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Review Article

**CORRECTION PROCEDURE OF MAXILLARY CANINE
TRANSPOSITION- REVIEW**

**Khalid Omar Baeshin,
Linah turki al-labban,
Rania Omar Sairafi,
Ahlam yahya Bakhsh,
Nouf hussein baeshen,
Abdulkarim esamil alkhuzami,
Majdah Ibrahim Mali,
Sawsan ghaith alshareef,
Ghaida Yassir Alfagih,
Elham mohammednoor jamal,**

Abstract:

Maxillary canine and first premolar transposition are a difficult dental anomaly to treat, especially if the clinician's goal is to move the canine into its normal position orthodontically. Early detection of this pathology with cone-beam computed tomography simplifies treatment. In terms of treatment planning and orthodontic management, such cases are frequently extremely difficult. One of the most common transposed teeth is the canine, which is ectopically positioned with either the lateral incisor or the first premolar. Narrative review of literature conducted among databases such as PubMed, for all relevant studies that were published up to 2022.

Partial or complete transposition is possible. Despite their low prevalence in the general population, transpositions pose a challenge to orthodontists, particularly if treatment is aimed at correcting tooth order. The diagnosis, planning, and treatment of a unilateral maxillary canine-first premolar transposition in a female patient treated orthodontically without premolar extraction and with transposition correction are described in this article. Treatment options, advantages and disadvantages of each method, and treatment mechanics are also discussed.

Corresponding author:**Khalid Omar Baeshin,**

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INTRODUCTION:

The positional interchange of two adjacent teeth or the development or eruption of a tooth in a position normally occupied by a nonadjacent tooth is referred to as tooth transposition [1]. Transposition can be complete when both teeth (crowns and roots) have been completely transposed or incomplete when only the crowns or roots have changed positions [2,3]. The literature has presented etiologic factors such as genetic inheritance, interchange of the position of developing tooth buds, trauma, early loss of permanent teeth, and lack of space. The prevalence of tooth transposition varies by population, but all have a low incidence (0.2%-0.4%) [4].

The impact of sex is unknown. Some studies have found that transpositions are more common in females than in males, while others have found no difference between the sexes [5]. Transpositions occur more frequently in the maxilla than in the mandible, and unilateral transpositions outnumber bilateral transpositions 88% to 12% [6]. Transposition of a maxillary canine and a first premolar is the most common type [3,6].

In these cases, there are several treatment options available, including tooth extraction if the degree of crowding necessitates it, posterior space closure, tooth extraction with posterior implant replacement, surgical repositioning, a surgical-orthodontic approach to reverse and correct the transposition, or orthodontic treatment that leaves the teeth transposed. Cone-beam computed tomography (CBCT) is currently the best method for ensuring accuracy and determining the feasibility of treating a transposition. If a surgical-orthodontic approach is required, determining the correct access and choosing the best direction in which to apply orthodontic forces is critical [7].

METHODOLOGY:

Narrative review conducted through medical electronic databases; such as PubMed and Embase, for all relative articles that were discussing the concern title of our studies, and published up to 2022. Moreover, we have searched included references for more similar studies to support the review. Limitation to only human subjects and English published studies.

DISCUSSION:

Transposition has been defined as the movement of two permanent teeth within the same quadrant of the dental arch [8]. The canine is the most commonly transposed tooth, erupting mesially to the lateral incisor or distally to the first premolar [9].

Tooth transposition is a relatively uncommon occurrence (0.33% prevalence), occurring more frequently in female patients and in the maxilla than in the mandible [3,4,5]. Unilateral canine transposition is more common (79%) and more common on the left side (69%) [10]. In 5% of cases, bilateral transposition has been reported [11]. Tooth transposition is a multifactorial condition that appears to be caused by both genetic and environmental factors. Early diagnosis and treatment are recommended, but this necessitates a complex and lengthy treatment protocol as well as a cost-benefit analysis [12].

Transpositions were classified as follows by Peck et al. [13]: maxillary canine-first premolar, maxillary canine-lateral incisor, maxillary canine to first molar site, maxillary lateral incisor-central incisor, maxillary canine to central incisor site, and mandibular lateral incisor-canine. Orthodontic treatment aims to restore dental occlusion and improve facial esthetics while preserving temporomandibular joint and periodontal health [14]. Tooth extractions, surgical repositioning, a surgical-orthodontic approach to reverse and correct the transposition, or orthodontic treatment to keep the teeth transposed are all potential treatment options for dental transposition [13,14,15]. When a transposed tooth does not erupt, surgical exposure of the dental crown is required, followed by careful orthodontic traction to avoid damage to the roots of adjacent teeth [15].

