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Review Article

Multi disciplinary orthodontics

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ABSTRACT:
In this age of aesthetics, dentistry is evolving from a single specialized or general dentist office to one that supports an amalgamate team due to patients' growing demands and expectations for an attractive facial profile, functional stability, and secure treatment outcomes.Orthodontics' affiliation with other dental specialties offers a better course of treatment and benefits both parties. In many cases, the combination method can greatly improve both facial aesthetics and oral health.
This aim can be partially achieved by orthodontics in many situations, but in many days to day and also critical situations, it has to be the combined efforts of many specialities and their opinions. The main intention and certain limitations of multidisciplinary work of orthodontics and other specialities and the mode that each field can contribute to optimize treatment of combined clinical problems.

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INTRODUCTION

Orthodontics' affiliation with other dental specialties offers a better course of treatment and benefits both parties. In many cases, the combination method can greatly improve both facial aesthetics and oral health.
In order to enhance the overall outcomes for adult patients with complicated dental issues, the orthodontist has now become a member—and often the leader—of a multidisciplinary team. Adult orthodontic treatment frequently necessitates an interdisciplinary collaboration between orthodontics, periodontics, implantology, maxillofacial surgery, and prosthodontics due to the correlation between primary and secondary maxillary malocclusions and a variety of stomatognathic system diseases. An orthodontist may play a key or secondary role in such an integrated treatment approach.[1]
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[2]

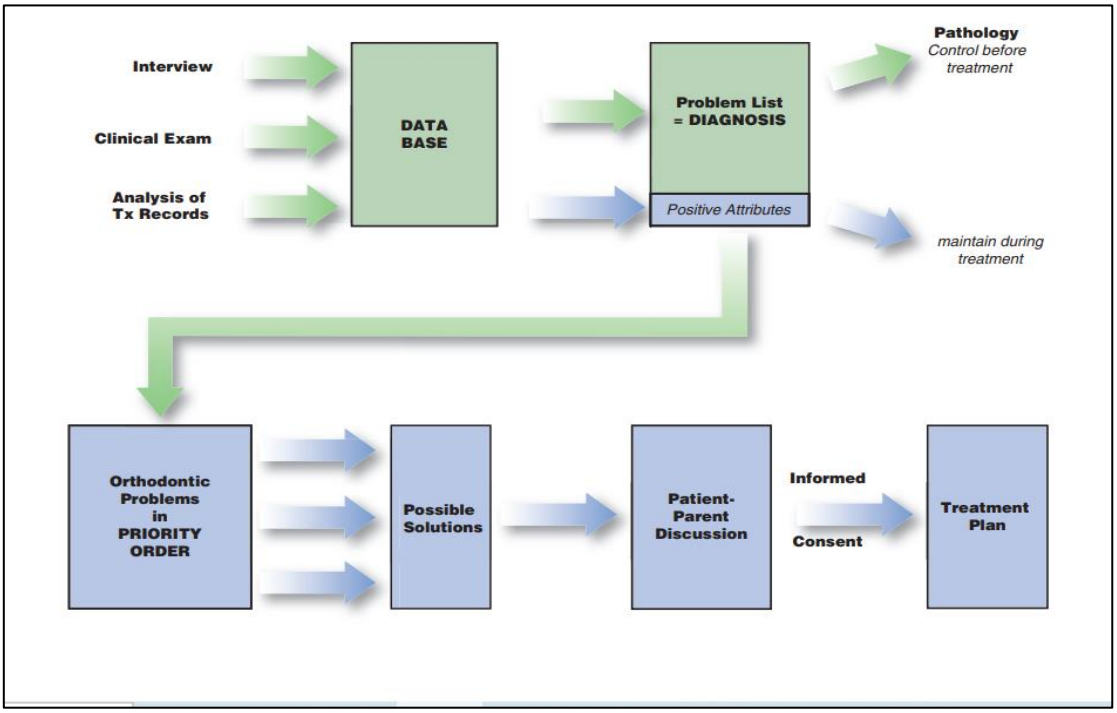
Advantages Of Multidisciplinary Orthodontics

- Idealize and simplify therapy
- Improve prognosis
- Turn problems into advantages
- Prevent unnecessary procedure
- Shorten treatment time
- Enhance individual team member's results

DIAGNOSIS

The diagnosis and treatment planning procedures used in orthodontics are highly compatible with the modern, problem-oriented approach to healthcare in general. As in other dental and medical specialties, orthodontic diagnosis necessitates gathering a sufficient amount of patient data and distilling from it

a detailed yet understandable list of the patient's health issues.



