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Interdisciplinary Orthodontics : A Review

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Abstract-*With increasing complexity of health problems, demand of facial aesthetic and awareness of proper treatment there is need for increased multidisciplinary treatment. Now a days interdisciplinary treatment is making uphold to the dentistry and provide much superior outcome. Constant interaction , communication and integrated work by all the members and patient at every level of treatment are the key to the success of all the treatment. This review article merely focus on the deep shell use of interdisciplinary approach toward the growing obstacle within the proper treatment planning. Integrated work of all the departments i.e. Periodontics, Prosthodontics, Endodontics, Pedodontics, Surgery, Diagnosis, Speech and ENT have been discussed along with Orthodontics.*

Key Words- *Interdisciplinary Treatment ;orthodontic Treatment ;Orthodontic relation.*

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I. Introduction

In this era of aesthetics, with the increasing demands and expectations of the patients to have a pleasing facial profile, functionally stable and secured treatment results, the practice of dentistry is advancing from a single specialist or general dentist practice to that ofamalgamate team support. This enables and ensures the best utilization of the skills and aptitude of clinicians of different specialities for the much better outcome treatment of the patients. Such integrated care of patient's dental requirement is explained as interdisciplinary treatment.[1].Affiliation of orthodontics with other fields of dentistry proposes a better treatment and are mutually beneficial. The combined approach can significantly enhance the oral health &facial aesthetic in many situations. The preference of orthodontic treatment is to provide acceptable and satisfactory functional occlusion, aesthetics occlusion with appropriate tooth movement[2]. This aim can be partially achieved by orthodontics in many situations, butin many day to day and also critical situations, it has to be the combined efforts of many specialities& their opinions.

Benefits and restrictions that result from the interdisciplinary approach of complex Orthodontic-Periodontic, Orthodontic-Prosthodontic, Orthodontic-Surgery, Orthodontic-Pedodontic, Orthodontic-Diagnosis, Orthodontic-Endodontics, Orthodontic-ENT all these clinical conditions are discussed.

The main intention to present a systematic review is to elaborate the advantages & certain limitations of interdisciplinary work of orthodontics and other specialities and the mode that each field can contribute to optimize treatment of combined clinical problems.

II. Orthodontics-Periodontic Relationship

For orthodontists, it is necessary to recognise the periodontal problems initially only before the starting of orthodontic treatment. It is essential todetect the improve treatment plan andspecifically sequence the orthodontic and periodontal therapy to eliminate such conditions as well as improve the patient's periodontal along with orthodontic health. Pre-orthodontic periodontal therapy includes elimination of plaque, sub gingival calculus, and occlusal trauma based on etiological factors. Scaling, root planning and sub gingival debridement are the procedures performed to decrease inflammation, bleeding, and suppuration. Case should be examined by periodontist also and areas of attached gingiva having minimum attachment should be evaluated before initiating orthodontic treatment.Areas of minimal gingivado have a greater possibility of successive recession and loss of underlying bony scaffold. Also; observation has been made that teeth with prominent roots have a higher incidence of recession through mechanical and toothbrush trauma. Teeth with less than 2 mm of gingiva covering may require grafting whereasproclined teeth orthodontically have a greater probability of recession.

When tooth is moved labiallyit may involve a chance of a bony dehiscence. Treatment of such modalities like recession area and root exposure can be predictably covered with various grafting techniques which most commonly involves gingival and pedicle grafting. The extent and achievement of the osseous surgery will depend on the type and variety of defect, i.e., crater,hemiseptal defect, furcation and/or three-walled defect, lesion. The wise and sensible therapist will know when and how to start directly orthodontic treatment and to identify defects will require pre-orthodontic periodontal surgical intervention.[3](Figure:1)

Figure1: This patient had irregularly placed maxillary central incisors initially (A), after intial orthodontic alignment of the teeth; space was present in the area of gingival embrasure was caused by divergence of the central incisor roots were moved together. This required restoration of the incisal edges and on mesial side after orthodontic therapy (E) because these teeth had worn unevenly before therapy. as the roots were paralled (F), the tooth contact moved gingivally and the papilla moved incisally, resulting in the elimination of the open gingival embrasure.[5]

