Interdisciplinary Therapy in Orthodontics: An Overview

Khumanthem Savana¹, Akram Ansari², Rani Hamsa PR³, Mukesh Kumar⁴, Abhay Jain⁵, Ankit Singh⁶

¹Post Graduate Students, ²Reader, ³Professor & Head, ⁴Professor
Department of Orthodontics. Teerthanker Mahaveer Dental College & Research Centre, Moradabad (U.P.), India.

Corresponding Author: Dr. Khumanthem Savana, Department of Orthodontics. Teerthanker Mahaveer Dental College & Research Centre, Moradabad (U.P.), India. E-mail: savana.kh@gmail.com

Abstract

Interdisciplinary approach is indispensable for patients with mutilated dentition. Patients with congenital defects can be best treated with such a team work only. It is also of utmost importance in adult patients presenting with severe jaw discrepancies, abraded or worn teeth, old failing restorations, transmigrated teeth, tipped teeth, multiple edentulous spaces from previous tooth extraction, periodontal breakdown, recession, and many other periodontal and restorative problems. A combined interdisciplinary treatment approach will yield a result best suited for the patient as well as the clinicians. The role of orthodontist in such an interdisciplinary treatment approach can be primary or secondary.

Keyword: Interdisciplinary orthodontics, Mutilated dentition, Transmigrated teeth, Primary, Secondary

Introduction:

In the recent times, with the increasing expectations of the patients to an esthetically and functionally stable treatment result, the practice of dentistry is changing from a single specialist or general dentist practice to that of a team approach. This enables the best utilization of the skills and expertise of clinicians of different specialties for the best possible treatment outcome of the patient. Such joint care of a patient’s dental needs is defined as interdisciplinary treatment.¹

Interdisciplinary approach is indispensable for patients with mutilated dentition. Patients with congenital defects can be best treated with such a team work only. It is also of utmost importance in adult patients presenting with severe jaw discrepancies, abraded or worn teeth, old failing restorations, tipped teeth, multiple edentulous spaces from previous tooth extraction, periodontal breakdown, recession, and many other periodontal and restorative problems.²

The role of orthodontist in such an interdisciplinary treatment approach can be primary or secondary. Primary as in a case wherein an orthodontic patient requires adjunctive other specialties treatment as prosthetic replacement of missing teeth, tooth build-up to match a Bolton discrepancy, periodontal rehabilitation, surgical exposure of an impacted tooth, etc. Secondary as in cases where the orthodontic treatment rendered is an adjunct to other treatment planned. Like in the case of space creation or tooth up righting to facilitate prosthetic replacement of a missing tooth, etc.

Few Conditions Requiring Treatment through Interdisciplinary Approach:

1. Periodontally compromised dentition
2. Missing teeth/ space management
   i. Tooth agenesis
   ii. Extracted teeth
3. Teeth malformation
   i. Single teeth
   ii. Multiple teeth
4. Trauma from occlusion
5. Fractured tooth
6. Congenital defects
7. Transmigrated teeth
8. Impacted teeth
9. Muco-gingival discrepancies
10. Severe jaw discrepancies
Periodontally Compromised Dentition:

The key to a stable dentition is a healthy periodontium. As such the success to any interdisciplinary treatment is a function of sound periodontal treatment planning especially in adult orthodontics. The initial therapy is inevitably directed towards control of etiologic factors such as plaque, subgingival calculus and occlusal trauma (Figure No. 1). This is to be followed by a re-evaluation within 3 months for assessment of tissue response to determine whether periodontium is stable enough to proceed with orthodontic treatment. From an orthodontic view, teeth with prominent roots are at a higher risk of recession through mechanical and toothbrush trauma. Also, teeth that are to be proclined are at a greater risk of gingival recession. Thus, areas of minimal attached gingiva are to be evaluated and grafted before initiation of treatment.

An interdisciplinary approach to treat a patient with pathologic migration of teeth, with severe anterior proclination and molar mesial inclination due to localized aggressive periodontitis will necessitate a combined approach of regenerative periodontal therapy, prosthodontic rehabilitation, and orthodontic treatment to achieve a greatly improved function and esthetics.