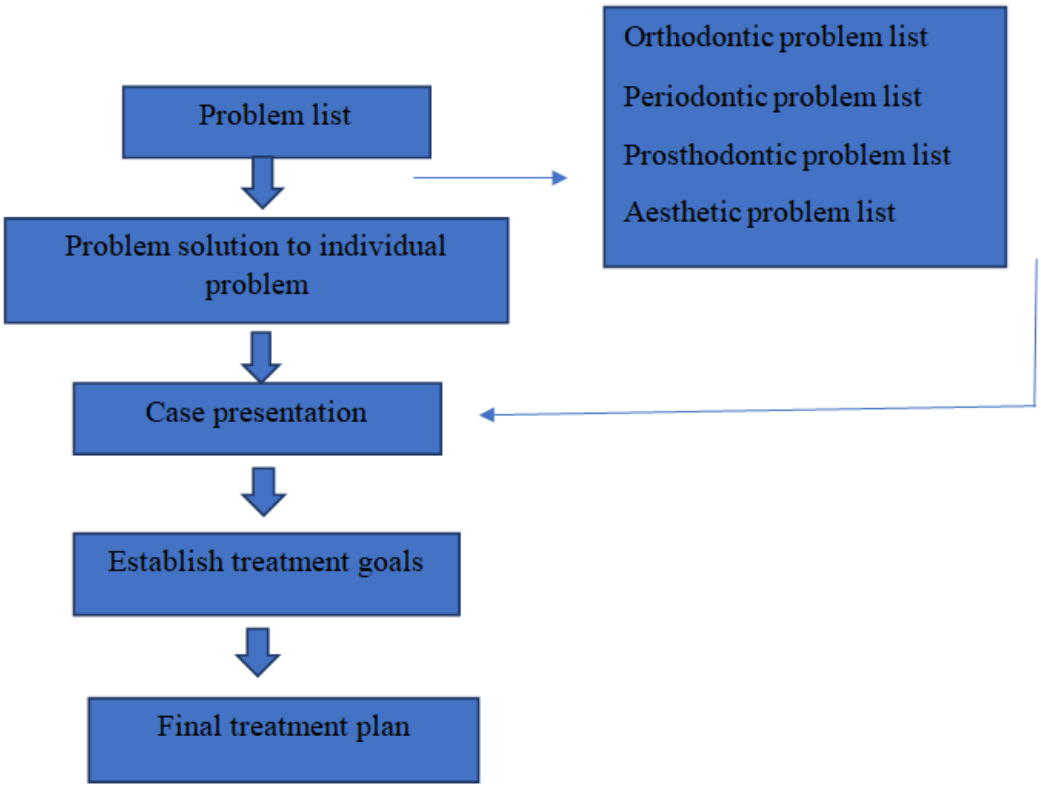


Figure 1: Diagnosis and Treatment Plan

ORTHODONTIC – PERIODONTIC RELATIONSHIP

Co-operation, coordination and interaction between different specialities in dentistry are extremely important in establishing diagnosis and treatment planning. Interaction between the different disciplines is necessary and in some cases is crucial in facilitating coordinated dental therapy. The interrelationship between orthodontics and periodontics often resembles symbiosis. In many cases periodontal health is improved by orthodontic tooth movement, whereas orthodontic tooth movement is often facilitated by periodontal therapy[3]

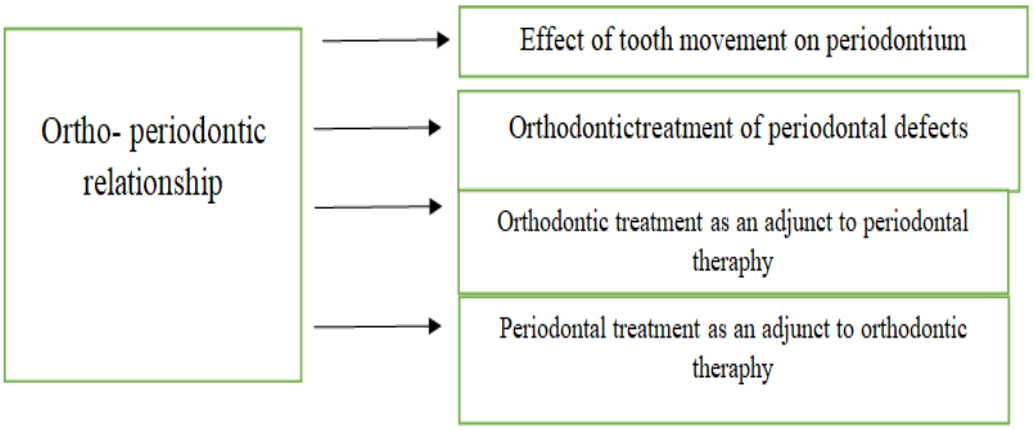


Figure 2: Ortho-periodontic relationship

1. EFFECT OF TOOTH MOVEMENT ON PERIODONTIUM

The diagnosis and treatment planning procedures used in orthodontics are highly compatible with the modern, problem-oriented approach to healthcare in general. As in other dental and medical specialties, orthodontic diagnosis necessitates gathering a sufficient amount of patient data and distilling from it a detailed yet understandable list of the patient's health issues.

There are force ranges available in clinical settings that the periodontium can tolerate biologically. It is important to keep in mind that the PDL is the primary cause of tooth movement, therefore the supporting tissues of various teeth are not subjected to the same stress from the same forces. Stress regions in the PDL are determined by the root's length and shape, the amount of bone support, the location of force application, and the center of rotation. Areas of maximum stress that could arise in the PDL must be taken into account in order to prevent tissue injury. If there is inflammatory connective tissue apical to crestal alveolar bone, there is a greater chance of bone loss.