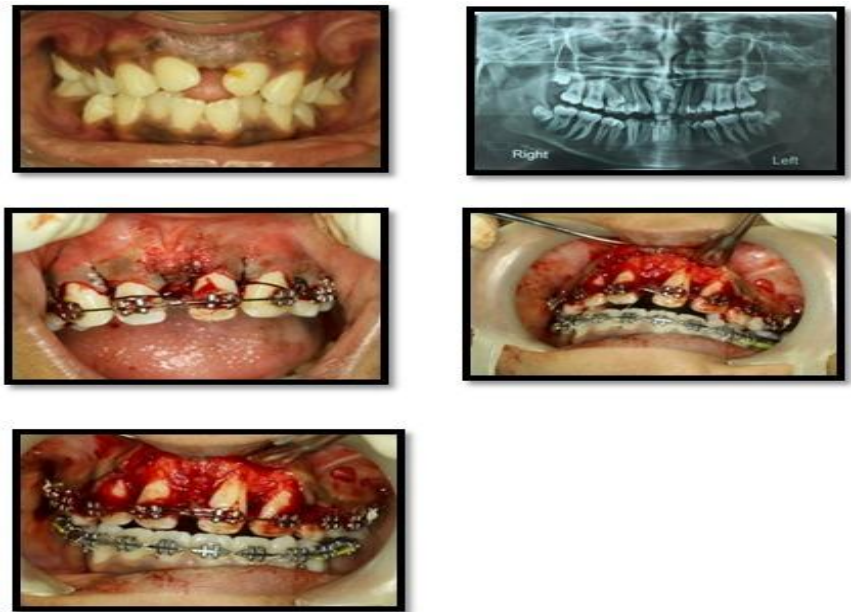

Figure 2:(a-f): Procedure of Corticotomy was performed on 15 year old,female. After fixed Orthodontic treatment for fast treatment results. Corticotomy was performed as seen in images from d to f.

II.1Inflammatory Disease[4]

Patient's periodontal status before, during, and after active orthodontic therapy affects the consequence of orthodontic treatment.The durableconsequence of the natural dentitionbased to an extent on proper responses, systemic resistance and on the patient's predisposition to the variable clinical forms of periodontal diseases. Multifactorial etiologic process can be present behind any periodontal pathology, and the prudent orthodontist should recognize the clinical forms of inflammatory periodontal diseases. Localized and generalized juvenile

(earlyonset) periodontitis Juvenile periodontics, Refractory periodontitis periodontal treatment are carried out before bracket placement. Sometimes flap surgery are also performed after orthodontic treatment for enhance aesthetics.

III. Ortho-Prostho Relationship

Mostly,patients do require restorative treatment during or after orthodontic treatment. Patients withfractured teeth, peg-shaped lateral incisors, multiple edentulous spaces, worn or abraded teeth, or other restorative needs get the treatment of tooth positioning and corrections that is slightly different from a non-restored, non-abraded, completely dentulous adolescent. All the restorative procedures for patient having many missingteeth or edentulous spaces formed during orthodontic treatment should be performedafter the removal of the orthodontic appliances. If patients are having multiple missing teeth, it may not be prudent to task for idealistic occlusal objectives.An ideal Angle ClassI posterior occlusion is achievable in a patient with a complete, non-restored, non-abraded dentition.

In order to restore short teeth, the restorative dentist typically considers two possible treatment plans. One option involves crown lengthening of the short abraded teeth, followed by potential root canal therapy, post and core build-ups, and eventual restoration of the teeth. Another option is to increase the patient's oral verticaldimension by restoring most of the posterior teeth so it would be suitable to gain the space needed to restore the anterior teeth.[6]Someorthodontic-restorative patients have small, malformed teeth that will eventually require restoration after the completion of orthodontic treatment. In most of these situations, sufficient space should be left by orthodontist so as to restore these teeth in future. Ideally, these restorations should be done before the initiation of orthodontic therapy. However, in many circumstances, we do not get sufficient space to restore the tooth before orthodontic treatment (Figure 3). The team must decide how much space should be created for these restorations and the timing of restoration for these small or malformed teeth[6&7]. Two situations are well known and common: retained primary teeth and peg-shaped lateral incisors.

Orthodontic therapy facilitate restorative reconstruction of the fractured tooth, abraded tooth along with treatment of gummy smile, congenitally missing lateral incisors & central incisor and implant placement.