Missing teeth/ Space management:

a. Tooth agenesis: Apart from the third molars, the most commonly congenitally missing teeth reported is the mandibular second premolars followed by the maxillary lateral incisors. Retained primary second molars are a common finding in cases of missing second premolars. If they are submerged due to ankylosis, they can be restored to functional occlusal plane with restorations such as occlusal composites or crowns. However, in immature patients, it is advisable to get the ankylosed teeth extracted to allow normal vertical growth of the alveolus. If the adjacent teeth have drifted or tipped over the primary molar region, orthodontic repositioning of those teeth may be necessary before any restorative or prosthetic replacement of the missing teeth is done. Congenitally missing lateral incisors is always associated with spacing that too in the anterior esthetic zone (Figure No. 2). This makes the patients seek treatment at a relatively young age. The presence of lateral incisor is a guide to the eventful eruption of the permanent canine to its ideal position. Occasionally, impaction or ectopic eruption of the canine may be seen. Two commonly employed treatment option incudes:

i. Space closure followed by esthetic reshaping of the canine to lateral incisor. To establish an ideal gingival relationship between the central incisor and the canine in the lateral incisor site, the latter may require slight extrusion. This is important particularly in patients with high smile line. Often due to a slight darker shade of the canine relative to the adjacent incisors, bleaching or veneering of the canine may be required.

ii. Opening up the space for the prosthetic replacement of the missing lateral can be accomplished by distalising the canine into Class I relationship with the opposing canine. Spear FM (1997) was in favor of the opinion that the ideal replacement for missing teeth is an implant provided all factors are favorable. The amount of space required for the implant placement is determined and created accordingly with orthodontic treatment. Space evaluation is of importance especially between the roots and at the level of the crowns to ensure successful crown placement. The implant is placed when the vertical growth of the patient is completed, usually 14-15 years of age in girls and 16-17 years of age in boys. Prosthetic replacement can also be panned with a Maryland bridge or a pontic on a retainer as convenient for the patient.

b. Extraction: Many a times in our clinical practice we do come across patients seeking for treatment of edentulous region with the teeth being missing over an extended periods of time (Figure No. 3). Such a situation is inevitably associated with a shifting and tipping of the individual dental units, changes in the cant of the occlusal plane and a functional shifts as a result of alteration in the
Figure No. 1: Periodontally Compromised Dentition

Figure No. 2: Congenitally Missing Lateral Incisors

Figure No. 3: Edentulous Space i.r.t. 36 and 46 with History of Extraction done
equilibrium of the dentition. Two common treatment options include:

i. Orthodontic closure of the edentulous space. This treatment option depends entirely on the general occlusion, crowding, available anchorage and the patient’s facial profile.

ii. Prosthetic replacement: Tipped teeth may be included in the design of a partial prosthesis. However, what one should remember is that the tipped teeth are not the best abutment either for a fixed or a removable prosthesis on account of the occlusal forces which are not directed along the long axis of the tipped teeth and the three-walled bony defects often seen on the side of the tip. Also supra-eruption of teeth in the opposing arch along the edentulous site may interfere with an ideal prosthetic replacement of the missing teeth (Figure No. 4).

The proposed treatment plan includes orthodontic treatment along with restorative treatment. Orthodontic correction of the axial inclination of the tipped teeth and intrusion of the opposing supra-erupted teeth, helps in improving the periodontal prognosis and the long term maintenance of the tooth. It provides the necessary space for the prosthesis. It also ensures achievement of ideal interproximal embrasure and cuspal relationship.

Teeth malformation:

a. Single teeth: Most common malformations encountered is the peg shaped lateral incisor (Figure No. 5), often presented with esthetic discrepancies in the anterior region with uneven space distribution, a midline deviation and disturbed occlusion. Management as such will consist of space management and bite correction by fixed orthodontic therapy followed by restorative reconstruction of the shape and size of the malformed teeth with the help of ceramic crown or veneers. If a full coverage restoration is planned, the overjet can be selectively increased by 0.5-0.75mm on the peg lateral to minimize lingual reduction. Thereby, minimizing intentional tooth structure reduction of an already malformed tooth. The overbite is kept minimal in cases when veneers are planned in the restorative treatment.

b. Multiple teeth: Generalized malformations of teeth are relatively uncommon and such patients may have other systemic conditions which need to be addressed during treatment planning. Hence, a thorough understanding of the nature of the problem is a must. The role of the orthodontist in such cases is to facilitate any subsequent restorative care through space management and bite correction.