Tooth transposition can have a negative impact on normal dentition from both an esthetic and functional standpoint; therefore, it is critical to understand the etiological factors influencing the incidence and prevalence of this abnormality so that possible preventive measures can be established [16]. There are numerous factors that contribute to the etiology of tooth transposition, as well as numerous existing theories that describe variables related to the location of the transposition and the involvement of specific teeth. A similar occurrence has been observed in both genders [17]. Tooth transposition is caused by a variety of etiologic factors, including genetics, changes in the position of developing tooth buds, trauma, mechanical interferences, and early loss of incisors [18]. The most common teeth involved in transposition are maxillary canines, which have a prevalence rate of 0.14%-0.51%, with left side unilateral transpositions being the most common [19]. The most common is maxillary canine - first premolar transposition, with an incidence rate of approximately 0.13% in the population, representing 71%-89.2% in total [20]. The etiology of maxillary canine - first

premolar transposition has been confirmed as an autosomal recessive mutation [21].

Tooth transposition has been observed in conjunction with other dental anomalies in various literatures, and has been reported in 40% of cases with agenesis, 25% of cases with peg shaped lateral incisors, and 50% of cases with deciduous tooth retention. Nearly 25% of maxillary canine - first premolar cases had unilateral or bilateral absence of lateral incisors. There was a significant relationship ($p < 0.001$) between lateral incisor agenesis and maxillary canine - first premolar transposition [7]. To achieve a long-term esthetic and functional outcome, a multidisciplinary approach is required for the successful treatment of this anomaly [22].

The physiologic tooth migration and tooth eruption path are determined by the morphology and growth pattern of the connective tissues of the jaws. While the shape of adjacent structures, particularly teeth in the anterior maxilla, determines the position of tooth crypts in the upper jaw [23]. The eruption path of a tooth is generally determined by the orientation of the root, which can be influenced and altered by adjacent structures such as maxillary spaces, variations in growth speed, and mechanical interferences [23]. It has been discovered that the tooth bud in the pre-eruptive stage of the maxillary canine is located adjacent to the apertura piriformis, which is at a relatively higher position occupied by pre-erupted premolars. As a result, it may be the primary cause of maxillary canines with a higher risk of ectopic eruption [24]. Trauma to deciduous teeth, as well as bone pathologies such as nonunion, cyst, and tumor formation, cause disruption in the eruption path of permanent tooth germs. Furthermore, the increased prevalence of retained deciduous canine and the presence of permanent canine transposition creates a cause-effect relationship.

However, whether the retention of the primary tooth is responsible for the displacement of its permanent successor or a changed path of eruption of the corresponding successor may lead to the retention of the primary tooth is unknown [25]. Many factors influence treatment outcomes when treating transpositions, including esthetics, occlusion, treatment period, patient comfort, patient cooperation, and periodontal support. Aside from the factors listed above, age is the most noticeable factor that is directly related to tissue regeneration [26]. There is a possibility that the medial deviation of the left canine was caused by lateral incisor agenesis in this case. This resulted in the eruption of the permanent canine in place of the permanent lateral incisor, as well as the

primary canine's persistence. Pediatric dentists play an important role in the prevention and detection of these types of abnormalities, based on the timely detection of variations in tooth position, allowing for early diagnosis and treatment [27]. This is beneficial in case evolution and reduces the likelihood of tooth transposition [28]. Any attempt at orthodontic correction is thwarted by a late diagnosis of tooth transposition after the permanent canine has completely erupted. There is also a greater risk of damage to supporting structures if orthodontic correction is performed in these cases. To avoid this, the tooth should be restored in its erupted sequence and treated similarly [29].

The impact of sex is unknown. Some studies have found that transpositions are more common in females than in males, while others have found no difference between the sexes [30]. Transpositions occur more frequently in the maxilla than in the mandible, and unilateral transpositions outnumber bilateral transpositions 88% to 12% [31]. Transposition of a maxillary canine and a first premolar is the most common type [32].

In these cases, there are several treatment options available, including tooth extraction if the degree of crowding necessitates it, posterior space closure, tooth extraction with posterior implant replacement, surgical repositioning, a surgical-orthodontic approach to reverse and correct the transposition, or orthodontic treatment that leaves the teeth transposed. Cone-beam computed tomography (CBCT) is currently the best method for ensuring accuracy and determining the feasibility of treating a transposition. If a surgical-orthodontic approach is required, determining the correct access and the best direction in which to apply orthodontic forces is critical [33].

CONCLUSION:

Because of the presence of lateral incisor and first premolar as weak abutments, canine replacement in fixed prosthodontics is considered a difficult process. However, in the present case report, even though there is space at the canine position, transposed canine at the lateral incisor position could serve as adequate abutment for the replacement. Treatment options include extracting one of the transposed teeth, leaving them in their transposed position, or repositioning them within the dental arch in their normal position. The length of treatment. The presence of this anomaly in the mandible adds to the clinical challenges imposed by anatomical constraints related to cortical

bone density and the narrow labio-lingual dimension of the alveolar process. Any attempt to move teeth in the labio-lingual plane to correct transposed teeth to their normal position is difficult and may result in periodontal support loss, gingival recession, and root resorption.

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