

REVIEW ARTICLE***Transmigration of tooth: a review***Santosh Kumar¹, A.K. Chauhan², Paras Aswal³, Prashant Shahi³, Sumandeep³**Abstract**

Intraosseous migration of unerupted teeth is a rare dental condition of horizontal tooth movement and impaction. The presence of a transmigrated tooth is one of the most difficult challenges that an orthodontist will meet. Orthodontic treatment is planned on an individual basis after thoroughly considering the patient's overall facial and dentoskeletal characteristics; the duration, risks, and costs of treatment; patient preferences; and the orthodontist's experience. Early radiographic detection and timely interception, plays important role in management of teeth which has an increased tendency towards transmigration and avoid future complications.

Keywords: *Intraosseous, transmigration, dentoskeletal*

INTRODUCTION

An unerupted tooth occasionally migrates to a location some distance away from the site in which it developed, but it usually remains within the same side of the arch

Ando et al were the first to use the term "transmigration."¹

Tarsitano et al² defined transmigration as the phenomenon of an unerupted mandibular canine crossing the midline.

Joshi³ felt that the tendency of a canine to cross the barrier of the mandibular midline suture is a more important consideration than the distance traveled.

Migration of a tooth across the jaw midline without the influence of any pathological entity is called as transmigration.

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Javid⁴ expanded the definition to include cases in which more than half the tooth had passed through the midline.

Migrated canines typically remain impacted. Infrequently, they may erupt ectopically at the midline or on the opposite side of the arch. Occasionally, transmigrated teeth have erupted into the line of the arch and have been taken for supplemental canines.

Caldwell and Bruszt⁵ provided neurological evidence that the canines did not develop in the region in which they were found but had migrated there from a position in or near their correct developmental site. Surgical removal of the tooth with an inferior dental nerve block on the migrated side caused pain. Pain ceased on blocking the contralateral side confirming the origin of the tooth because it maintained its nerve supply from the original side. Furthermore, though both mandibular canines were found on the same side of the mandible, their morphology suggested that they belonged to opposite sides of the lower jaw because the teeth are mirror images of each other.

Ando et al¹ demonstrated the transmigration of a mandibular canine across the mandibular symphysis to the opposite side of the dental arch by serial radiographs taken over several years.

Greenberg and Orlian⁶, over a 30-month period, followed the transmigration of a normally positioned unerupted mandibular left canine to a position of horizontal impaction below the apices of the four incisors.

Howard, Kerr⁷, and Wertz⁸ also cited cases where an apparently normal lower canine, for no apparent reason, tipped mesially and started to migrate across the lower incisors.

Transmigration of mandibular canine is classified by Mupparapu⁹ in 2002 on the basis of its path of deviation.

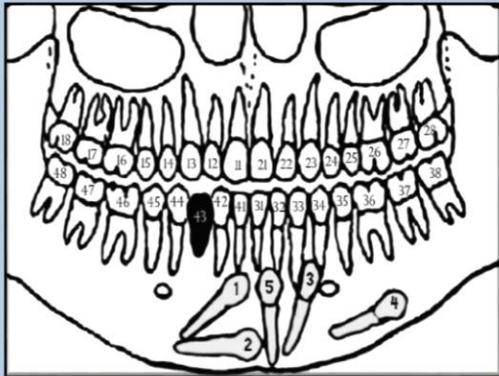


Figure 1: Mupparapu's classification

He classified transmigration in 5 types:-

1. **Type 1:** canine positioned mesioangularly across the midline within the jaw bone, labial or lingual to anterior teeth, and the crown portion of the tooth crossing the midline (45.6%).
2. **Type 2:** canine horizontally impacted near the inferior border of the mandible below the apices of the incisors (20%).
3. **Type 3:** canine erupting either mesial or distal to the opposite canine (14%).
4. **Type 4:** canine horizontally impacted near the inferior border of the mandible below the apices of either premolars or molars on the opposite side (17%).
5. **Type 5:** canine positioned vertically in themidline (the long axis of the tooth crossing the midline) irrespective of eruption status (1.5%).

INCIDENCE

The incidence of transmigration has increased over the past 50 years with the introduction of dental panoramic tomography.

Mandibular canine¹⁰ is reported to be most common tooth to transmigrate followed by maxillary canine.

