Bilateral 90° Rotation of Maxillary Second Premolar: A Rare Case Report in Nigeria and Review of Literature

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ABSTRACT

Background: Rotation of a tooth within the dental arch is a clinical finding considered an observable mesiolingual or distolingual displacement of the tooth around its longitudinal axis. The reported prevalence of rotated teeth is between 10.2-20.2% in permanent dentition. It can either be unilateral or bilateral, with varied degrees of rotation.

Objective: To present a case of bilateral 90° Rotation of Maxillary Second Premolar, a rare finding that has never been reported in our environment.

Case Report: Case presentation of a 14-year-old male who was presented to the Orthodontic unit, Department of Child Dental Health, Aminu Kano Teaching Hospital, Kano, with a chief complaint of misaligned upper posterior teeth. The bilateral 90° rotated maxillary second premolars were diagnosed based on direct clinical assessment.
This reports a rare case of bilateral 90° rotated maxillary second premolars etiologic factors, prevalence, and the highlight of treatment plans in a 14-year-old male.

Conclusion: Bilateral 90° rotation of maxillary second premolars teeth within the dentoalveolar arch are clinical findings not often seen in the population.

Key words: Rotated teeth, 90° rotation, dental anomalies, bilateral 90° of premolars

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INTRODUCTION

Tooth anomalies present a set of developmental abnormalities of the primary or permanent dentition which are commonly encountered in clinical practice. They arise due to disturbances of genetic alteration or environmental factors[1–3] or possibly by a combination of both. Disturbance during the morpho-differentiation stage of development leads to size, shape and structure variation. At the same time, positional anomalies such as ectopic eruption, rotation and impaction of teeth arise from disturbance of the eruption path of dentition.[1,3–6]

Rotation of the tooth within the dental arch is considered the observable mesiolingual or distolingual displacement of the tooth around its longitudinal axis.[7] The aetiology of tooth rotation is not very clear; studies have opined that tooth rotations occur due to disturbances during the development of the tooth, which may lead to the displacement of the dental follicle and alteration in the path of eruption.[5,7,8]

The roles of trauma, benign pathologies within the arch, supernumerary teeth, retained primary teeth, oro-facial cleft, and severe crowding related to the segment of the arch have been found to contribute to the development of tooth rotation significantly. The level of displacement of a tooth around its long axis determines its classification, which can be rotation occurring <45°, rotation between 45° and 90° and rotation more than 90°.[5,6]

Reports from the literature have shown that dental anomalies have been observed to lead to malocclusion, occlusal problems, and esthetic concerns[1,9] and its attendant cost of treatment. Although it is common to see varying degrees of rotations in daily clinical practice, clinicians rarely encounter 90° bilaterally rotated second premolars in the maxillary arch with no occlusal disturbances.

Generally, data on tooth rotation in the literature are limited, and only a few studies conducted in India[5] and Saudi Arabia[3] population reported a prevalence of 10.2% and 20.2%, respectively. The most often rotated tooth was maxillary first premolars (7.9%), followed by mandibular canine (6.0%), and prevalence higher in males (22.8%) compared to females (17.6%) according to Vani et al.[3] Gurudutt Nayak and Inderpreet Singh[10] reported a 180° rotation of a maxillary second premolar in a 37-year-old Indian female; Suresh et al. [6] reported a bilateral 180° rotation of the maxillary second premolars in a 30-year-old Chinese male patient while Saimbi et al. [11] reported a bilateral 180° rotation of mandibular first molars in a 30-year-old male.

In this case, we report a rare case of bilateral 90° rotated maxillary second premolar and review the literature highlighting treatment plans. To the best of our knowledge, there is no previous report on bilateral 90° rotations of the maxillary second premolars from our center or geopolitical zone.

CASE REPORT

A 14-year-old boy accompanied by his father was presented to the Orthodontic unit, Department Child Dental Health, Aminu Kano Teaching Hospital, Kano, for orthodontic intervention with a chief complaint of misaligned upper posterior teeth which was first noticed two months before presentation (Figure 1). The family and medical history were non-contributory. There was no history of oral habits or previous dental intervention before the onset of the condition.

