papers in which the designs or methods were originally reported. Any general-use computer programs used should be specified and statistical terms, abbreviations, and most symbols be defined.

Results

This section should include only relevant, representative data and not all information collected during the study. Major findings should be presented clearly and concisely. Text, tables, and illustrations should be used sensibly while avoiding repeating in the text all the data depicted in the tables or illustrations and emphasizing or summarizing only important observations. Tables and figures should be restricted to those needed to explain the argument of the paper and to assess its support. It is necessary to cite the tables in the text and type them on separate sheets. It may also be useful to mention what the study did not find.

Discussion

Discussion ordinarily should not be more than one third of the total length of the manuscript. This section should include a summary of the major findings, their relationship to other similar studies, limitations of methods and implications of these findings in future research. Conclusions should be linked to the goals of the study. Unqualified statements and conclusions which are not completely supported by the data should be avoided. Authors should also refrain from making statements on economic benefits and costs unless their manuscript includes economic data and analyses.

Acknowledgements

In acknowledgements section, it is suitable to list all contributors who do not meet the criteria for authorship, such as a person who provided purely technical help, writing assistance, or a department head who provided only general support. Financial and material support should also be acknowledged.

Groups of persons who have contributed materially to the paper but whose contributions do not justify authorship may be listed under a heading such as "clinical investigators" or "participating investigators", and their function or contribution should be described, for example, "served as scientific advisers", "critically reviewed the study proposal", "collected data", or "provided and cared for study patients". A written consent is required from all the persons acknowledged, indicating their acceptance for the same.

Contributions to joint-authorship

In the case of multiple author-ship, authors are expected to state clearly their contributions to the paper being considered for publication in terms of study initiation, design including methodology, data collection, analysis and final write-up. The editorial board reserves the right to remove any author's name if the contribution is insignificant.

References

References should be numbered consecutively in the order in which they are first mentioned in the text.

References are identified in text, tables, and legends by Arabic numerals in parentheses. References cited only in tables or in legends to figures should be numbered in accordance with the sequence established by the first identification in the text of the particular table or figure.

The titles of journals should be abbreviated according to the style used in Index Medicus. Authors are required not to use abstracts, unpublished observations and personal communications as references. References to papers accepted but not yet published should be designated as "in press"; authors should obtain written permission to cite such papers as well as verification that they have been accepted for publication.

The references must be verified by the author against the original documents. The Uniform Requirements style (the Vancouver style) is based largely on an American National Standards Institute (ANSI) standard style adapted by the NLM for its databases.

Journal Article

List all authors when 6 or less. When 7 or more, list only first six and add et al. Ngan P, Yiu C, Hu A, Hagg U, Ei SHY, Gunel E. Cephalometric and occlusal changes following maxillary expansion and protraction. Eur J Orthod 1998; 20: 237-254.

Organization as Author

Australian Dental Association Inc. An Australian Schedule of Dental Services and Glossary. 7th edn. Sydney: Australian Dental Association Inc., 1996.

Complete Book

Department of Health. Shifting the balance of power within the NHS: securing delivery. London: Doll, 2001.

Clayton D, Hills M. Statistical models in epidemiology. Oxford: Oxford University Press, 1993.

Farkas LG. Anthropometry of the Head and Face, 2nd Edn, New York; Raven Press; 1994

Book Chapter Lekholm U, Zarb GA. Patient selection and preparation. In: Branemark P1, Zarb GA, Albrektsson T, editors.

Tissue integrated Prostheses: Osseointegration in Clinical Dentistry, Chicago: Quintessence; 1988,199-209

Thesis and Dissertation

Yong SJ. Bone mineral density of normal Korean adults. Ph.D. Thesis. Seoul, Korea; 1989 Anozike, AN. Orthodontic treatment needs and its impact on oral health related quality of life in Lagos school children aged 12-16 years. FMCDS. Dissertation. Lagos, Nigeria; 2006

Conference Proceedings

Marshall SJ, Rixon RC, Whiteford DN, Cumming JT. The OrthoForm 3-Dimensional Clinical Facial Imaging System. Proceedings of the 15th IFHE Congress 1998; 15:83-87.

Dictionary and Similar References

Stedman's medical dictionary. 26th ed. Baltimore: Williams & Wilkins; 1995. Apraxia; p.11 9-120. Unpublished accepted material Leshner Al. Molecular mechanism of cocaine addiction. N Eng J Med. In Press 1996.

Material from Internet

World Health Organization, 2002.
www .who.intlmental-health!prevention/suicide
(accessed August 1, 2004).

Tables

Each table should be typed in double-space on a separate sheet of paper. Tables not submitted as photographs must be numbered consecutively (Arabic numerals) in the order of their first citation in the text, with a brief but self explanatory title for each.
Each column should have a short or abbreviated heading.
Explanatory matters are placed in footnotes, not in the heading. In footnotes all nonstandard abbreviations that are used in each table should be explained adequately.
Statistical measures of variations should be identified such as standard deviation and standard error of the mean.
Be sure that each table is cited in the text. If data are used from another published or unpublished source, it is necessary to obtain permission and acknowledge them fully.