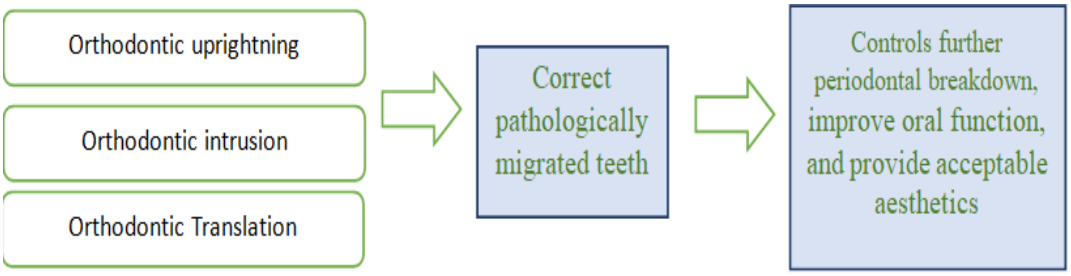
Although most tooth movement involves combinations of movements, clinicians tend to view movement more simply in terms of

- Extrusion (eruption)
- Intrusion
- Tipping
- Translation
- Torque

2. ORTHODONTIC TREATMENT AS AN ADJUNCT TO PERIODONTAL THERAPY

Orthodontic treatment can frequently be used in conjunction with periodontal therapy. In order to correct the pathologically migrated teeth, control additional periodontal breakdown, enhance oral function, and give acceptable aesthetics, a variety of orthodontic treatments are used, including uprighting, intrusion, and rotation.

Even while malocclusion and periodontal disease do not consistently correlate, several aspects of malocclusion can impede periodontal therapy and foster a pathologic environment. The patient can more easily clean all of the surfaces of his or her teeth when crowded or malpositioned teeth are corrected. The development of appropriate arch form and proximal contact also lessens or eliminates food impacts.



3. PERIODONTAL TREATMENT AS AN ADJUNCT TO ORTHODONTIC THERAPY

Periodontal health is essential for any form of dental treatment, especially for orthodontic treatment. Properly delivered orthodontic forces do not induce any damage to the periodontium. However, various periodontal treatment acts as an adjunct to orthodontic therapy[4]

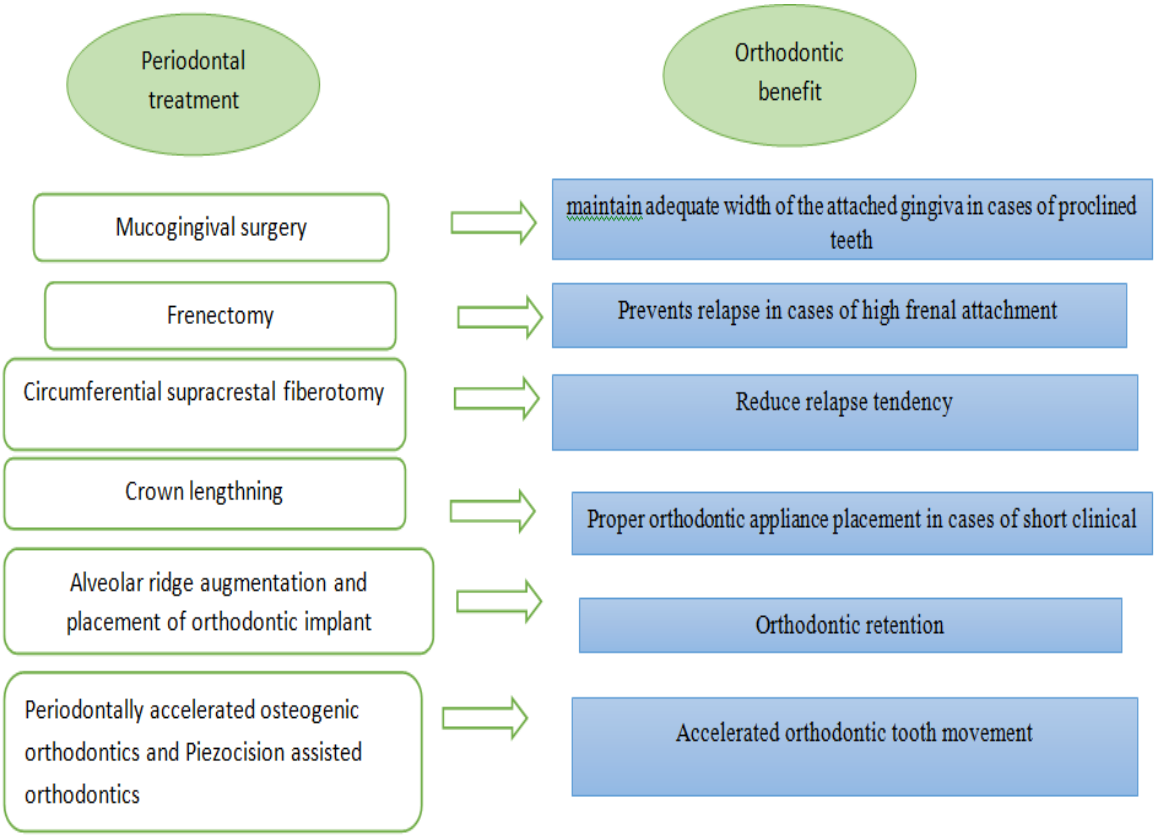


Figure 3: periodontal treatment as an adjunct to orthodontic theraphy

ORTHODONTIC - ORAL SURGERY RELATIONSHIP

Oral surgery is a branch of dentistry involving minor to major surgical procedure. Oral surgical procedure is frequently required during orthodontic therapy