Figure 3: This patient had a peg-shaped maxillary right lateral incisor (A)Space were closed between two central incisors (B and C). By creating the appropriate space between canine and central incisor and positioning implants the lateral incisor correctly could be placed to enhance the occlusion and the aesthetic appearance of the teeth

IV. Surgical Management of Orthodontic Cases

Impacted teeth are often encountered during the diagnosis and correction of malocclusions in adolescent orthodontic patients. Maxillary canine with an incidence of 1% to 3%,is the second most common impacted tooth which varies based on the ethnicity of the sample population.[8&9] There are 2 strategies for sequencing the orthodontics and the surgical uncovering. One approach is to apply brackets on all the teeth of maxilla, create required space for the impacted canine, and then surgically uncover the impacted tooth. After a short healing period of a few weeks, traction is placed on the tooth, and it is moved toward the alveolar ridge.

The other plan of action is to uncover a palatally displaced canine before placing orthodontic appliances and allow the tooth to erupt autonomously into the palate.[60] Usually 6 to 9 months later, sufficient eruption of these teeth take place so that orthodontic appliances can be placed, and canines can be moved into the dental arch, although there is apparently not anyreporting literature to support this statement.[10]

Surgical procedures are performed to improve the facial profile and enhance aesthetics which are mainly focused on the correction of disproportions of underlying jaws and their alignment are collectively

grouped as orthognathic surgery. The surgical procedures may be undertaken on either of the jaws [one jaw] or both the jaws independently or in addition to surgery of the craniofacial structures which may include the orbits, zygoma and the cranium.

The following are the stages in an ideal surgical –orthodontics treatment case;

1. Pre orthodontics preparatory phase
2. Pre surgical orthodontics treatment phase
3. Surgical phase
4. Post surgical orthodontic phase
5. Prosthodontist treatment phase rehabilitation of occlusion and aesthetic
6. Dentistry.
7. Follow up and retention

The role of an orthodontist in Surgical Orthodontics isdental decompensation using fixed mechanotherapy prior surgery and postsurgical establishment of functional occlusion.

The spectrum of surgeries can be broadly summarized as:

a. 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.

b. Surgically assisted expansion or contraction of the maxilla (and to a lesser extent the mandible).

c. Subapical surgeries in both the jaws including the Segmental surgeries involving Dento-alveolar segments.

d. Chin surgeries

e. 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.

f. Distraction osteogenesis: It isa biological process of formation of new bone between the surfaces of bony segments that are separated by the incremental traction in a gradual way. Specifically, this whole process is started when distraction forces are applied to the callus tissues which is responsible for connecting the divided bony segments and continues as long as these tissues are stretched.

IV.1stem Cell Therapy For Enhancement Of Bone Consolidation In Distraction Osteogenesis[10]

Distraction osteogenesis (DO) improves the bone regenerative potential of bone and avoids the adverse effect of other treatments such as bone grafting. The major drawback of DO is the lengthy time needed for bone consolidation. Mesenchymal stem cells (MSCs) have been used to promote bone formation in this phase, with some better results.

V. Orthodontic Endodontic Relationship

Enhancement of orthodontic treatment outcome of endodontic treatment can be done by improving access to teeth requiring endodontic treatment, usually which is gained by extrusion[11]. Common indications are deep subgingival decay,infrabony fractures, lateral root perforations due to resorption or post preparation as well as situations where access preparation may be difficult. As the alveolar bone and gingiva usually follow the tooth occlusally periodontal surgery for crown lengthening is often a necessary procedure.

With ortho-endo mutual treatment advice benefits can be received in following treatment modalities such as…

1. Treatment of ankylosed teeth with alveolar ridge defect

The root of an ankylosed tooth undergoe treatment of replacement resorption. Replacement resorption is the progressive resorption of the root which is then slowly replaced by bone. Main adavantge of the treatment is the height and width of the ridge remains intact as the root is resorbed and replaced by bone later. This allows for placement of a more natural-looking restoration.

2.Simultaneous apexification and active orthodontic movement[12]

Orthodontist, endodontist, and prosthodontist should make an combine effortto estimate accurately the start of adolescent rapid growth(figure 4). This information helps identify the best time to supervene the maximize alveolar ridge development. Orthodontists frequently encounter patients with impacted or ankylosed teeth. Treatment decisions must be based on the best prerequisites, i.e, early diagnosis and knowledge of when to treat, how to treat, and, not to treat.

