Jaypee Gold Standard Mini Atlas Series®

Orthodontics

Gurkeerat Singh

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Orthodontics

Gurkeerat Singh
BDS MDS (Ortho.) M Orth (Intercollegiate)
Professor and Head, Department of
Orthodontics and Dentofacial Orthopedics
Sudha Rustagi College of Dental Sciences and Research
Faridabad, Haryana, India

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Phones: +91-11-23272143, +91-11-23272703, +91-11-23282021
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  Mumbai 400 012, Phones: +91-22-24124863, +91-22-24104532,
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  e-mail: nagpur@jaypeebrothers.com

USA Office
1745, Pheasant Run Drive, Maryland Heights (Missouri), MO 63043, USA, Ph: 001-636-6279734
e-mail: jaypee@jaypeebrothers.com, anjulav@jaypeebrothers.com

Jaypee Gold Standard Mini Atlas Series: Orthodontics

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Dedicated to

the past, present and future
Orthodontic Patients

Preface

The **Mini Atlas in Orthodontics**, is a small effort to spread the knowledge of orthodontics. An atlas, with its inherent concept of illustrations and photographs provides a visual impact that is required to understand the various clinical situations.

This atlas will not only be an aid for the clinicians but shall also serve as a visual guide to educate the patients. Such visual aids provide a reason for the patients to think and at times correlate the photographs with their own conditions—thus seeking treatment.

Basic knowledge is provided and has been further simplified with the aid of photographs depicting individual situations for easy understanding. Orthodontics is a vast science today and the mini atlas is only a small, yet basic part of this science.

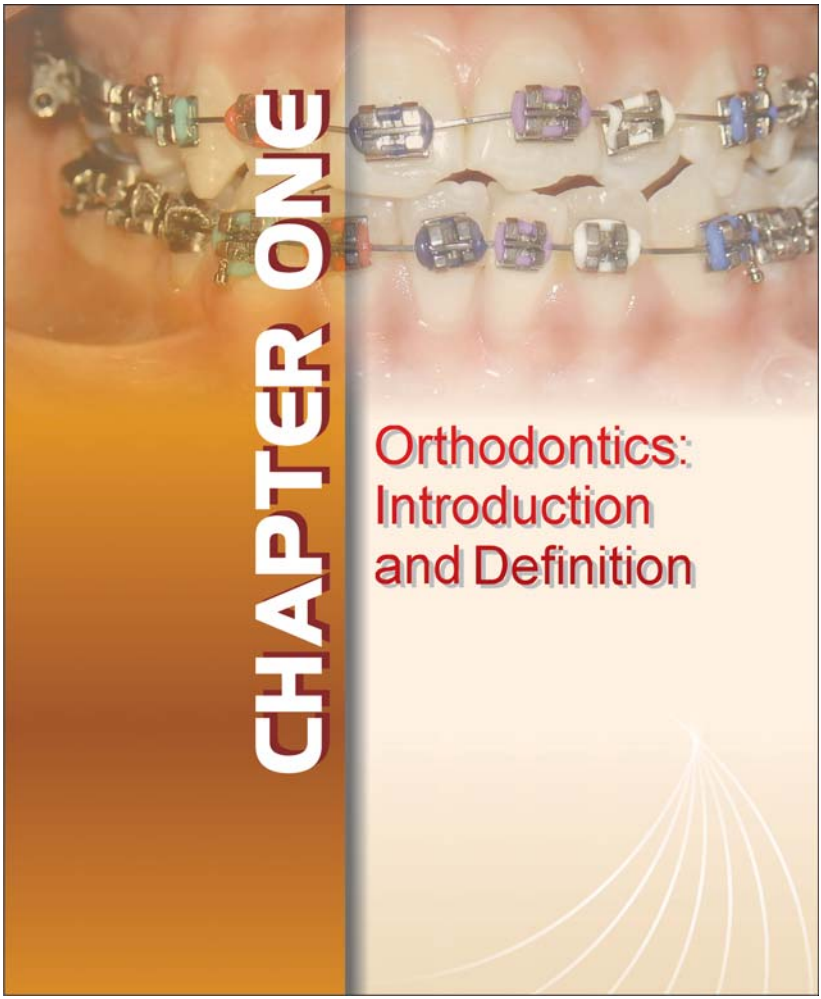
Gurkeerat Singh

Acknowledgements

No publication is produced just by the hard work and labor of the author or the editor. This atlas has been compiled because of my dear patients, who have been gracious enough to tolerate my photographic skills and my co-clinicians—Dr Abhay Lamba, Dr Rajesh Ahal, Dr Vishal Singh and Dr Pankaj Dutta who have contributed to produce not just great smiles for the patients but picture perfect results which we are proud to show-case here.

Dr Ankur Kaul and Dr Aditya Chhibber are not just my colleagues in the department at the college but my best critics. It is their untiring effort that motivates me to gather more relevant and better quality photographs for this atlas. Last but not the least—the members of the Jaypee team keep any author on his / her toes in order to produce results and I am no exception.

Contents


CHAPTER ONE
Orthodontics:
Introduction
and Definition

2 ORTHODONTICS

For a layman, orthodontics is that branch of dentistry that deals with aligning of teeth using braces, basically an esthetic treatment associated with young children. However, being the first specialty branch of dentistry with over 100 years of existence, this is an over simplification of a rather complex science.

In 1911, *Noyes* defined orthodontics as—"the study of the relation of the teeth to the development of the face, and the correction of arrested and perverted development."

In 1922, the *British Society of Orthodontists* proposed that—"Orthodontics includes the study of growth and development of the jaws and face particularly, and the body generally, as influencing the position of the teeth; the study of action and reaction of internal and external influences on the development, and the prevention and correction of arrested and perverted development."

The American Board of Orthodontics (ABO) and *(AAO)*—"Orthodontics is that specific area of dental practice that has as its responsibility the study and supervision of the growth and development of the dentition and its related anatomical structures from birth to dental maturity, including all preventive and corrective procedures of dental irregularities requiring the repositioning of teeth by functional or mechanical means to establish normal occlusion and pleasing facial contours."