On extra oral examination, the facial form and proportion reflect a straight facial profile, competent lips and a symmetric face. The intraoral examination showed an Angle's class I molar relation and full complement of all permanent dentition adequate for the patient's age were present. However, the maxillary arch showed a rotation of 15 and 25, with both buccal and palatal cusps facing the distal and mesial sides of the arch, as seen in the clinical photograph, periapical radiograph and study model respectively (Figure 1, 2a and b).

Based on the above observation, a diagnosis of bilateral 90° rotated maxillary second premolars was made considering the clinical assessment, dental cast examination, panoramic and cephalometric radiograph. The father was therefore advised and reassured of the need for orthodontic correction, and informed consent and assent were sought for both the case report and orthodontic treatment.

A panoramic radiograph showed full complement of all permanent dentition, including the third molars with both buccal cusps of rotated maxillary 15 and 25 orientated toward the mesial surfaces of maxillary 16 and 26, respectively (Figure 3).

The lateral cephalometric radiograph obtained was analysed using manual tracing and it showed a class 1 skeletal pattern and proclined incisors (Figures 4a

and b) and the cephalometric summary of manual analysis (Table 1)

Figure 1: Intra-oral photograph of the patient

Figure 2a: Periapical radiographs of the rotated second maxillary premolars

Table 1. Cephalometric values of the patient

Cephalometric measurements	Value
SNA	86°
SNA	81°
ANB	5°
Ui-Fp	110°
Li-Mp	97°
I-I	121°
Y-AXIS angle	5.9/9.2=0.64
Jarabak's ratio	63%
MMA	34°