Other types of teeth are also known to transmigrate, such as mandibular lateral incisors or mandibular premolars, although this phenomenon (0.079%) is less common than transmigrated mandibular canines.¹¹

Aydin et al.¹⁰ reported a panoramic radiographic survey of 4500 patients in a Turkish subpopulation, which revealed 14 cases of canine transmigration, out of which six were maxillary and eight mandibular canines, with an incidence of 0.31%.

Javid⁴ reported a radiographic survey of 1000 students which revealed only 1 case of transmigrated impacted mandibular canine.

Aktan¹⁰ and associates reported a panoramic radiographic survey of 5000 patients and observed that transmigration of impacted mandibular canines was greater than the maxillary canines. Women were affected more often than men. Most of the cases reported in the literature were unilateral mandibular canine transmigration and a very few were cases of bilateral canine transmigration.

ETIOLOGY

1. Heredity

The most commonly accepted explanation is the abnormal displacement of the dental lamina in the embryonic life.
2. Presence of obstacle

Noidine emphasized that even a very small obstacle, such as a small root fragment or an odontoma, would be sufficient to divert a tooth from its normal path of eruption.
3. Agenesis of permanent lateral incisors

Ando et al. suggested that agenesis of permanent lateral incisors may result in deviated path of eruption and hence the transmigration.
4. Presence of cystic lesion

Al-Waheidi¹³ suggested that transmigrated canines are usually associated with a cystic lesion and that the presence of a cyst at the crown of the canine may facilitate the migration process.

Joshi³ and Howard, did not report any associated cystic lesions with transmigration. However, it is difficult to determine the role of cystic lesions in the etiology of transmigration. A cyst is an expansive lesion and is more likely to displace the tooth in any direction in the path of the least resistance.

Bruzst¹⁴ suggests that the canine germ is situated in front of the lower incisors and that facial growth pushes the canine towards the contralateral side. Other authors¹⁵ claim that a strong eruption force or a change affecting the crypt of the tooth germ might lead to erroneous eruption.

DIAGNOSIS

Patient's history (Clinical and radiological information) :

1. Age and gender,
2. Presence of primary canines, clinical symptoms encountered (inclination, rotation or/and migration of the neighboring teeth, referred pain),
3. Radiographic findings from the adjacent teeth (presence of root resorption, size and shape of the pulp chamber and the root canal),
4. Thermal and electrical vitality tests of the adjacent teeth compared to contralateral teeth,
5. Treatment options and treatment provided.

CLINICAL FEATURES:-

1. Retained primary tooth
2. Deviated midline
3. Absent permanent tooth
4. Agenesis of lateral incisor (in canine transmigration)
5. Incisor proclination
6. Root resorption of adjacent tooth
7. Tipping, and sensitivity of adjacent teeth
8. Pain or discomfort for the patient (rarely)

INVESTIGATION :-

- A. OPG
- B. Occlusal radiographs
- C. IOPA
- D. Lateral cephalogram
- E. CBCT

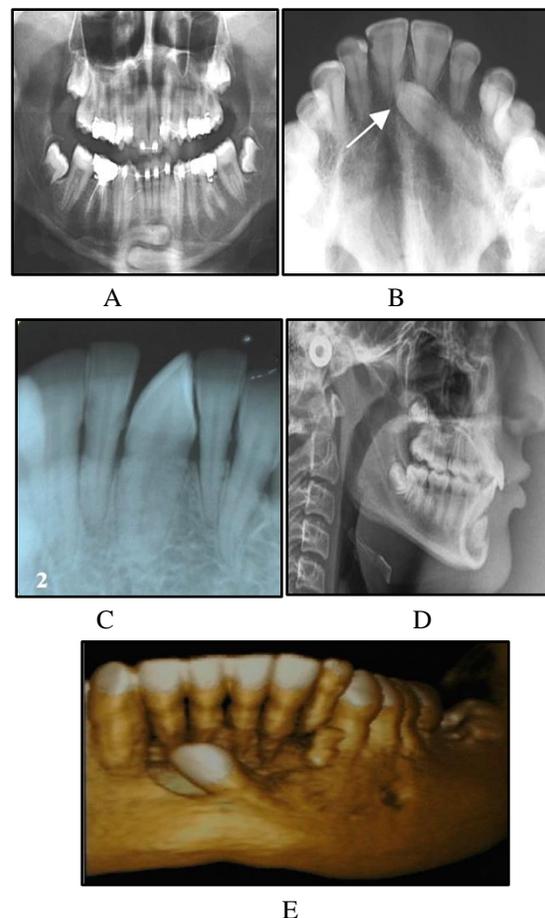


FIG 2: Investigation techniques (A) OPG (B) occlusal radiograph (C) IOPA (D) lateral cephalogram (E) CBCT 3-d reconstruction