Various interdisciplinary procedures involving orthodontics and oral surgery

1. Exodontia
2. Management of impacted teeth
3. Skeletal anchorage
4. Orthognathic surgery
5. Procedure for accelerated tooth movements
6. Retention procedure

a. Circumferential supracrestalfiberotomy
b. Frenectomy

1. EXODONTIA

In orthodontics patients with marked arch length tooth material discrepancy it is wise to consider the extraction of one or more dental units to obtain stable results

Teeth are extracted in orthodontic primarily for

- Gaining space
- Retraction
- Levelling of curve of spee
- Camouflaging the sagittal jaw discrepancy

2. MANAGEMENT OF IMPACTED TEETH

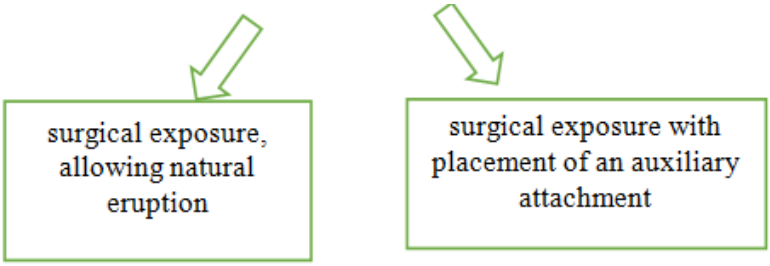
Impaction of tooth is a retardation or halt in the normal process of eruption

When diagnosing and treating adult patients with malocclusion, impacted teeth are frequently seen. With an incidence of 1-3%, which varies according on the population's ethnicity, maxillary molars are the most prevalent impacted tooth of orthodontic consequence. The canine crown is more commonly positioned in the palate, though it can be impacted either labially or palatally. If the contralateral tooth erupts for at least six months with full root creation, or if the canine is interrupted after full root development, it is deemed to be an impacted tooth.

TREATMENT OF IMPACTED CANINES

There are numerous surgical methods for exposing the impacted canine and bringing it to the line of occlusion.

Two of the most commonly used methods are



3. SKELETAL ANCHORAGE

Anchorage means the intentional minimization of migration of specific teeth through the supporting alveolar bone structure. Anchorage is very important in orthodontic treatment.

The intraoral skeletal anchorage is more beneficial because it provides absolute anchorage and has better patient compliance. Intraoral skeletal anchorage is provided either by mini implants or bone anchored mini plates. Mini implants can be inserted by orthodontist himself but insertion of mini implants requires the help of oral surgeon

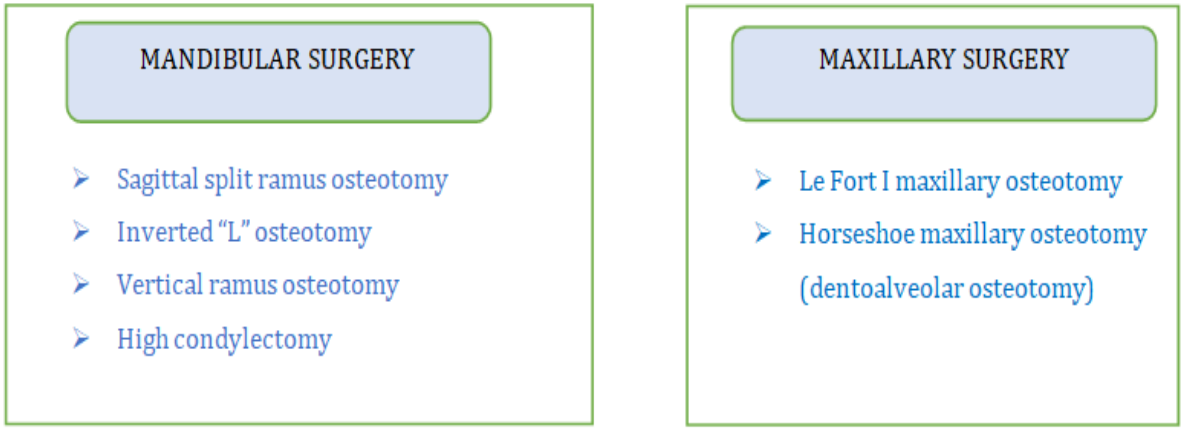
4. ORTHOGNATHIC SURGERY

Subjects with severe malocclusion dur to underlying facial skeleton disproportion cannot be treated with orthodontic alone. They have an inherent imbalance of craniofacial structure in terms of facial heights, width and anteroposterior dimensions in varying degree of severity and variety of combination[6]

Steps involved in an orthognathic surgery procedure

1. Pre-orthodontic preparatory phase
2. Pre-surgical orthodontic treatment phase
3. Surgical phase
4. Post-surgical orthodontic phase
5. Prosthodontic treatment phase, rehabilitation of occlusion and aesthetic dentistry

Orthognathic surgery is divided into two parts



Complications following orthognathic surgery

1. Patient-related factors.

Unrealistic expectations, external motivating factors, unknown psychological problems.