Figure 2b: Study model of the maxillary arch

Cephalometric radiographs of the patient

Figure 4a

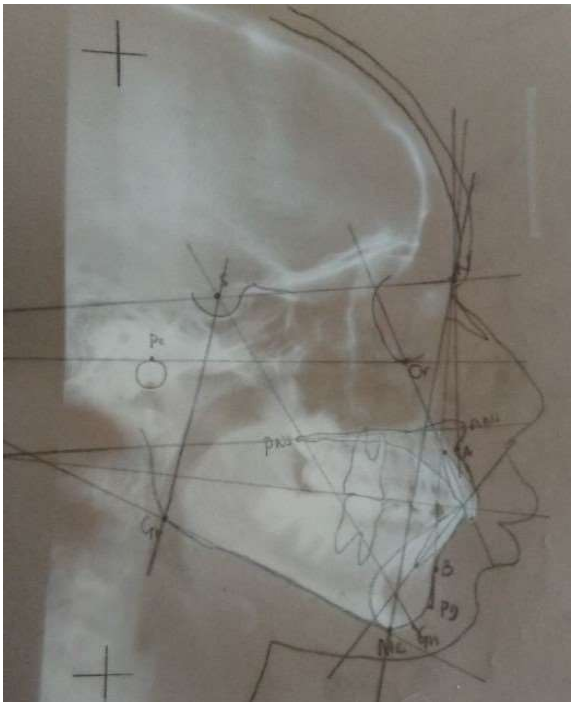

Figure 4b

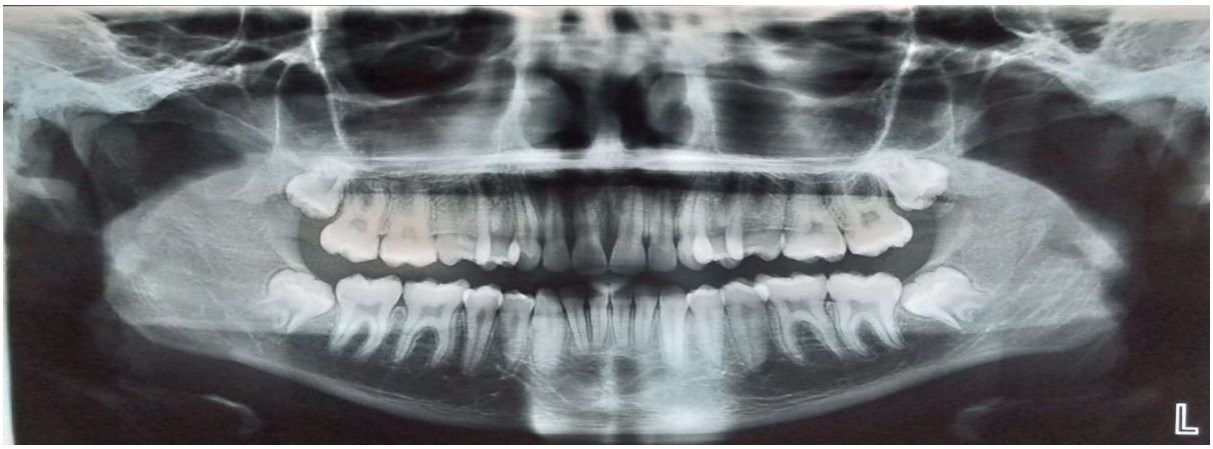

Figure 3: Orthopantomograph of the patient

DISCUSSION

Rotation of teeth in the permanent dentition is a common finding seen by dental clinicians with varying degrees of inclination ranging from mild rotation to a more pronounced axial rotation typically involving 90° to 180°.[5,6] Though the etiology is unclear, several theories have been postulated to describe the possible causes of tooth rotation; these include the "theory of axial gradients" and morphogenetic field theory.

The theory of axial gradients states that during embryogenesis, the polarity of a cell is determined by its metabolic rate. The pole with the highest metabolic rate gives rise to the "head", and the other gives rise to the "tail." However, due to uncertain causes, the lingual part of the tooth germ grows faster than the buccal part, thus leading to a buccal cusp.[6,12,13] The theory of morphogenetic fields proposed by Butler, then adapted for the human dentition by Dahlberg, suggested that there is a field of influence operating on each of the tooth classes (tooth germ) of the maxillary and mandibular arches which is controlled by the same genetic information, and allow this tooth classes to give rise to any type of tooth.[12] Each field was thought to have its strongest effect on the anterior or key tooth within a class. The more distally placed teeth, which generally develop later than those more mesially placed, were observed to show greater phenotypic variation.[6,12] The prevalence of rotated teeth in Nigeria, as reported by various researchers, varies depending on the geopolitical region. The prevalence of rotated teeth is reported to be 14.3% among 250 adult dental patients in Ibadan[14], 18.9% among a sample of 500 school children aged 12-15 years in Lagos[15], 20.7% among 300 orthodontic patients in Enugu[16], 9.6% among 480 school children aged 8-12 years in Ilorin[17] and 30.2% among 400 participants in Kano.[18]

In the present case of bilateral 90° rotated maxillary second premolar goes on to provide hypothetical support by Butler's morphogenic field. Other possible reasons include the early loss of primary molars, which causes mesial drifting of the permanent first molar hence, reducing the space for normal eruption of the premolar,[2] dental follicle displacement, and path of tooth eruption.[7]

The role of genetically determined tooth position can also occur, as HOX genes, which play a role in oro-dental development, are known to show site-specific antero-posterior expression patterns. Msx1 and Msx2 genes, components of HOX gene, are known to be responsible for the developmental position and development of tooth buds, respectively.[13] According to Thilander et al.[19] in their study to assess the prevalence of malocclusion in a population of Bogotanian, Colombia children and adolescents, the prevalence of >45° rotation was 8.9%, and the prevalence of each phase of dentition was primary (2.4%), early mixed (4.2%), late mixed (9.2%), and permanent (15.3%) respectively.

This present report shows that bilateral 90° rotation of maxillary second premolar is the first case reported from our center and the geopolitical zone in Nigeria. The treatment plan proposed was to either counsel patient to leave them alone as there was no occlusal interference or to carry out fixed orthodontic appliance therapy to align the maxillary and mandibular arches, simultaneous de-rotation of

rotated premolar by the use of the force couple technique of de-rotation, and post-treatment retention of the maxillary arch.

CONCLUSION

90-degree rotation of the same teeth bilaterally in the same arch is quite uncommon as reported in this case. Its exact aetiology is unknown, but genetic and environmental factors have been implicated. Although it is common to see varying degrees of rotations, early detection is necessary to prevent complications that could arise with its attendant cost of treatment.

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Conflict of interest

None declared

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