Influence of axial inclination

Howard observed that those canines with axial inclination between 25° and 30° to the midsagittal plane represent a group of unerupted canines that are displaced but not migrating across the mandibular midline. Those impacted canines that are between 30° and 95° are a group that tends to cross the midline. An overlap appears to exist between 30° and 50° . When this angle exceeds 50° , crossing the midline becomes a rule.

Joshi³ reported the axial inclination to the midsagittal plane of migratory canine ranged from 45° to 95° .

Management

The treatment of transmigrated canines depends on the radiographic position and the clinical symptoms presented.

Treatment consideration-

1. Location
2. Angulation
3. Condition

Treatment options-

1. Radiographic monitoring
2. Surgical removal
3. Surgical and orthodontic
4. Autotransplantation

Preventive and Interceptive Treatment.

A small root fragment or an odontoma interferes with the normal path of the eruption of the tooth, hence their removal would facilitate its eruption.

Taguchi et al. reported, after removal of the odontoma and surgical exposure an improvement in the position of the associated canines.

Vichi and Franchi suggested that an 8-to 9-year-old patient with an excessive mesial inclination of the unerupted mandibular permanent canine should be kept under critical observation with periodical panoramic radiographic examination. If the position of the unerupted mandibular canine is observed to progressively tilt more to the mesial, interceptive measures should be taken.

The preventive and interceptive treatment includes extraction of the retained deciduous canine and surgical exposure of the impacted canine followed by orthodontic treatment. This emphasizes the importance of early diagnosis to correct this problem before the tooth migrates too far from its original location.

Radiographic Monitoring.

Transmigrated tooth can be left in place if it is symptomless and not associated with any pathology.

A series of periodic radiographs should be taken to check the status of the transmigrated tooth.

A continuous worsening of position or development of cystic lesion and in case of severe root resorption of adjacent teeth, surgical removal is indicated.

Surgical Exposure and Orthodontic Treatment. (fig 3)

The transmigrated canine, when detected early, can be surgically exposed and moved to its ideal position by using orthodontic forces. The biggest biomechanical challenge for orthodontic traction is when the canine is labial to the mandibular incisors and the crown is required to move in a vestibular manner ahead of the roots of these teeth to avoid compromising their integrity while the canine is moved to its right place in the alveolar ridge (Becker)¹⁶

Wertz⁸ reported the successful correction of three cases using orthodontic treatment, where lower canine was transmigrated labially. Kumar and associates¹⁷ recently reported one case of successful eruption of transmigrated lower left canine after orthodontic traction, which was located with its crown below the apices of the right central incisor. However, if the crown of such a tooth migrates past

The opposite incisor area or if the apex is seen to have migrated past the apex of the adjacent lateral incisor, it might be mechanically impossible to bring it into place.



FIG 3: Traction of transmigrated canine with the use of mini implants¹⁸

Transplantation (fig 4)

If the transmigrated canine is in a favorable position for surgical removal in one piece asymptotically and there is sufficient space with retained deciduous canine, transplantation may be undertaken.

Timing of transplant is very important since a primary objective is to obtain maximum root length. The best time to perform the procedure is when the root length of the tooth is between one-half and three-fourths complete for the reestablishment of blood supply.

The prognosis is diminished as the root apex nears closure. The length of time from removal to reinsertion should be minimal; ideally, this is a nonstop relocation and desiccation of the periodontal ligament can cause resorption, ankylosis, and failure.

Howard¹⁹ transplanted a transmigrated canine when there was enough space, and retained deciduous canine was present to accommodate the tooth.

Retrograde endodontic treatments are performed simultaneous to transplantation with varying degrees of success; such treatment introduces a foreign substance into the site, possibly inducing an inflammatory reaction, but it greatly increases the length of the procedure and the time the transplant remains out of the mouth. Such manipulation will assuredly traumatize the root surface. It would be more judicious to perform the root canal treatment after the periodontal ligament attachment has readapted if such treatment proves necessary.



FIG 4: Autotransplantation of lower right canine

Surgical Removal.