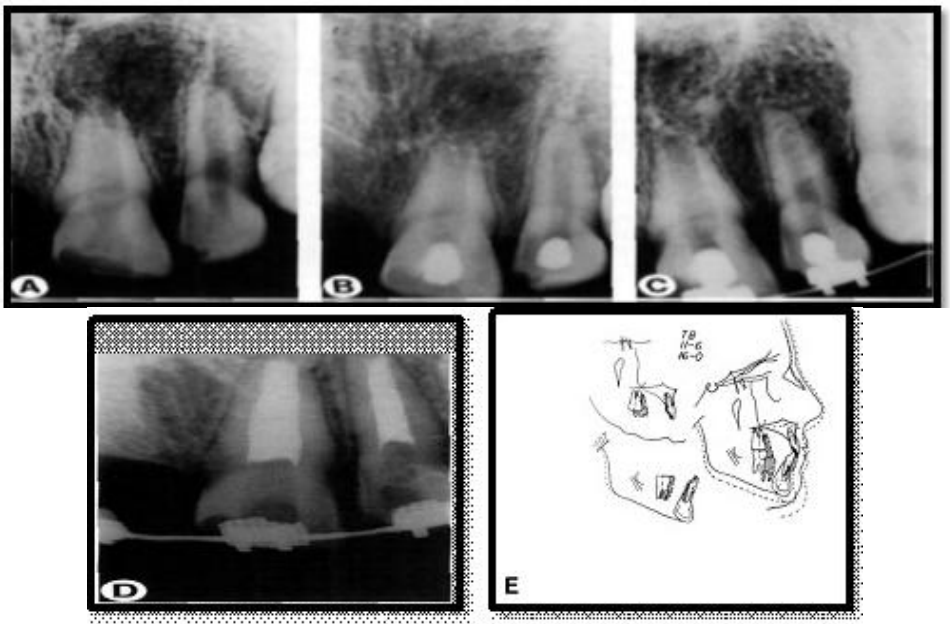

Figure-4: The maxillary central and lateral incisors were pulpless (A). After 7 months of treatment with calcium hydroxide (B) a barrier had formed on the lateral incisor. At the start of orthodontics (C), the central incisor apex had a partial barrier and at the completion of orthodontics (D and E) both teeth had complete calcific barriers despite the tooth movement.

VI. Interdisciplinary Management of Cleft Lip & Palate

The American Cleft Palate-Craniofacial Association was established in 1943 to promote a teamapproach and to serve as an advocate for patients with cleft lip and/or palate and their families. The association defined orthodontist's role on a cleft palate team and recognized a team approach as the most appropriate method to manage the care of patients with orofacial clefts.

The care of cleft lip & palate patientrequires a team of specialists including psychologists & social workers to provide a comprehensive treatment from birth to childhood (Table No.1). During previous days, the feeding specialist, orthodontist, neonatologist and the cleft surgeon take the leading role immediately after birth. After the first year, issues with middle ear infections, hearing and speech therapy are more relevant and important affairs to deal with. Similarly, during the late mixed dentition stage orthodontist would need greater gratification and at adulthood plastic surgeons would play an important role in the correction of secondary deformities of nose and lip. Rapid maxillary expansion appliances are enabled by orthodontists to secure the proper space in upper arch (Figure:5) A prosthodontist may be necessitate to rehabilitate missing teeth and for aesthetic treatment of the dentition.

Table No.1: Treatment schedule for cleft Lip & Cleft Palate

BIRTH	• Initial Assessment • Pre surgical assessment
3 MONTHS	• Primary lip repair
9-18 MONTHS	• Palate repair
2 YEARS	• Speech assessment
3-5 YEARS	• Lip revision surgery
8-9 MONTHS	• Initial interventional Orthodontics • Preparation of alveolar bone grafting
10 YEARS	• Alveolar bone graft
12-14 YEARS	• Definite Orthodontics
16 YEARS	• Nasal Revision Surgery
17-20 YEARS	• Orthognathic surgery

Recent Updates

For the success of the treatment of cleft lip and palate respectively, combined efforts and co-operation of team is required in a certain way. Contribution of nasoalveolarmolding has significantly altered and improved the prognosis and outcome of cleft treatment. Patients who are given the benefit of NAM have better form and shape of nose and facial aesthetics compared to the patients devoid of it. The NAM appliance has twocrucial components—the nasal (nasal stents) and the oral (molding plate). Clinical techniques constantly will be

improving with timewhich setteles the clinician to provide the enriched care while striving to reach the point of excellent facial aesthetics in patients of clefts.[13]

VII. Orthodontics-Pedodontics Interaction[14]

Oral trauma in children and adolescents have always remained a crucial health issue that can be more properly treated from an interdisciplinary approach between the orthodontist and the pediatric dentist. The young or adolescent patient with a history of dental trauma adds a certain level of complexity to the orthodontist's plan of treatment already challenged with caries risk status, traditional issues of home care and patient willingness or ability to comply. Furthermore, children are also considered to be an inherently vulnerable population. The clinician has to be more careful as child cannot serve as a reliable health historian and may do not have the physical faculty or legal authority to make their own decisions regarding care, well being and treatment. All of these considerations requires the need for coordinated patient care plan between orthodontic and pediatric specialties in order to acquire safer and more effecient care.