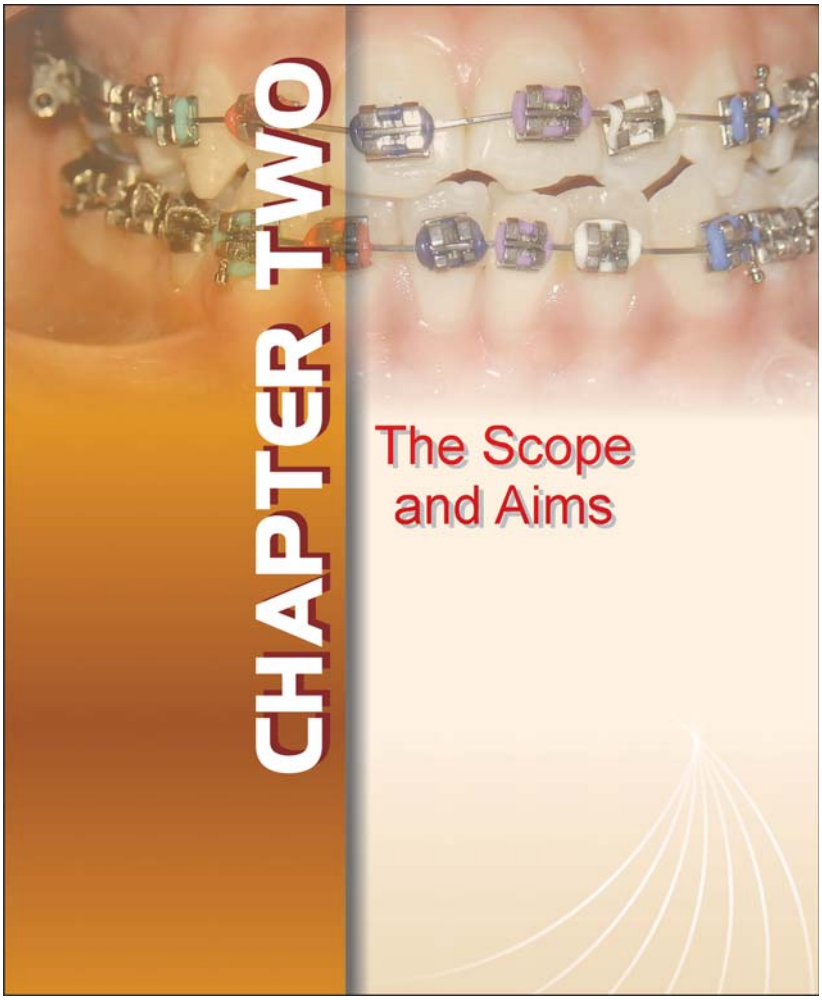
With the advent of 21st century, our knowledge of life sciences has increased tremendously. Today, we can predict the extent of possible growth in individual cases and even mould the growing child's face.

Along with this, the extensive advances in material science has brought about better acceptance of our treatment plans by children and adults alike. With the advent of esthetic (tooth colored) appliances (Fig. 1.1) and lingual appliances (Fig. 1.2) (invisible braces or braces that are actually put towards the tongue) the acceptance of orthodontic treatment has increased many fold.

Fig. 1.1: Tooth colored esthetic brackets (Lower arch)

Fig. 1.2: The lingual appliance, brackets/braces placed towards the tongue (Upper arch)

Advances in surgical procedures have added a whole new dimension of orthognathic surgery to the field of orthodontics. Now if tooth movement is beyond the preview of orthodontics alone, orthognathic surgery can aid in aligning the jaws *per se*. Today orthodontic correction can be brought about at practically any age as long as the supporting structures are healthy and the patient motivated.


CHAPTER TWO
The Scope
and Aims

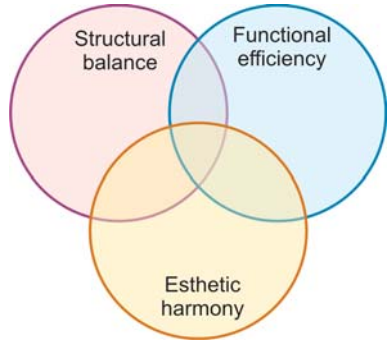
6 ORTHODONTICS

Orthodontic treatment is aimed at moving teeth, altering jaw bones and the soft tissue envelope.

Jackson had summarized the aims of orthodontic treatment as:

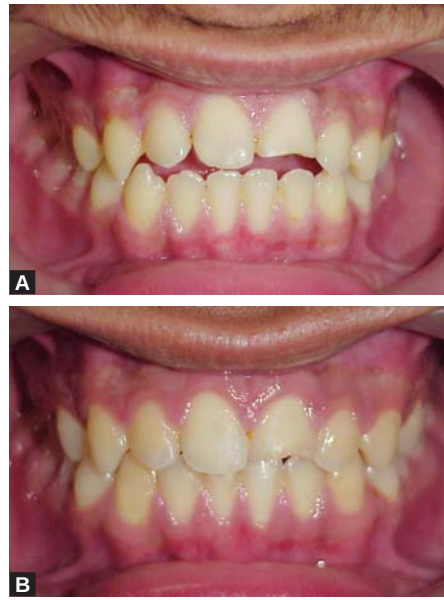
- Functional efficiency.
- Structural balance.
- Esthetic harmony.

These three are now famous as the **Jackson's triad**.



Functional Efficiency

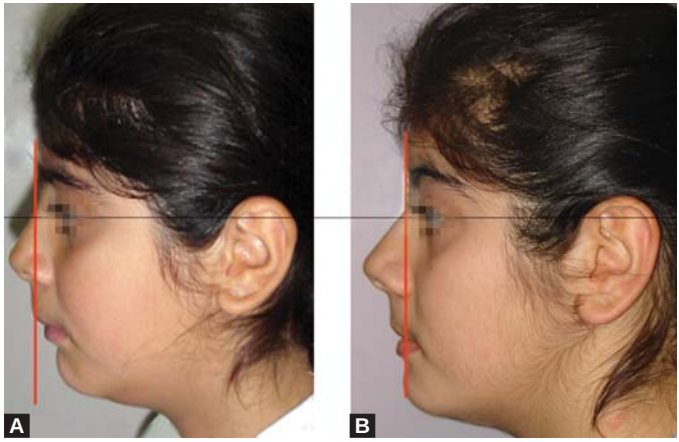
The teeth along with their surrounding structures are required to perform certain important functions like mastication, phonation. Orthodontic treatment should increase the efficiency of the functions performed (Figs 2.1A and B).



Figs 2.1A and B: Well aligned teeth provide better functional efficiency and not just better esthetics

Structural Balance

The treatment should maintain a balance between these structures, and the correction of one should not be detrimental to the health of another (Figs 2.2A to 2.3B).