Trauma from occlusion:

When the occlusal force exceeds the adaptive capacity of the tissues, tissue-injury occurs. The resultant injury is termed trauma from occlusion. 8 It may be primary or secondary trauma from occlusion. Management includes:

a. Reversible approach: Management of parafunctional habits through patient’s education & the use of occlusal splints

b. Irreversible approach: assessment for the needs of this approach is done after initial phase therapy and the first recall visit.

- Selective grinding
- Orthodontic therapy
- Temporary or provisional splinting of mobile teeth
- Occlusal reconstruction
- Extraction of selected teeth

Careful occlusal assessment and management of the inflammatory processes should be conducted before occlusal adjustment is carried out.

Fractured tooth:

Teeth fractured above the gingival margin can be readily restored with a cast or prefabricated post. However, teeth fractured below the gingival margin may encroached on the biological width create a significant restorative challenges. The latter has three treatment option open to it:

a. Extraction of the fractured tooth followed by prosthetic replacement.
a. Periodontal surgery aided restorative reconstruction of the fractured tooth: Periodontal surgery can reposition the gingival margin to an appropriate level to expose the sound tooth structure for restorative reconstruction of the tooth.9

b. Orthodontic therapy aided restorative reconstruction of the fractured tooth: Orthodontic extrusion of the root portion to an appropriate level for subsequent restorative care (Figure No. 6). The last two option is dependent on the length of the root portion within the bone, the root shaped and form and the periodontal health of the concerned tooth.

Congenital defects:
Cleft lip and palate is a global congenital problem affecting roughly 0.28-3.74/1000 live births globally. These patients are presented with a number of problems staring from dental, speech, hearing, esthetic to psychological problems. Management of CLCP involves a multidisciplinary approach with a long term treatment plan requiring the services of a Geneticist, orthodontist, oral surgeon, prosthodontist, otolaryngologist, audiologist, neurologist, speech therapist, and pediatrician. (Table No. 1)

The role of orthodontist can be discussed in four periods of development:
- Neonatal or infant maxillary orthopedics
- Orthodontic considerations in the primary dentition
- Mixed dentition to include presurgical considerations before an alveolar bone graft is placed
- Final treatment in the permanent dentition with orthodontics only or combined with orthognathic surgery.10

Autotransplantation of Tooth:
Transmigration refers to the physiological migration of an unerupted tooth across the midline in the absence of pathology or trauma.11 Multidisciplinary care involving orthodontic creation of the recipient space, surgical extraction of the transmigrated tooth followed by implant replacement and crown or autotransplantation of the transmigrated tooth to the recipient site (Figure No. 7). Kiyoshi Tai (2011) successfully carried out autotransplantation of premolars in a patient with multiple congenitally missing teeth.

Surgical exposure of impacted tooth:
As per Kuftinec and Shapira, impaction is a condition in which a tooth is embedded in the alveolus so that its eruption is impeded and it is locked in position by bone and by adjacent teeth (Figure No. 8). Apart from the third molars, the teeth in decreasing order found to be impacted are maxillary canines, second premolars, maxillary central incisors and the mandibular canines. Joe Rebellato (2003) reported a case of palatally impacted, ectopically erupting upper right canine treated with surgical exposure and traction of a palatally impacted maxillary canine, full orthodontic appliance treatment, and cosmetic periodontal procedures. Through a team approach the patient was successfully provided with an excellent esthetic and functional result.

Muco-gingival discrepancies:
The relative level of the gingival margins of the six anterior teeth plays an important role in the esthetic appearance. Postorthodontic treatment requires gingival recontouring to meet the following characteristics of an ideal gingival form:
- Height of the gingival margins: Ideally, the gingival margins of the maxillary lateral incisors should be 0.5mm coronal to that of the maxillary central incisors and the gingival margins of the maxillary canines should be 0.5-1.0mm apical to those of the maxillary lateral incisors.
- Contour of the labial gingival margins: it is usually even with the greatest height slightly distal to the centre of the tooth.
- Papilla form: The height of the papilla is usually halfway between the incisal edges.
- Embrasure form: The lack of papilla between the teeth leads to an open gingival embrasure or a black triangle.
Figure No. 4: Supra-eruption of 16 and 17 over the Edentulous Space i.r.t. 46 and 36 respectively

Figure No. 5: Peg Shaped Lateral Incisors

Figure No. 5: Endodontic Treatment of Fractured 11
## Table No. 1: Treatment Schedule for Cleft Lip & Cleft Palate