2. Team-dependent factors

Lack of proper understanding of the patients' expectations, needs and psychology. Such a situation could result from the hurried approach by the team during patient evaluation or due to too poor pre-operative preparation.

3. Poor communication

Poor doctor-patient inter-action or personality conflict. Short-term patient dissatisfaction and depression may be associated with pain and discomfort caused by surgery, use of drugs and sedatives, and insufficient preoperative information about the immediate consequences of the operation

DISTRACTRACTION OSTEOGENSIS

Distraction osteogenesis (DO) is a biologic process of the new bone formation between vascularised margins of bone segments gradually separated by incremental traction. The traction force generates tension in the callus that connects the bone segments.[7]

Sequential periods in DO :

1. Osteotomy
2. Latency
3. Distraction
4. Consolidation
5. Remodelling

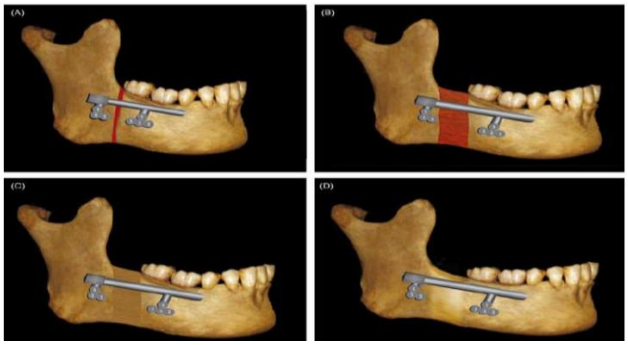


Figure 4 : Schematic representation of the sequential phase of distraction osteogenesis (DO) for mandibular corpus lengthening. (A) Osteotomy and placement of distractor. (B) End of distraction. (C and D) Consolidation and Remodelling. At the end of 1 year, distracted bone cannot be distinguished from origin bone.

Advantages of distraction osteogenesis over orthognathic surgery

- Need for orthognathic surgery is minimised and so are the complication associated with orthognathic surgery.
- The slow rate of bone elongation allows histiogenesis of the associated soft tissues, and therefore possibilities of relapse are minimised.
- A shorter hospital stay.
- Reduced postoperative pain and swelling.
- Increased stability

Disadvantages of distraction osteogenesis over orthognathic surgery

- Poor 3D control on the segments with current distractors. The 3D distractors are being continuously modified for desired results.
- Manipulation of healing corticotomy daily or several times a day could give rise to pain.
- Difficult access for the orthodontist during distraction and consolidation stages as the distractor could obscure the buccal segments.

ORTHODONTIC – ENDODONTIC RELATIONSHIP

Endodontic treatment of teeth is now a common procedure across all age groups, either as a result of caries or trauma. Furthermore, as the number of adults undergoing orthodontic treatment increases, orthodontic patients presenting with restored teeth or having endodontic treatment is on the rise.[8]

1. EFFECT OF ORTHODONTIC TOOTH MOVEMENT ON DENTAL PULP

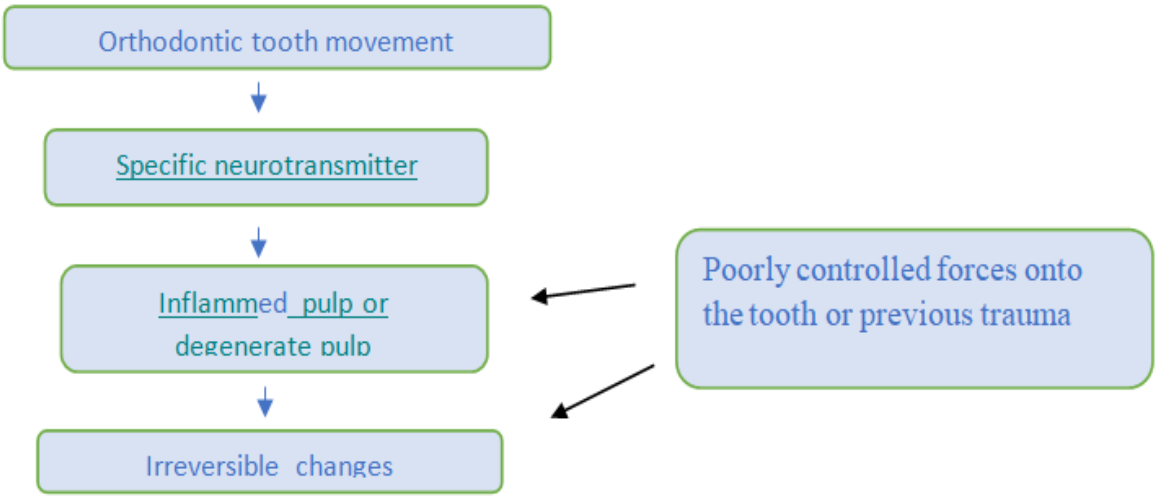


Figure 5: Effect of orthodontic tooth movement on dental pulp

2. DIFFERENCE BETWEEN ORTHDONTIC MOVEMENT OF ENDODONTICALLY TREATED TOOTH AND NON ENDODONTICALLY TREATED TOOTH

Teeth with viable pulps can be relocated just as easily and for the same distances as teeth that have had endodontic treatment. Endodontically treated teeth can be moved orthodontically just as easily as essential teeth, according to research on both humans and animals. But in case of replacement resorption (ankylosis) or injury to apical periodontium, tooth movement may be prevented