Figs 2.2A and B: A more balanced profile representing a better relationship of the basal bones and increased chewing efficiency of the teeth

Figs 2.3A and B: Esthetic harmony achieved following orthodontic treatment combined with orthognathic surgery (Orthognathic surgery, *Courtesy:* Dr Vishal Singh)

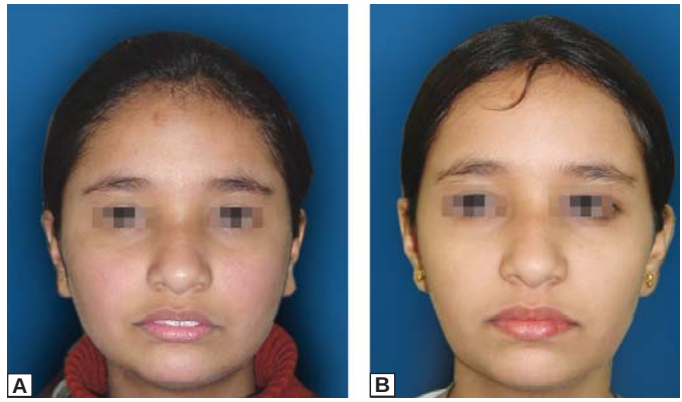
Esthetic Harmony

The orthodontic treatment should increase the overall esthetic appeal of the individual. This might just require the alignment of certain teeth or the forward movement of the complete jaw including its basal bone. The aim is to get results which gel with the patient's personality and make him /her look more esthetic (Figa 2.4A and B).

Figs 2.4A and B: Better esthetic harmony achieved following orthodontic treatment along with the extraction of all first premolars

The various purposes for which an orthodontic treatment can be used include:

1. Improvement of facial esthetics (Figs 2.5A and B).



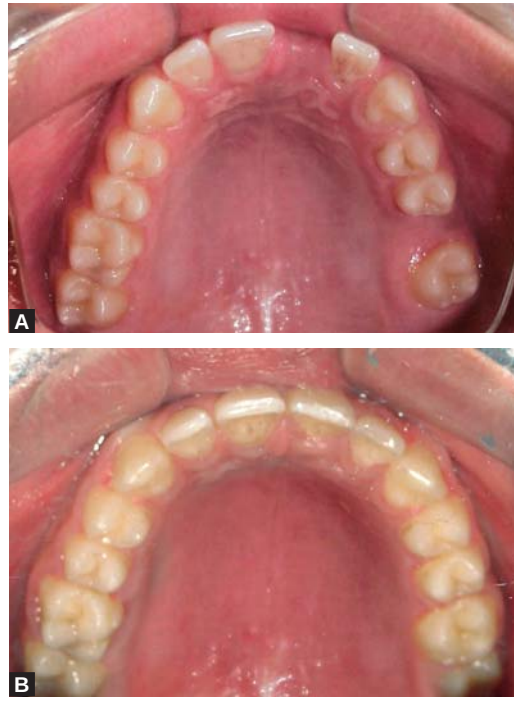
Figs 2.5A and B: Improvement of facial esthetics following orthodontics treatment

2. Improvement of dental esthetics (Figs 2.6A and B).

Fig. 2.6A: Improvement in the smile following orthodontic correction

Fig. 2.6B: Improvement in dental esthetics following orthodontic correction. Distilization of maxillary posterior teeth was under taken to create space in this case where molars were in an Angle's class II relationship initially

3. To assist the eruption and alignment of impacted or displaced teeth (Figs 2.7A and B).



Figs 2.7A and B: Impacted teeth can be assisted to errupt and brought into alignment with orthodontic mechanotherapy, the left maxillary central incisor in the Figure A

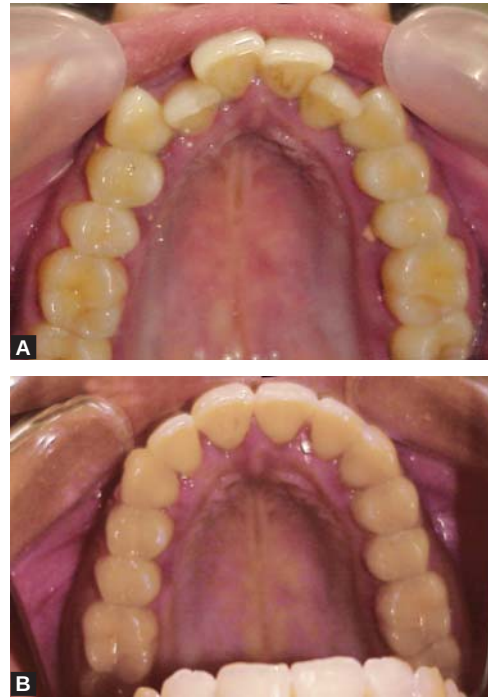
4. Elimination of traumatic bite/occlusion (Figs 2.8A and B).

Fig. 2.8A

Fig. 2.8B

Figs 2.8A and B: Cross-bites can cause trauma to the opposing teeth causing periodontal breakdown. Correction of cross-bites/ traumatic occlusion can improve general oral health
Note: The improvement in the periodontal condition of mandibular central incisors

5. Alignment of teeth to eliminate stagnation areas (Figs 2.9A and B).



Figs 2.9A and B: Malaligned teeth, especially crowding causes areas of stagnation, which are difficult to clean. Alignment of these teeth leads to better oral hygiene

6. Alignment of periodontally involved teeth prior to splinting (Figs 2.10A to C).

Figs 2.10A to C: Periodontally compromised mandibular incisors aligned using the lingual appliance and then splinted with the fiber splint

7. Alignment of irregular teeth prior to prosthetic rehabilitation (Fig. 2.11A) including implants (Fig. 2.11B).

Fig. 2.11A: Space created for the missing mandibular left central incisor using the lingual appliance and rehabilitated with an implant retained prosthesis (Implant prosthesis, *Courtesy:* Dr Abhay Lamba)

Fig. 2.11B: Space created for the missing maxillary left lateral incisor using an open coil spring on a pre-adjusted edge wise appliance and rehabilitated using an implant retained prosthesis (Implant prosthesis, *Courtesy:* Dr Abhay Lamba)

8. Supraeruption of fractured teeth/root-stumps prior to prosthetic restoration (Figs 2.12A to C).

Fig. 2.12A: Grossly decayed teeth are difficult to restore prosthetically due to a lack of creditable stable tooth structure to support them

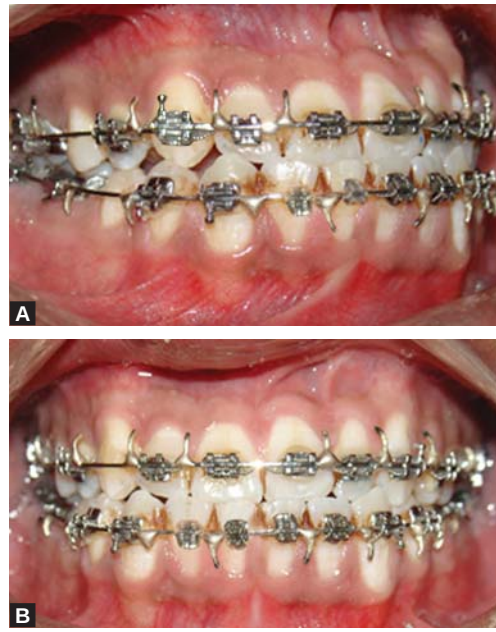
Figs 2.12B and C: Grossly decayed teeth/root stumps can be orthodontically made to supraerupt (more visible in the oral cavity) and suitably restored prosthetically. In the above case, microimplant was used (see black arrow) with elastics to pull the decayed tooth further into the oral cavity (Prosthesis, *Courtesy:* Dr Pankaj Dutta)