<table>
<thead>
<tr>
<th>Time</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIRTH</td>
<td>• Initial assessment</td>
</tr>
<tr>
<td></td>
<td>• Pre-surgical assessment</td>
</tr>
<tr>
<td>3MONTH</td>
<td>• Primary lip repair</td>
</tr>
<tr>
<td>9-18 MONTH</td>
<td>• Palate repair</td>
</tr>
<tr>
<td>2 YEAR</td>
<td>• Speech assessment</td>
</tr>
<tr>
<td>3-5 YEAR</td>
<td>• Lip revision surgery</td>
</tr>
<tr>
<td>8-9 MONTH</td>
<td>• Initial interventional Orthodontics</td>
</tr>
<tr>
<td></td>
<td>• Preparation for alveolar bone grafting</td>
</tr>
<tr>
<td>10 YEAR</td>
<td>• Alveolar bone graft</td>
</tr>
<tr>
<td>12-14 YEAR</td>
<td>• Definite Orthodontics</td>
</tr>
<tr>
<td>16 YEAR</td>
<td>• Nasal revision surgery</td>
</tr>
<tr>
<td>17-20 YEAR</td>
<td>• Orthognathic surgery</td>
</tr>
</tbody>
</table>

---

**Figure No. 7a:** Transmigration of 43

**Figure No. 7b:** Autotransplantation of 43

**Figure No. 8a:** Impacted 13

**Figure No. 8b:** Surgical Exposure of Impacted 13
These are extremely unaesthetic particularly when it is seen in the anterior regions. The three probable factors to the black triangles are:

- More rounded shape of the incisors with resultant point contact.
- Unfavorable root angulation
- Periodontal bone loss

Management includes reshaping of interproximal areas of teeth crowns followed by orthodontic space closure or orthodontic correction of root angulation or periodontal regeneration therapy accordingly.

Severe jaw discrepancies:

The term Surgical Orthodontics, in a broad sense, would encompass all the treatment modalities involving the surgeon and the orthodontist. Even extractions, surgical exposures of impacted teeth, frenectomies and such other minor surgeries are part of the Surgical Orthodontics. However, specifically the term implies those conditions which require relatively major surgeries in conjunction with the orthodontic treatment. These can be enumerated as follows:

2. Excessively large or small jaw dimensions on account of abnormal growth coupled with abnormal placement (in one or more planes) in adult patients.
4. Anatomic limitations, which hinder the orthodontic tooth movement such as very narrow palatal or symphyseal cortices. Also, some surgical procedures can facilitate certain orthodontic tooth movements (e.g. inter-dental corticotomy for quicker Orthodontic movements).

The orthodontist role in Surgical Orthodontics is presurgical dental decompensation using fixed mechanotherapy and postsurgical establishment of functional occlusion.

The spectrum of surgeries can be broadly summarized as:

- Osteotomies (some procedures are actually Ostectomies involving removal of part of the bone) of the entire jaws - with or without bone grafts. The commonly practiced surgeries are:
  i. Le fort I, Le fort II, or Le fort III osteotomies and anterior segmented osteotomy in the maxilla; and
  ii. Sagittal split osteotomy and osteotomy of the ramus (trans-oral or extra oral, vertical or inverted L) in the mandible. Body ostectomy in the mandible is not as popular as it used to be some years ago. These procedures are useful in correcting the sagittal problems and some of the vertical problems.

- Surgically assisted expansion or contraction of the maxilla (and to a lesser extent the mandible).
- Subapical surgeries in both the jaws including the Segmental surgeries involving Dentoskeletal segments.
- Chin surgeries
- Cosmetic surgeries involving the nose, ears, cheekbones etc. and soft tissue surgeries of the lips, cheeks and gingivae are often carried out as an adjunct to the above surgeries simultaneously or as secondary procedures.

- Distraction osteogenesis: A biologic process of new bone formation between the surfaces of bone segments that are gradually separated by the incremental traction. Specifically, this process is initiated when distraction forces are applied to the callus tissues that connect the divided bone segments, and continues as long as these tissues are stretched. The traction generates tension that stimulates new bone formation parallel to the vector of distraction.

Conclusion:

Many a times, in our dental practice, a fulminant patient’s care involves a multidisciplinary treatment approach. A thorough examination of the patient’s chief complaint and treatment demands should be done. It is important that the orthodontist together with the other specialists frame a treatment objectives which are realistic and meet the needs of the patient. Constant interaction and communication among the team members and the patient at all level of treatment are the keys to the success of the interdisciplinary treatment.
References: