A Novel Approach for Correction of Tooth Transposition

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ABSTRACT

Tooth transposition is defined as the positional interchange of two adjacent teeth within the same quadrant. The new concept of interdisciplinary collaboration between orthodontics and other specialties of dental medicine is best synthesized by the word TEAM (together everyone achieves more). The success of any dental procedure is not considered without careful consideration of other allied branches. Orthodontic correction does not always guarantee a full treatment. Corrective and restorative phases are required to complete the procedure. In this article, we present a case with canine premolar transposition, and its interdisciplinary management with novel restorative procedure.

Keywords: Interdisciplinary treatment, Tooth transposition, Ceramic tints, Gingival esthetics.

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INTRODUCTION

Tooth transposition is defined as the positional interchange of two adjacent teeth within the same quadrant.

It is termed as complete transposition when the crowns and the roots of the involved teeth exchange places in the dental arch and as incomplete transposition when the crowns are transposed but the roots remain in their normal positions.1-5 The incidence has been reported as about 0.4%. Tooth transpositions occur more commonly in the maxilla than the mandible, and the maxillary permanent canine has been reported as the tooth most frequently involved in transposition with the first premolar followed by transposition between the maxillary permanent canine and maxillary lateral incisor.6 In this article, we present a case with canine premolar transposition, and its interdisciplinary management with novel restorative procedure.7 The new concept of interdisciplinary collaboration between orthodontics and other specialties of dental medicine is best synthesized by the word TEAM (together everyone achieves more).8 An interdisciplinary approach to dentistry is now considered as an emerging trend.

CASE REPORT

A 23-year-old male patient presented with irregular upper anterior teeth. On examination, it was observed that the maxillary arch was constricted. Upper left lateral incisor was in palatal crossbite. Upper left canine and first premolar was in transposition (Figs 1 and 2). Upper left first molar was in palatal crossbite. Skeletally patient had a mild asymmetry and a prominent chin.

On studying the case, it was noticed that by orthodontic treatment, except tooth transposition other anomalies could be treated. Therefore, treatment modality involves three phases namely orthodontic phase, periodontic phase and restorative phase.

Fig. 1: Upper left canine and first premolar in transposition (frontal view)
Orthodontic Phase
Orthodontically, it was planned to expand the maxillary arch with the help of Hyrax Expansion Screw (Rapid Maxillary Expansion). In a span of nearly 1 month, 5 mm of expansion was achieved (Fig. 3). The bite was raised, 0.022 MBT (preadjusted edgewise appliance) appliance was placed. In nearly 4 months of time, the initial alignment was achieved. The arch wire sequence followed was 0.016 Nickel Titanium (NiTi) wire for 1 month, next 0.016 × 0.022 NiTi wire for 1 month, 0.017 × 0.022 Stainless Steel (SS) wire and finally 0.021 × 0.025 SS wire was inserted. Adequate torque was achieved. Crossbite correction was achieved on the left side with the help of intermaxillary elastics using reciprocal anchorage. Orthodontic treatment part was complete in almost 8 months (Fig. 4).

Periodontal Phase
After Orthodontic treatment, it was decided to reshape upper lateral incisor and lengthen the crown margin of upper left first premolar to resemble the canine. Another treatment protocol was to use the tissue of the first premolar as a graft for the canine. But this was unacceptable as autografts have not shown predictable results and patient was not keen on it. Cosmetic contouring of lateral incisor was done and crown lengthening procedure of the canine was advised to which the patient declined. It was evident that he wanted to avoid any surgical intervention at the moment. Oral prophylaxis was carried out following which the patient was sent to the department of conservative dentistry.

Restorative Phase
The premolar was transpositioned in place of the canine. The premolar had to be redesigned to look like the canine. The palatal cusp had to be removed as it was interfering with the lower canine. For this, it was initially decided to carry out intentional root canal treatment (RCT) as cusp removal could lead to severe hypersensitivity and pulpal exposure. The patient was unwilling to undergo RCT so it was decided to remove the palatal cusp and evaluate. Cusp removal did not devitalize the pulp and hypersensitivity was minimal. A coating of bonding agent was placed on the flattened surface and patient was comfortable. The buccal cusp appeared flattened and therefore, it was contoured to resemble canine.