9. Intrusion of supraerupted teeth to aid prosthetic rehabilitation (Figs 2.13A and B).

Fig. 2.13A: Supraerupted teeth (maxillary right first molar in this Figure) cannot be used as prosthetic abutments without intruding or devitalizing them

Fig. 2.13B: Individual supraerupted teeth can be intruded to achieve better alignment, which allows their use as prosthetic abutments without devitalizing them

10. The alignment and planned positioning of teeth in the jaws prior to orthognathic surgery (Figs 2.14A and B).



Figs 2.14A and B: Before any orthognathic surgery is done, it is essential to perform preorthodontic treatment and align the individual teeth and the two arches so that they can seat well following surgery

11. Stabilization of bone grafts by directing the eruption of teeth through the graft in cleft cases (Fig. 2.15).

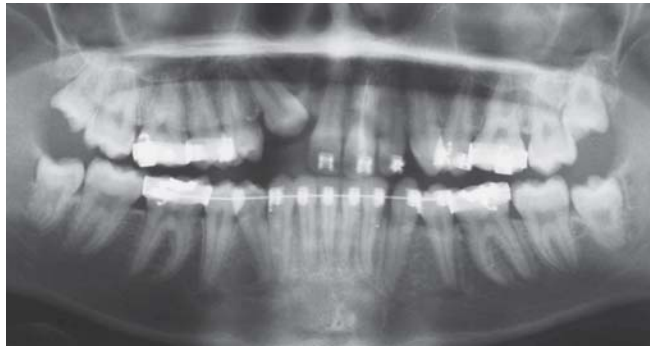


Fig. 2.15: If a tooth is made to erupt through a bone graft put in a case of cleft palate, the bone graft has a greater rate of success

CHAPTER THREE

Treatment Options

There are basically five options for treating any case:

1. No treatment recommended.
2. Preventive orthodontic treatment.
   Preventive orthodontic treatment can be sub-divided according to the nature of treatment rendered as:
   a. Preventive pediatric care (Fig. 3.1A).

Fig. 3.1A: Pit and fissure sealants used on mandibular first permanent molars

b. Preventive surgical treatment:
   i. Removal of supernumeraries (Figs 3.1Bi and Bii).

Fig. 3.1Bi: Mesiodens is a supernumerary tooth seen in the midline

Fig. 3.1Bii: Mesiodens seen erupting before the permanent maxillary central incisors (orthopantomogram and frontal view)

ii. Removal of retained deciduous teeth (Fig. 3.1Biii and Biv)

Fig. 3.1Biii: Retained deciduous right maxillary incisor causing the succedaneous tooth to erupt palatally (Frontal view)

Fig. 3.1Biv: Retained deciduous right maxillary incisor causing the succedaneous tooth to erupt palatally (Occlusal view)

c. Conservative/Restorative treatment (Fig. 3.1C).

Fig. 3.1C: Fancy colored restorations done on deciduous mandibular molars

d. Rehabilitative treatment (3.1Di and Diii)

Fig. 3.1Di: Prematurity lost maxillary deciduous incisors (*Courtesy:* Dr Rajesh Ahal)

Fig. 3.1Dii: Acrylic teeth replacing the deciduous maxillary incisors, retained by soldering stainless steel crowns on deciduous molars (Occlusal view, *Courtesy*: Dr Rajesh Ahal)

Fig. 3.1Diii: Acrylic teeth replacing the deciduous maxillary incisors, retained by soldering to stainless steel crowns on deciduous molars (Frontal view, *Courtesy*: Dr. Rajesh Ahal)

3. Interceptive orthodontic treatment. Interceptive orthodontic treatment is that phase of orthodontics that is employed to recognize and eliminate potential irregularities and malpositions in the developing dentofacial complex.

   Interceptive orthodontic care can be further subdivided according to the nature of insertion and removal of the appliance as:

a. Removable interceptive appliance (Fig. 3.2Ai to Aiii).

Fig. 3.2Ai: Maxillary right lateral insior in cross-bite

Fig. 3.2Aii: Acrylic plate incorporating a mini-screw and a posterior bite-plane used to correct the lateral incisor cross-bite

Fig. 3.2Aiii: Alignment of teeth following correction of lateral incisor cross-bite

b. Fixed interceptive appliance.
   i. Passive (Fig. 3.2Bi).

Fig. 3.2Bi: A passive lingual arch given to prevent loss in mandibular arch length

ii. Active interceptive appliance (Figs 3.2Bii and Biii).

Fig. 3.2Bii: Constricted maxillary arch with posterior teeth in cross-bite

Fig. 3.2Biii: Constricted maxillary arch expanded using a NiTi expander retained by molar sheaths welded to maxillary first molar bands

c. Interception of developing deleterious habits:

Deleterious Habits

i. Thumb sucking (Fig. 3.2Ci)

Fig. 3.2Ci: Patient with the thumb sucking habit

ii. Finger sucking (Fig. 3.2Cii)

Fig. 3.2Cii: Male patient with finger sucking habit

iii. Mouth breathing (Fig. 3.2Ciii)

Fig. 3.2Ciii: Patient with mouth breathing habit

iv. Nail biting (Fig. 3.2Civ)

Fig. 3.2Civ: Typical appearance of nails of a patient with nail biting habit

v. Tongue thrusting (Fig. 3.2Cv)

Fig. 3.2Cv: Anterior tongue thrusting habit is usually associated with an abberent swallowing pattern and leads to proclination and spacing between teeth

vi. Lip biting (Fig. 3.2Cvi)

Fig. 3.2Cvi: Young may develop the habit of biting their lips

Methods of Interception

i. Reminder/retraining appliance (Fig. 3.2Di)

Fig. 3.2Di: A removable blue grass appliance can act as a reminder or a retraining device in the correction of the anterior tongue thrust habit

ii. Restraining appliance –tongue crib (Fig. 3.2Dii)

Fig. 3.2Dii: A fixed tongue crib forcefully keep the tongue from coming in contact with the anterior teeth during swallowing

iii. Mouth breathing (Fig. 3.2Diii)

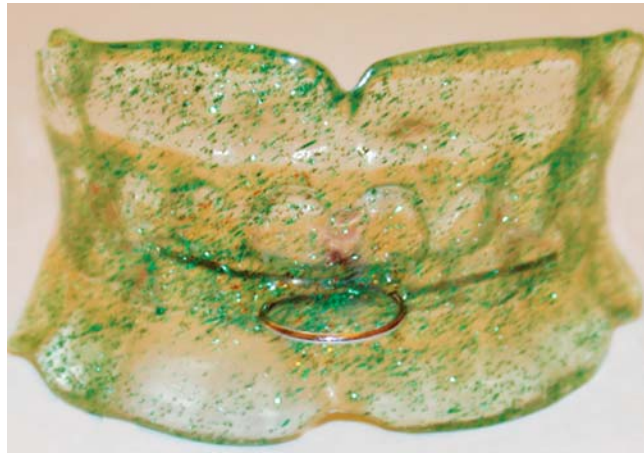


Fig. 3.2Diii: A vestibular screen extends into the labial sulcus and prevents mouth breathing. Selective trimming opposite the maxillary incisors can aid in retruding them. Also, an anterior wire loop if incorporated, can help perform certain lip exercises

4. Corrective orthodontic treatment.
   Corrective orthodontic care can be further subdivided according to the nature of the insertion and removal of the appliance as:
   a. Removable appliance (Figs 3.3Ai to Aiv).