Wetz⁸ stated that it is orthodontically impossible to reposition the tooth to its ideal position once the canine crown migrated past the adjacent lateral incisor root apex. Surgical removal is indicated in

cases where the transmigrated canine is associated with pathology or neurological symptoms.

Joshi³ suggested that when the extraction is to be attempted under local anesthesia it is important to anesthetize the nerve of the side to which the canine belongs. However, if general anesthesia is to be used, this problem does not arise. He also suggested that the surgical removal of a transmigrated tooth should be done as far as possible through an intraoral approach. Nevertheless, if necessary, an extra oral approach can be used in extreme unusual cases of canine transmigration.

Conclusion

Transmigration of the mandibular canine is the rarest phenomenon. Missing permanent tooth or teeth, mixed dentition, proper investigation, especially pantograph, is almost mandatory to detect such abnormality at an early stage and for better treatment planning and to avoid possible complications due to delay.

Reference

1. Ando S, Aizawa K, Nakashima T, Sanka Y, Shimbo K, Kiyokawa K. Transmigration process of the impacted mandibular cuspid. *J Nihon Univ Sch Dent.* 1964;6:66-71.
2. Tarsitano JJ, Wooten JW, Burditt JT. Transmigration of nonerupted mandibular canines: report of cases. *J Am Dent Assoc.* 1971; 82:1395-1397.
3. Joshi MR. Transmigrant mandibular canines: a record of 28 cases and a retrospective review of the literature. *Angle Orthod.* 2001; 71:12-22.
4. Javid B. Transmigration of impacted mandibular cuspids. *Int J Oral Surg.* 1985;14:547-549.
5. Caldwell JB. Neurological anomaly associated with extreme malposition of a mandibular canine. *Oral Surg Oral Med Oral Pathol.* 1958;11:89-90.

6. Greenberg SN, Orlian AI. Ectopic movement of an unerupted mandibular canine. *J Am Dent Assoc.* 1976;93:125–128.
7. Kerr WJ. A migratory mandibular canine. *Br J Orthod.* 1982;9: 111–112.
8. Wertz RA. Treatment of transmigrated mandibular canines. *Am J Orthod Dentofacial Orthop.* 1994;106:419–427.
9. M.Mupparapu, A. Auluck, S. Suhas, K. M. Pai, and A. Nagpal, “Patterns of intraosseous transmigration and ectopic eruption of mandibular canines: review of literature and report of additional cases.” *Denomaxillofacial radiology.* 2002;31:355-360.
10. U. Aydin, H. H. Yilmaz, and D. Yildirim, “Incidence of canine impaction and transmigration in a patient population.” *Dentomaxillofacial Radiology.* 2004 ; 33(3): 164–169.
11. Isa-Kara M, Ay S, Murat-Aktan A, Sener I, Bereket C, Ezirganli S, Demirkol M Analysis of different type of transmigrant mandibular teeth. *Med Oral Patol Oral Cir Bucal .* 2011.
12. A.M. Aktan, S. Kara, F. Akgönlü, and S. Malkoc, “The incidence of canine transmigration and tooth impaction in a Turkish subpopulation,” *European Journal of Orthodontics.* 1996; 32:575–581.
13. E. M. H. Al-Waheidi, “Transmigration of unerupted mandibular canines: a literature review and a report of five cases,” *Quintessence International,* 1996;27(1): 27–31.
14. Bruszt P () Neurological anomaly associated with extreme malposition of a mandibular canine. *Oral Surg Oral Med Oral Pathol.* 1958;11:89–90.
15. Shapira Y, Kufte NC. Unusual intraosseous transmigration of a palatally impacted canine. *Am J Orthod Dentofacial Orthop.* 2005;127:360–363.
16. Becker A. Orthodontic treatment of impacted teeth. 2012. Aufl.; 3rd ed. USA: Wiley-Blackwell.
17. Santosh Kumar, Priyanka Jayaswal, Kalyana Chakravarthy Pentapati, Ashima Valiathan, Nidhi Kotak. Investigation of the transmigrated canine in an orthodontic patient population. *Journal of Orthodontics.* 2012;39:89–94.
18. Sonia Patricia Plaza Orthodontic traction of a transmigrated mandibular canine using mini-implant: a case report and review Orthodontic Department, UniCIEO, Private Practice, Bogotá, Colombia 2016.
19. Howard RD. The anomalous mandibular canine. *Br J Orthod.* 1976;3:117-21.