3. ORTHODONTIC TREATMENT AN AID TO FINAL ENDODONTIC OUTCOME

The role of orthodontic tooth movement to optimizes the prognosis of endodontic therapy by improving the access of the tooth for a good restoration. Mainly two types of movement were appraised in the literature in this perspective.

a. Orthodontic extrusion
b. ii. Orthodontic uprighting

ORTHO – PROSTHODONTIC RELATIONSHIP

Prosthodontics is the area of dentistry that deals with replacing missing teeth and other oral structures with artificial devices in order to restore and maintain oral functions.In adult teeth, loss of support or teeth can lead to pathological migration of one or more teeth, causing the posterior occlusion to collapse with decreasing vertical dimensions and causing midline diastema or generalized spacing of the teeth with or without incisor proclination, rotation, and tipping of premolars and molars.[9]

A. MANAGEMENT OF CONGENITALLY MISSING TEETH

1.LATERAL INCISOR

Management of absent maxillary lateral incisors can broadly be divided into two strategic approaches.[10]

a. Space closure involving canine substitution is a well-recognised modality for management of patients presenting with this condition
b. Space re-opening and prosthetic replacement of the absent tooth or teeth is the other commonly advocated technique

FACTOR	
Dental health	Caries risk potential Oral hygiene Periodontal diseases Toothwear
Unilateral absence	Ideally space opening to achieve dental symmetry
Bilateral absence	Space opening or space closure will achieve symmetry
Generalized hypodontia/microdontia	Space opening usually more appropriate
Skeletal pattern	Class 3 more suited to opening space Class 2 more suited to closing space
Arch alignment	Spacing: Space opening usually more appropriate Crowding: Space closing usually more appropriate
Colour and morphology of adjacent teeth	Yellow/pointed teeth are difficult to modify Microdontia can make space closure difficult to achieve
Smile line	Space opening better in 'toothy' smile Gingival equilibration may be necessary in 'gummy' smile
Planned buccal segment relationship at end of treatment	Class I with non-extraction lower arch is usually amenable to space opening
Other factors	Habits Co-operation and motivation Age of patient