Figs 3.3Ai: A trainer appliance is a commercially available flexible appliance which is removable yet able to correct various habits that are basically abberant patterns associated with normal functions

Fig. 3.3Aii: Anterior cross-bite with molars in a super Class I relationship

Fig. 3.3Aiii: A 3-D expander to expand the maxillary arch both transversally and sagittaly

Fig. 3.3Aiv: A better alignment over all and correction of cross-bite

b. Fixed appliance (Figs 3.3Bi to Biii).

Fig. 3.3Bi: Malalignment with crowding midline shift and end-on molar relationship on the left side

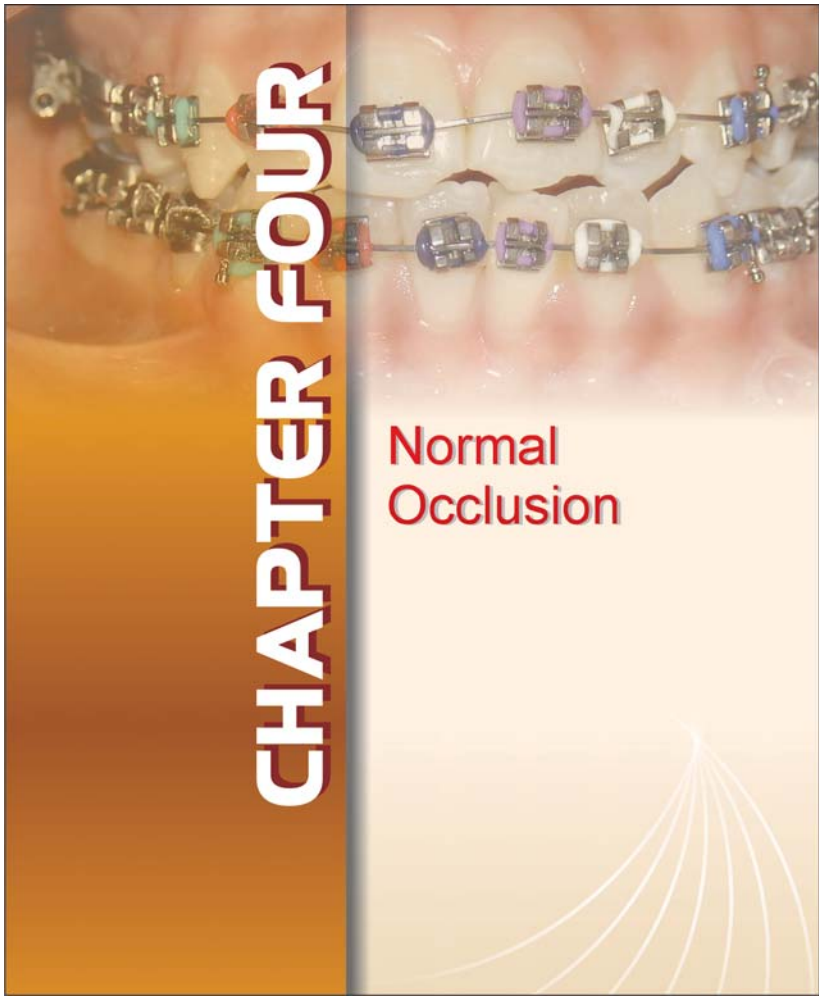
Fig. 3.3Bii: Orthodontic treatment along with non-extraction treatment mechanics

Fig. 3.3Biii: Finished results lead to well-aligned teeth, homogenous smile and increases the patient self esteem and confidence

5. Inter-disciplinary treatment (Figs 3.4A and B).
   This includes orthodontic treatment, both fixed and/or removable so as to augment the results of treatment as planned by other dental specialists. It should be remembered that this is a synergistic relationship and certain cases are best treated by a team rather than an individual.

Fig. 3.4A: Impacted 3rd molars can be up-righted orthodontically to permit there use as an abutment for bridge placed to replace the extracted 2nd molar

Fig. 3.4B: Discolored maxillary central incisors can be aligned, deep bite corrected and crowned/capped with metal free ceramic crowns for optimal esthetics


CHAPTER FOUR
Normal
Occlusion

Many individuals have tried to describe the elusive concept of 'normal occlusion'. The concepts described here are based on Andrew's work on 120 non-orthodontic models, based on which he gave six keys to normal occlusion and developed the 'Straight wire appliance' in 1972.

KEY I—Inter-arch Relationship (Fig. 4.1)

a. The distal surface of the distal marginal ridge of the upper first permanent molar contacts and occludes with the mesial surface of the mesial marginal ridge of the lower second molar.
b. The mesiobuccal cusp of the upper first permanent molar falls within the groove between the mesial and middle cusps of the lower first permanent molar.
c. The mesiolingual cusp of the upper first molar seats in the central fossa of the lower first molar.

Fig. 4.1: Angle's Class I relationship

KEY II—Mesiodistal Crown Angulation, the Mesiodistal "Tip" (Fig. 4.2)

In normally occluded teeth, the gingival portion of the long axis of each crown is distal to the occlusal portion of that axis. The degree of tip varies with each tooth type.

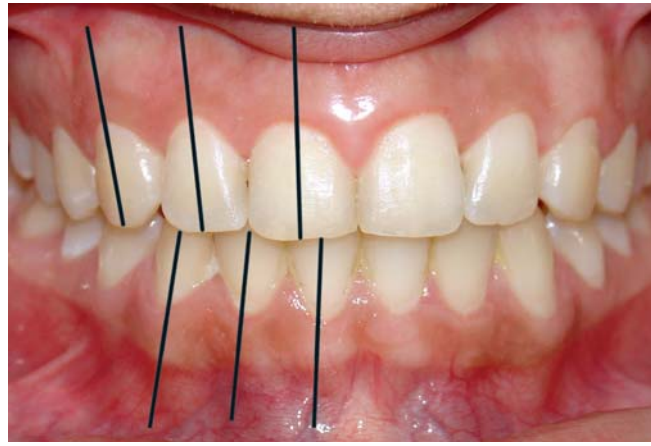


Fig. 4.2: Mesiodistal crown angulations

KEY III—Labiolingual Crown Inclination, the Labiolingual or Buccolingual, "Torque"

- Crown inclination is the angle between a line 90 degrees to the occlusal plane, and a line tangent to the middle of the labial or buccal surface of clinical crown (Fig. 4.3A).

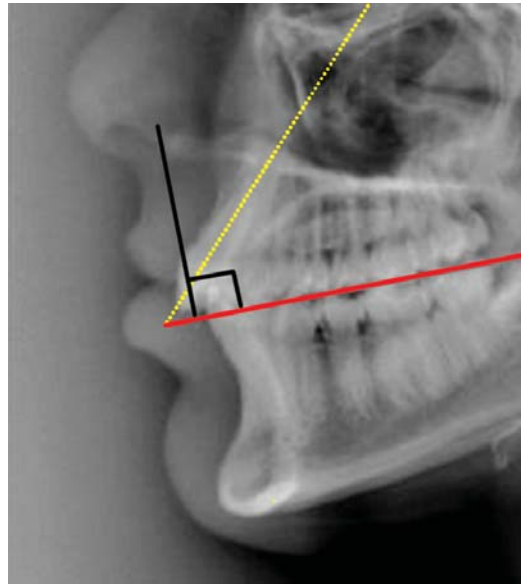


Fig. 4.3A: Labiolingual crown inclination

- Anterior crowns central and lateral incisors: In upper and lower incisors, the occlusal portion of the crown's labial surface is labial to the gingival portion. In all other crowns, the occlusal portion of the labial or buccal surface is lingual to the gingival portion. In the non-orthodontic normal models, the average interincisal crown angle is 134 degrees (Fig. 4.3B).

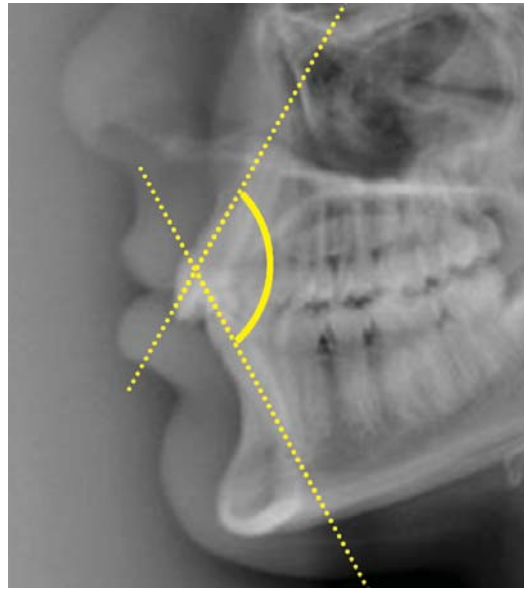


Fig. 4.3B: Interincisal angle

- Upper posterior crowns (cuspids through molars): Lingual crown inclination is slightly more pronounced in the molars than in cuspids and bicuspids (Fig. 4.3C).

  In the maxillary arch, lingual/palatal inclination progressively increases from cuspids/canines to molars, i.e. to say that the occlusal table of individual posterior teeth tilts progressively towards the palate as we move posteriorly.

Fig. 4.3C: Depiction on of the lingual crown inclinations on maxillary posterior teeth

- Lower posterior crowns (cuspids through molars): Lingual inclination progressively increases (Fig. 4.3D).

  In the mandibular arch, lingual inclination progressively increases from cuspids/canines to molars; i.e. to say that the occlusal table of individual posterior teeth tilts progressively towards the tongue as we move posteriorly.

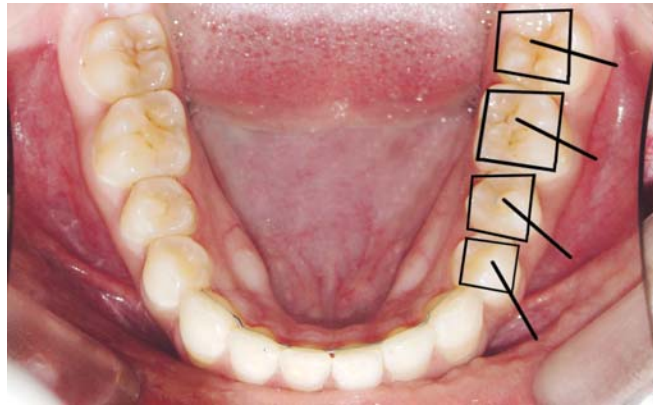


Fig. 4.3D: Depiction of the lingual inclination of the mandibular posterior teeth

KEY IV—Absence of Rotations

Teeth should be free of undesirable rotations (Fig. 4.4). If rotated, a molar or bicuspid occupies more space than normal – a condition unreceptive to normal occlusion. A rotated incisor will occupy less space than when normally aligned.

Rotated teeth prevent the occurrence of proper contact points/surfaces, they may also increase or decrease arch length. Hence absence of rotated teeth is essential for the stability of occlusion.

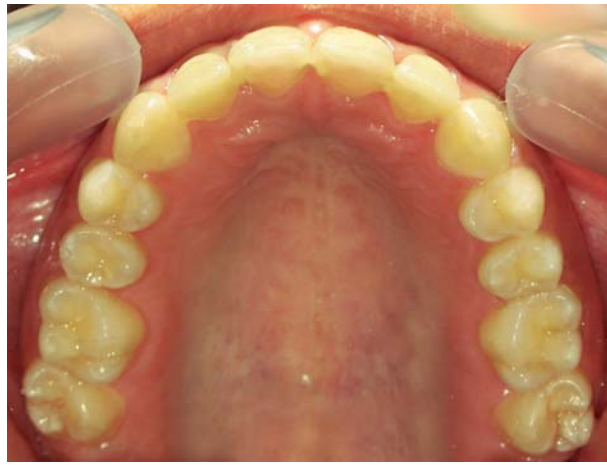


Fig. 4.4: Absence of rotations of teeth

KEY V—Presence of Tight Contacts (Fig. 4.5)

In the absence of such abnormalities as genuine tooth-size discrepancies, contact points should be tight.

Tight contacts are an essential part to maintain the integrity of any arch form especially the dental arches.

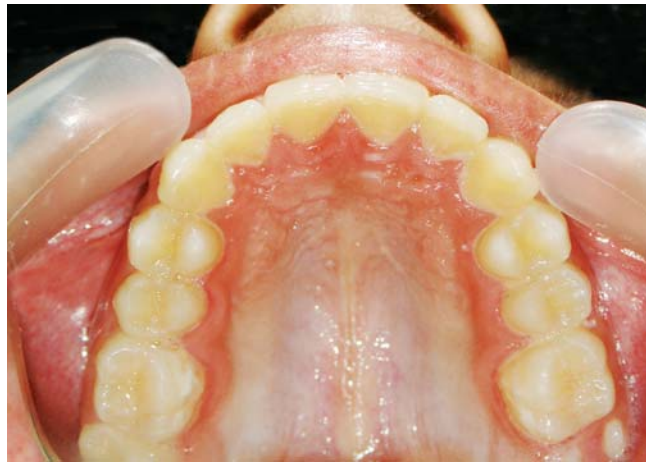


Fig. 4.5: Presence of tight contacts

KEY VI—Flat Curve of Spee (Fig. 4.6)

A flat occlusal plane should be the treatment goal. Measured from the most prominent cusp of the lower second molar to the lower central incisor, no curve was deeper than 1.5 mm in the non-orthodontic normals.

The vertical distance between any tooth and the line joining the most prominant cusp-tip of the mandibular molar and central incisor (curve of Spee) should be minimal. In other words a flat curve of Spee aids in stability of occlusion.

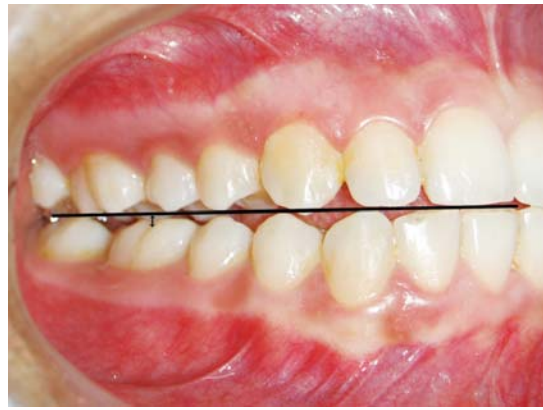
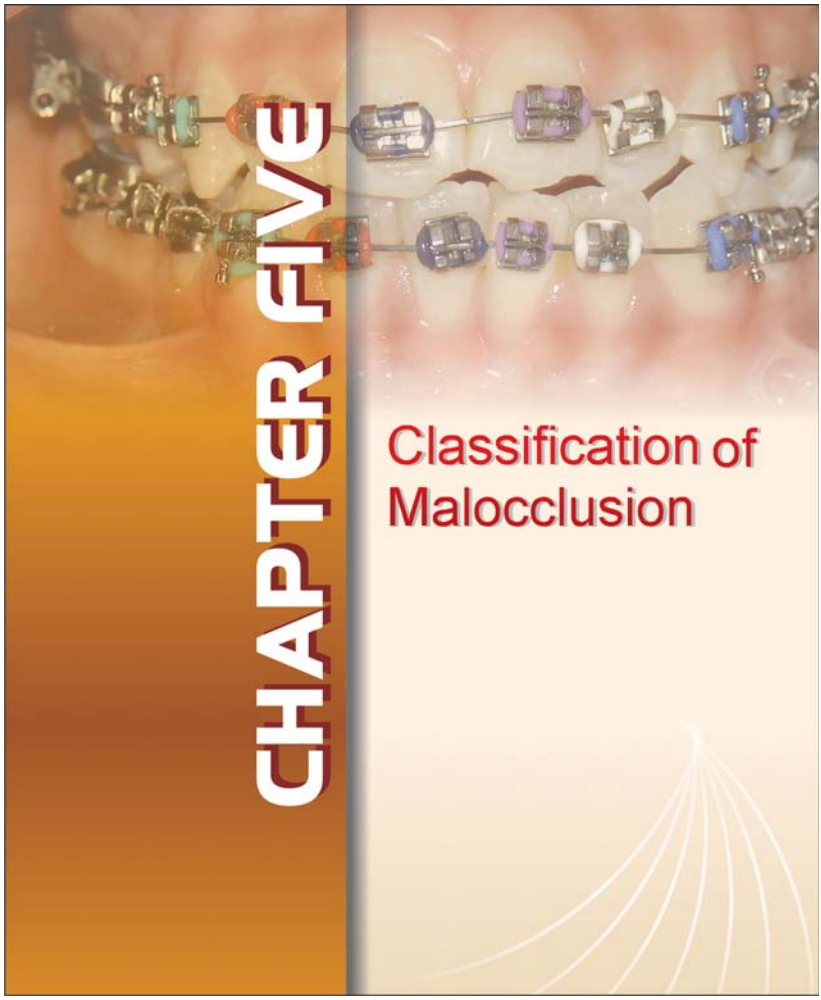


Fig. 4.6: A flat curve of Spee


CHAPTER FIVE
Classification of
Malocclusion

Angle's Class I (Fig. 5.1)

- Mandibular arch is in normal mesiodistal relationship with the maxillary arch.
- The mesiobuccal cusp of the maxillary first molar occludes in the buccal groove of the mandibular first permanent molar.
- The mesiolingual cusp of the maxillary first permanent molar occludes with the central fossa of the mandibular first permanent molar.

Fig. 5.1: The mesiobuccal cusp of the maxillary first molar occludes in the buccal groove of the mandibular first permanent molar

Angle's Class II (Fig. 5.2A)

- Mandibular dental arch and body are in distal relationship with the maxillary arch.
- The mesiobuccal cusp of the maxillary first molar occludes in the space between the mesiobuccal cusp of the mandibular first molar and the distal aspect of the mandibular second premolar.

Fig. 5.2A: The mesiobuccal cusp of the maxillary first molar occludes in the space between the mesiobuccal cusp of the mandibular first molar and the distal aspect of the mandibular second premolar

- The mesiolingual cusp of the maxillary first permanent molar occludes mesial to the mesiolingual cusp of the mandibular first molar.
- Distobuccal cusp of upper first permanent molar occludes in the buccal groove of the lower first permanent molar.

Class II, Division 1 (Fig. 5.2 B)

Maxillary incisor teeth are in labio-version.

Fig. 5.2B: Increased horizontal over-lap (overjet) between the upper and lower front teeth is evident

Class II, Division 2 (Fig. 5.2C)

The maxillary incisors are near normal antero-posteriorly or slightly in lingual version, whereas the maxillary lateral incisors are tipped labially and/or mesially.

Fig. 5.2C: Retroclined maxillary central incisors with labially tipped maxillary lateral incisors and anterior deep bite are typical of Angle's Class II division 2

Class II Sub-division (Fig. 5.2D)

Class II molar relationship occurs only on one side.

Fig. 5.2D: Angle's Class I molar relationship on the right side and Class II on the left side

Angle's Class III Malocclusion (Fig. 5.3)

- The mandibular dental arch and body are in mesial relationship to the maxillary arch.
- The mesiobuccal cusp of the maxillary first molar occludes in the interdental space between the distal aspect of the distal cusp of the mandibular first molar and the mesial aspect of the mesial cusp of the mandibular second molar.