Figures and Instructions

Figures should be professionally drawn and photographed; freehand or typewritten lettering is unacceptable. Instead of original drawings, X-ray films, and other material, sharp, glossy, black-andwhite photographic prints of high quality are necessary, usually 127x 173 mm (5x7 in) but no larger than 203x254 mm (8x10 in) For color illustrations negatives or positive transparencies are provided, along with color prints. It is preferable to have the photograph in portrait form rather than in landscape form to fit easily into one column.
Letters, numbers and symbols in photographs should be clearly legible.
Each figure should have a label pasted on its back indicating the number of the figure, author's name, and an arrow to mark the top and left side of the figure.
It is unacceptable to write on the back of figures or scratch or mark them by using paper clips, and to bend figures or mount them on cardboard. If photographs of individual/people are used, either the subjects must not be identifiable or their pictures must be accompanied by written permission to use the photograph. It is advisable to cover the eyes unless specifically need to be shown. If a figure has been published, the original source should be acknowledged and written permission from the copyright holder be obtained to reproduce the material. Figures should be numbered consecutively (Arabic numerals) according to the order in which they have been first cited in the text.

Legends for Illustrations

Legends for illustrations should be typed or printed out in double-space, starting on a separate page, with Arabic numerals corresponding to the illustrations.
When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, each of them must be identified and explained in the legend. The internal scale should be explained and the method of staining in photomicrographs be identified.

Units of Measurement

Measurements of length, height, weight, and volume should be reported in metric units, i.e., meter(m), gram(g), or liter(l) or their decimal multiples.
Milliliter or deciliter should be expressed as ml or dl.
Red and white blood cell counts are to be expressed as 63 x10 /mc l and x10/ mc respectively. Temperatures should be given in degrees Celsius and blood pressures in millimeters of mercury (mmHg). All hematological and clinical chemistry measurements should be reported in the conventional system or in terms of the International System of Units (SI).

Abbreviations and symbols

Only standard abbreviations are used in the text while avoiding abbreviations in the title and abstract.
The full term for which an abbreviation stands should precede its first use in the text unless it is a standard unit of measurement. Year, month, day, hour, minute and second should be abbreviated as yr, mon, d, h, mm, and s in tables respectively.

References

1. Mother M, Schulz KF, Altman DG, for the CONSORT Group. The CONSORT statement Revised recommendations for improving the quality of reports of parallel group randomize Trials. Lancet 2001; 357: 1191-1194. (Also available from: URL: http ://www.consort-statement.orgl). Accessed June 28, 2002.
2. International Committee of Medical Journal Editors. Uniform Requirements for Manuscripts Submitted to Biomedical Journals. Ann Intern Med 1997;126:36-47. (Updated October 2001 version Available from: URL: http: //www.icmje.org/). Accessed June 28,2002.
3. JAMA Instructions for Authors. Available from URL: http :// jama.ama-assn.org/. Accessed June 28, 2002.
4. HaIl GM. Structure of a scientific paper. In: Hall GM, ds. How to write a paper. London:BMJ Books, 2000.
5. 52nd WMA General Assembly. World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. Available from: URL: http://www.wma.netl. Accessed June 28,2002.

Appendix 1:

Declaration of Originality and Transfer of Copyright

(Please download from Nigerian Association of Orthodontists (NAO) website https://www.nao-ng.org/)

This form is to be submitted with the initial copies of the manuscript to: West African Journal of Orthodontics, Department of Child Dental Health, Obafemi Awolowo University Ile-Ife, Osun State. Nigeria Manuscript No. (If known):

The author(s) hereby affirms that the submitted manuscript entitled:

I/We certify that the manuscript represents valid work and that neither this manuscript nor one with substantially similar content under my/our authorship has been published or is being considered for publication elsewhere. For papers with more than I author, we agree to allow the corresponding author to serve as the primary correspondent with the editorial office, to review the edited typescript and proof.

I/We have seen and approved the submitted manuscript. All of us have participated sufficiently in the work to take public responsibility for the contents. All the authors have made substantial contributions to the intellectual content of the paper and fulfill at least 1 condition for each of the 3 categories of contributions: i.e., Category 1 (conception and design, acquisition of data, analysis and interpretation of data), Category 2 (drafting of the manuscript, critical revision of the manuscript for important intellectual content) and Category 3 (final approval of the version to be published).

I/We also certify that all my/our affiliations with or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript are completely disclosed on the title page of the manuscript. My/our right to examine, analyze, and publish the data is not infringed upon by any contractual agreement.

I/We certify that all persons who have made substantial contributions to the work reported in this manuscript (e.g., data collection, writing or editing assistance) but who do not fulfill the authorship criteria are named along with their specific contributions in an acknowledgment section in the manuscript. If an acknowledgment section is not included, no other persons have made substantial contributions to this manuscript.

I/We also certify that all persons named in the acknowledgment section have provided written permission to be named.

The author(s) undersigned hereby transfer(s), assign(s), or otherwise convey(s) all copyright ownership, including any and all rights incidental thereto, exclusively to the West African Journal of Orthodontics, in the event that such work is published in the West African Journal of Orthodontics.

Authors name(s) in order of appearance in the manuscript; signatures (date):