Figure 6: Factors to consider in the space opening/closing decision

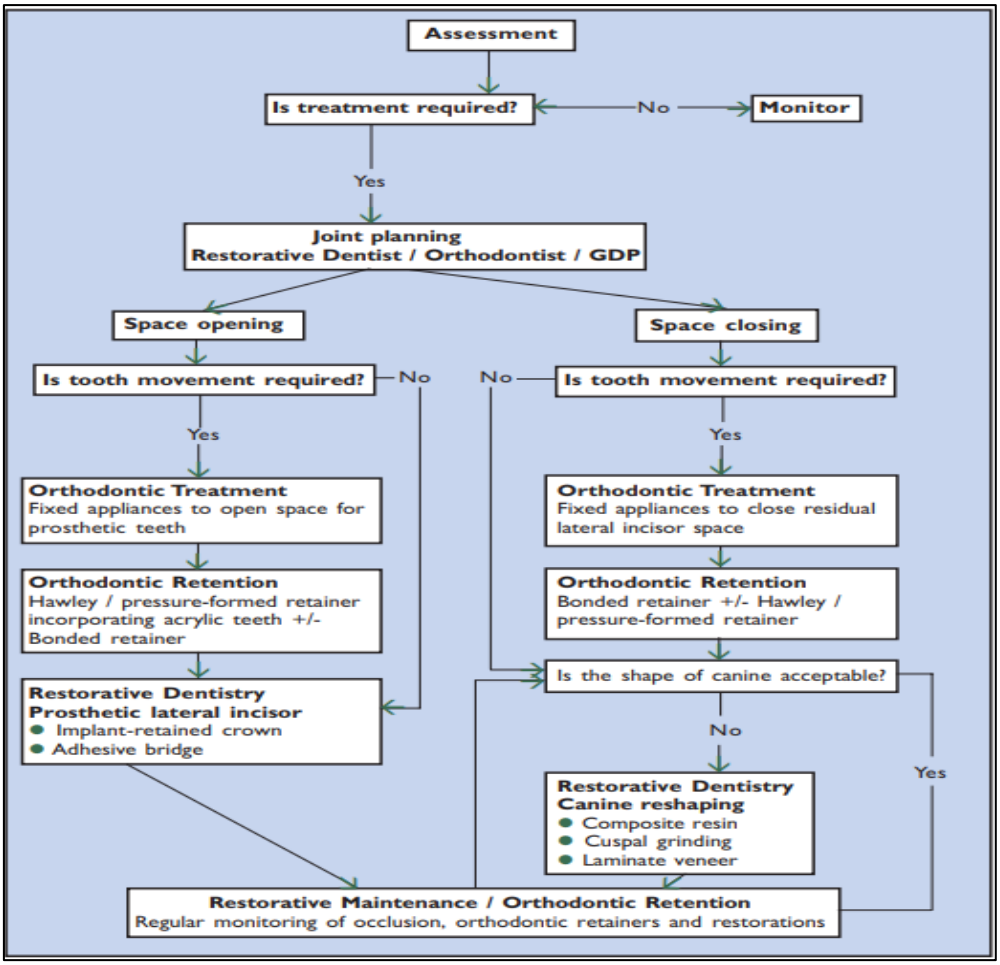


Figure 7: Space closing / opening decision

B. PROSTHODONTIC IMPLANTS AS ORTHOTODONTIC ANCHORAGE UNITS

Orthodontic anchorage is defined as "resistance to unwanted tooth movement." Dentists use appliances to produce desired movements of teeth in the dental arch

INDICATION

In orthodontic treatment, anchorage control is essential for success.10 Dental implants, due to the stability in bone, can serve as firm anchorage

- Close edentulous spaces.

Missing first molars or congenital missing teeth are common. Because of reduced anchorage, implants in retromolar areas have been used to translate teeth into edentulous areas.

B. TEMPORORY PONTIC

All patients have the expectation that they will look lovely at the end of treatment, but most are also worried about how they look during the procedure. This is demonstrated by manufacturers' efforts to satisfy patients' aesthetic needs while undergoing orthodontic treatment, which include shrinking metal brackets, creating lingual or invisible brackets, creating estheticarchwire, creating plastic brackets, and creating translucent ceramic

RIDING PONTICS

Riding pontics are temporary prostheses used during fixed orthodontic treatment in patients with missing teeth and can be used for any missing teeth. It is especially good when one or more anterior teeth are missing.

Benefits of using Riding Pontics

- Improvement of aesthetics during orthodontic treatment.
- Development of abnormal habits such as tongue thrusting and defective speech can be prevented.
- Exact mesiodistal width of the missing tooth can be maintained.
- Midline matching along with riding pontic is easier when unilateral incisor is missing.
- Psychosocial status of the patient can be improved

Problems with Riding Pontics

- Labiopalatal rotational control of the riding pontic is difficult with round arch wire; however, movement can be limited with rectangular arch wires.
- Bond failure of the pontic may occur during treatment

Figure 8a: Preoperative intraoral view Figure 8b: Riding pontic with bonded bracket

Figure 8c: Riding pontic ligated to 0.019 × 0.025 SS archwire

MANAGEMENT OF CLEFT LIP AND PALATE

Cleft of the lip and/or the palate (CL ± P) is a congenital birth defect, which is characterised by complete or partial clefting of the lip and/or the palate. The severity of clefting may vary from the trace of notching of the upper lip to complete non-fusion of the lip, primary palate and secondary palate. Facial clefts are seen due to non-fusion of the facial process[11]

THE TEAM APPROACH

The timing and sequencing of orthodontic treatment are not carried out in isolation from other members of the team but as a result of collaborative decisions made in a coordinated, patient-centred manner sensitive to the patient's and family's needs

Several texts provide specific details of treatment intervention, but the overall care of affected infants should rely on interdisciplinary team decisions rather than a series of independent, critical events by individual specialists on a team

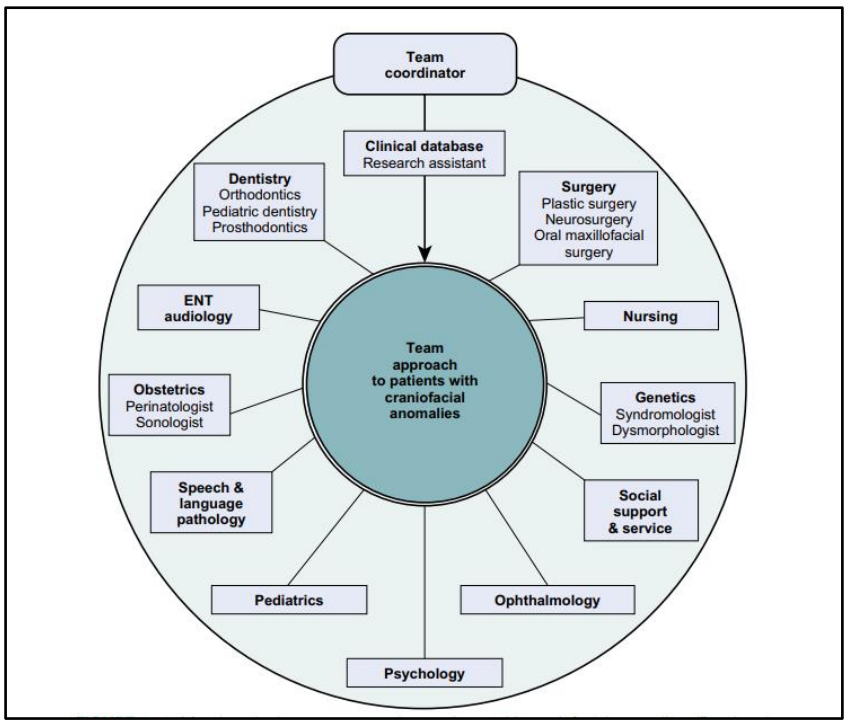


Figure 9: Team approach for craniofacial anomalies

Presurgical nasoalveolar moulding (PNAM)