Now the canine had to resemble the premolar. At the cervical third of the canine, a cavity was created (Fig. 5). Pink composite (Giomer beautiful flow gum shade F02-Shofu) in which Ceramic
Tint (VITA Akzent natural surface colour effect) was added to mimic the gingiva, was placed in a mixing well to form a thick paste (Figs 6 and 7). The shade used was Redwood (Akz 12-VITA Zahn Fabrik H Rauter GmbH &Co.KG D-79713 Bad Säckingen Germany). Etching and bonding was achieved using Tetric N Bond (Fig. 8). The gingival trough was built up with the prepared composite material keeping in mind that there are no overhangs. The material was then light cured. Finishing and polishing was done with composite finishing and polishing system (Enhance Dentsply Caulk, Milford) (Fig. 9). Dental floss was passed through the contact area. The buccal cusp of the premolar was built up with composite to resemble the
canine and the incisal sharpness of the canine was ground to resemble the premolar (Fig. 10). The result was satisfactory (Fig. 11).

Color plates showing preoperative and postoperative treatment changes.

Plate I: Intraoral view (front view), plate II: Intraoral view (left lateral view), plate III: Extraoral view (Figs 12A to C).

**DISCUSSION**

This was a case of complete transposition that is the complete transposition of the crown as well as the root. Among many types canine-premolar transposition is the most common anomaly. Such cases are usually managed as nonextraction basis keeping the transposed order of the teeth.

Dental esthetics is based not only on the ‘white component’ of the restoration but also on the ‘pink component’. Trying to restore a defective environment inside the esthetic zone will always be challenging. Training to reproduce not only the teeth but also the gingival esthetics and anatomy are paramount. Currently with the quality of available materials (ceramics and composite resins), it is possible to mimic the esthetics of...
natural teeth and gingiva. This was done keeping in mind patients decision as well as economical factors.

Restorations need to be carefully reviewed, maintained and replaced throughout the patient’s life and the lifespan of some restorative options need to be carefully evaluated. The other treatment restoration would be ceramic crown for the canine but it would involve additional tooth preparation and good lab support. The innovative technique used here is a quicker and easier one. No elaborate laboratory procedures are involved. The gingival composite used here was too light to match the adjacent gum tissue. The porcelain stains used in this technique, to get the shade of gingiva readily dissolved with the flowable composite used, which shows that they must be chemically compatible with each other. The stains merged well and this could be estimated by the high polish ability of the restoration.

The advantages of this technique is, there is no composite resin impingement on the soft tissue, the ceramic tints which are used help to get the exact shade of the lost gingival tissue which was not possible with composite stains and it is also very cost effective. Shade selection was done by mixing the various ceramic tints with the flowable composite resin of gum shade and light curing them on the prepared tooth surface without acid etching and application of bonding agent. Further studies have to be done to find out the chemistry of the mixture (that is flowable composite and ceramic tints) and long-term evaluation of the cases to check the outcome of the treatment.

Gingival defects may be treated with surgical or prosthetic approaches. With successful surgical treatment, the result mimics the original tissue contours. Such treatments include minor procedures to rebuild papillae and grafting procedures that may involve not only soft tissue manipulation but also bone augmentation to support the soft tissue. It is possible to create esthetically pleasing and anatomically correct tissue contours when small volumes of tissue are being reconstructed, but this method is unpredictable when a large volume of tissue is missing. The surgical costs, healing time, discomfort and unpredictability make this choice unpoplar. Prosthetic replacement, with composite resins and porcelains is a more predictable approach to replacing lost tissue architecture. It is especially useful when a small amount of tissue needs replacement. The patient need not undergo any additional surgical procedures and receives an esthetically pleasing, functional restoration. It is possible to show the patient a preoperative result before proceeding to place the permanent restoration.

CONCLUSION

Interdisciplinary dentistry helps to treat patients with multiple defects in the teeth and malocclusion. Esthetic defects include malformed teeth, transposed teeth, gingival recession, periodontal attachment loss and discolorations. During the esthetic consult, it is important that all treatment options be discussed fully. When alternative restorative treatment plans are presented, each should include their advantages and disadvantages.

It is likely that clinicians will continue to develop innovative strategies to meet the esthetic challenges presented by periodontally healthy but compromised patients as part of their long-term management. It is important that successful treatment options are shared to provide practitioners with a wide range of options for the treatment of the esthetic problems.

REFERENCES