VIII. Orthodontics & Speech

Since there is a dynamic relationship between normal sound production and the oral cavity, the orthodontist should endow the ability and quality to recognize and determine how dental anomalies are related to orthodontic treatment and sound production. This provides refined patient care through upgraded treatment planning and appropriate referrals to speech pathologists for patients whose malocclusion affects sound and speech production. In the various types of cross-bite, underbite, overbite,medial-open-biteetc., the speech difficulty is generally found in those articulatory movements which produces hissing, or so-called friction noises. The normal production of these sounds is characterized by following structures, firstly a pocket reservoir of air above and behind the radix of the tongue, secondly a varied series of narrow openings between the blade antfapex of the tongue and the hard structures of the palate and upper teeth, and thirdly forceful expulsion of the air and sound against the lower front teeth as far[15].

While speech is performed mainlyas a function of the central nervous system, abnormalities in the peripheral speech organs, of course, counter against development, of normal language. These disorders are the main meeting agenda of the orthodontist and the speech therapist. There are certain abnormalities which frequently require an orthodontic treatment prior to adequate speech correction work. These are certain types of malocclusions and cleft palates, irregularly erupted teeth. cerebral palsy and& intensionuthetosis.

Relation of speech and malocclusion

1. Features of malocclusion are associated withdifficullty in producing speech and sound.
2. The severity of malocclusion is directly proportional to speech sound error.
3. Open bite, even as less as 2 mm, it is associated with sound production errors.
4. Bilateral crossbite andopen bite were more significant in affecting sound production rather than Angle's classification.
5. Production of the /s/ and /t/ sounds is most affected by an open-bite malocclusion.
6. Auditory and visual distortions combined (typically called a sound error) occurred in 17% of the subjects.
7. Although visual inaccuracy is itself not considered as sound error but it occurred with the most frequency(80%), meanwhile it may inadvertently be viewed as such because of the lingual protrusion.

IX. Ent Coordination & Otolaryngology Orthodontics

Significant interactions are presentbetween the pharyngeal and both craniofacial and dentofacial structures. Skeletal features such as vertical maxillary excess in hyperdivergent patients and retrusion of the maxilla and mandible may lead to narrower anteroposterior dimensions of the airway. On the other hand, the oropharyngeal airway has been claimed to affect the growth of craniofacial structures. To breathe through the mouth properly, one has to maintain an oral airway path, and, to fullfill this, the mandible and the tongue are displaced backward and downward and the head is tipped back. These postural changes consequently effect the relationship of teeth as well as the direction of jaw growth, which leads to become more downward and backward.

Maxillary constriction is associated with several problems that include occlusal disharmony, cross bite (dental and/or skeletal), esthetics and functional problems such as narrowing of the pharyngeal airway. Several studies reveals that maxillary constriction may responsible in the aetiology of obstructive sleep apnea[17] (OSA). A child may show the symptoms of "adenoid face," including the open mouth, the narrowed alveolar arch, the vacuous countenance, etc. During the office examination, however, the careful observer may see this child demonstrate an equally important clue to the true etiology-the "allergic salute." Treatment by a orthodontist include use of oral appliances during sleep which repositions the lower jaw, soft palate, tongue, and uvula and

maintains an open and unobstructed airway.It protrudes the mandible and tongue forward and prevents upper airway collapse during sleep.

X. Conclusion

The growing complications, variability multidimensionality of health problems directs the need for interdisciplinary integration to provide much better and saviour treatment plan, patient care, good prognosis and health outcomes. Within this period of dentistry, the use of an interdisciplinary approach has been found to be of remarkableyimportant in achieving treatment success for individuals with adverse and unfit oral health conditions and medical or behavioural challenges. Constant interaction & communication among the members & the patient at all level of treatment are the keys to the success of the interdisciplinary treatment.

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