Presurgicalnasoalveolar moulding (PNAM) appliance. PNAM appliance is a palatal plate that is constructed on an infant's maxillary cast prepared on an accurate impression. The device consists of an acrylic bulb (nasal stent) attached to the maxillary plate with a rigid wire

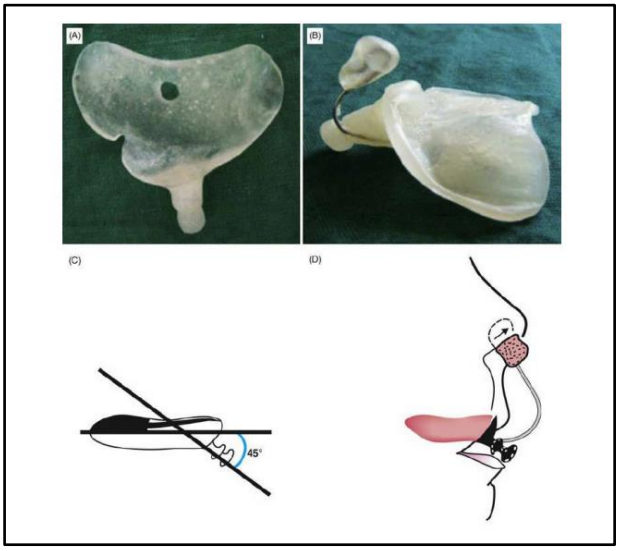


Figure 10: Presurgicalnasoalveolar moulding with nasal stent

ROLE OF AN ORTHODONTIST

Four separate developmental stages can be used to categorize the timing and sequencing of orthodontic treatment. These time spans, which are determined by age and dental development, should be viewed as windows of opportunity to achieve particular goals**.**

Neonate and Infant (Birth to 2 Years of Age)

Presurgical orthodontics or neonatal maxillary orthopaedics is initiated during the first- or second-week following birth unless complications arise from other congenital anomalies or medical problems.[13-17]

- This treatment may be carried out orthodontist, the paediatric dentist, or the prosthodontist. Parental counselling
- Pre Nasoalveolar moulding

Figure 11: Pre Nasoalveolar Moulding

Primary Dentition

- Acquisition of normal speech function – Speech therapist
- Minimal orthodontic intervention
- Removal of interfering contact
- Severe skeletal discrepancies - forward protraction face mask

Mixed Dentition

- Extraction of super numerary teeth and over retained teeth
- Levelling and alignment
- Early mixed dentition – minimal anteroposteriorintermaxillary skeletal malrelation – protaction headgear
- Correction of crossbite and expansion of collapsed segment to improve surgical access to graft side for secondary alveolar bone grafting
- Sufficient space created in the arch – eruption of maxillary canine

Permanent Dentition

- Severity of negative overjet – major deciding factor on orthodontic treatment alone or along with surgical approach
- Simultaneous expansion and / or chin cup therapy

- Dental malpositions are corrected
- Alignment of dental arches
- If lateral incisors present and viable in cleft – attempt made to preserve it
- Patients with missing lateral incisors – space closure or prosthetic replacement
- Orthognathic surgery – patient with large maxilla mandibular jaw discrepancy
  ---- Distraction osteogenesis

CONCLUSION

In our dental office, a multidisciplinary treatment approach is frequently used to provide comprehensive patient care. The patient's primary complaint and treatment needs should be carefully examined. It's critical that the orthodontist and other specialists establish treatment goals that are both practical and patient-centered. The secret to effective multidisciplinary treatment is ongoing engagement and communication between the patient and the team at all stages of care.

In multidisciplinary approach, we must know the sequence to be followed in different cases. In orthodontic treatment. Periodontal procedures (scaling and root planning) and the endodontic procedures (root canal and restorations) must be carried out before initiation if orthodontic treatment. The oral surgery procedures can be carried out at any stage of orthodontic treatment whether before the treatment (cortictomy procedure), during treatment (exposing impacted tooth, extraction) and after the treatment (frenectomy, orthognathic surgery). The need for oral surgery procedure whether required before, during and after the treatment can vary form case to case. The prosthodontic procedures to replace the missing teeth must be carried out after completion of orthodontic treatment. During orthodontic treatment extraction space either can be maintained for prosthesis or can be closed orthodontically to prevent a lifelong prosthesis

The overall goal for a multidisciplinary team is to provide an unbiased diagnosis, formulate an optimal treatment plan that properly weighs and addresses all relevant factors, and produce and maintain an optimal dento-facial result that enhances the overall physical and psychological wellbeing of the patient.

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