Fig. 5.3: Angle's Class III molar relationship

Pseudo Class III

The mandible shifts anteriorly in the glenoid fossa due to a premature contact or some other reason, when the jaws are brought together in centric occlusion.

Class III Sub-division

The molar relation is Class III only on one side with the contra later side being in Angle's Class I.

Dewey's Modification of Angle's Class I

Type 1

Maxillary anterior crowding (Fig. 5.4A).

Fig. 5.4A: Maxillary anteriors are crowded with the molars in Angle's Class I relationship

Type 2

Maxillary incisors are proclined (Fig. 5.4B).

Fig. 5.4B: Maxillary incisors are proclined with the molars in Angle's Class I relation

Type 3

Maxillary incisors in lingual version to mandibular incisor teeth (Fig. 5.4C). Or in other words, a negative overjet exists.

Fig. 5.4C: Maxillary incisors are lingual to the mandibular incisors with the molars in Angle's Class I relation

Type 4

Molars and/or premolars in bucco/lingual version. (Fig. 5.4D).

Fig. 5.4D: Maxillary right posterior teeth in cross-bite

Type 5

Molars are in mesio version due to early loss of teeth mesial to them (Fig. 5.4 Ei and Eii).

Fig. 5.4Ei: The maxillary left permanent first molar and the deciduous 2nd molar have drifted mesially done to the early loss of the deciduous canine and 1st molar. The overall decrease in arch length is causing the permanent maxillary canine to erupt labially

Fig. 5.4Eii: The mandibular left first molar (arrow) has drifted forward due to the early loss of the deciduous second molar. This will cause a decrease in the mandibular arch length and a possible impaction of the mandibular left second premolar

Dewey's Modification of Angle's Class III

Type 1

Individual arch is in normal alignment, but in occlusion-anteriors are in edge to edge (Fig. 5.5A).

Fig. 5.5A: First molars are in Angle's Class III relationship with the incisors meeting edge to edge

Type 2

Mandibular incisors are crowded and lingual to maxillary incisors (Fig. 5.5B).

Fig. 5.5B: First molars are in Angle's Class III relation with a positive overjet existing due to crowding in the mandibular anterior segment

Type 3

Maxillary arch is under developed, in cross-bite with incisors crowded (Fig. 5.5C).

Fig. 5.5C: Cleft lip and palate case with under developed maxillary arch

SKELETAL CLASSIFICATION

Salzmann in 1950 was the first to classify malocclusions according to the underlying skeletal structures.

Class I

Jaws in harmony with the profile being orthognathic (Fig. 5.6Ai)

Fig. 5.6Ai: A well balanced face–skeletal Class I relationship

Division 1: Local malrelationship of incisor, canine and premolar (Fig. 5.6Aii).

Fig. 5.6Aii: Skeletal Class I relationship with local malrelationships

Division 2: Maxillary incisor protrusion (Fig. 5.6 Aiii).

Fig. 5.6Aiii: Skeletal Class I relationship with maxillary incisor protrusion

Division 3: Maxillary incisors in linguo-version (Fig. 5.6Aiv)

Fig. 5.6Aiv: Skeletal Class I relationship with maxillary incisors lingually tipped

Division 4: Bimaxillary protrusion (Fig. 5.6Av).

Fig. 5.6Av: The maxillary and mandibular anterior are excessively proclined otherwise face is harmonious

Class 2

Subnormal distal mandibular development in relation to the maxilla.

Division 1: Dental arch narrow, crowding in canine region, decreased vertical facial height, maxillary anterior protrusion and the profile is convex (Fig. 5.6Bi).

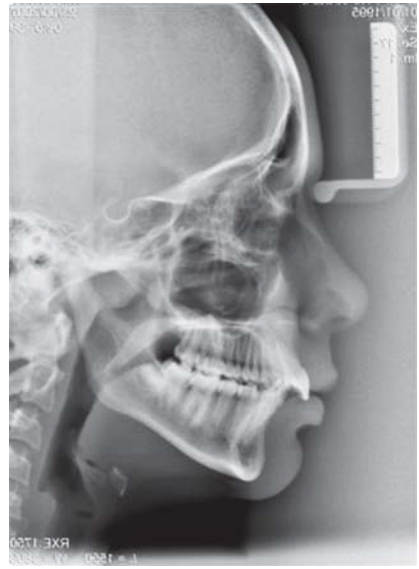


Fig. 5.6Bi: Mandibular arch is either under developed or retro-positioned with respect to the rest of the face

Division 2: Maxillary incisors are lingually inclined, lateral incisors may be normal or proclined. Profile is orthognathic (Fig. 5.6Bii).

Fig. 5.6Bii: The mandibular basal bone is near normal with the mandibular dentoalveolar segment being retro-positioned with respect to the rest of the face. This is usually caused due to backward path of closure of the mandible

Class 3

Here there is an over growth of the mandible with an obtuse mandibular angle. The profile is prognathic at the mandible (Fig. 5.6C).

Fig. 5.6C: The mandible is either large or forwardly placed in comparison to the rest of the face. It is a usually heriditary in nature

INCISOR CLASSIFICATION

Incisor classification was adopted by the British Standards' Institute in 1983. It is based upon the relationship of the lower incisor edges and the cingulum plateau of the maxillary central incisors.

Class 1

The mandibular incisor edges occlude with or lie immediately below the cingulum plateau of the maxillary central incisors (Fig. 5.7A).

Fig. 5.7A: The mandibular incisal edge lies immediately below the cingulum plateau of the maxillary central incisor

Class 2

The mandibular incisor edges lie posterior to the cingulum plateau of the maxillary central incisors.

- *Division 1:* The maxillary central incisors are proclined or average inclination and there is an increased overjet (Fig. 5.7Bi).

Fig. 5.7Bi: The mandibular incisor edges lie posterior to the cingulum plateau of the maxillary central incisors with an increased overjet

- *Division 2:* The maxillary central incisors are retroclined; the overjet is normally minimal, but may be increased (Fig. 5.7Bii).

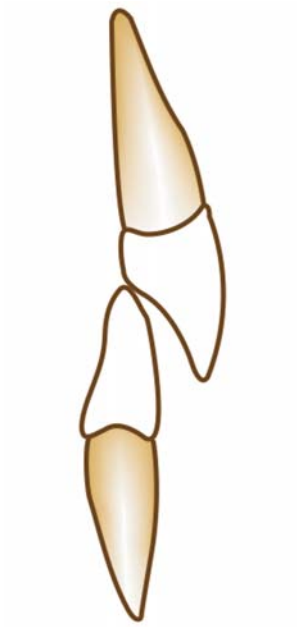
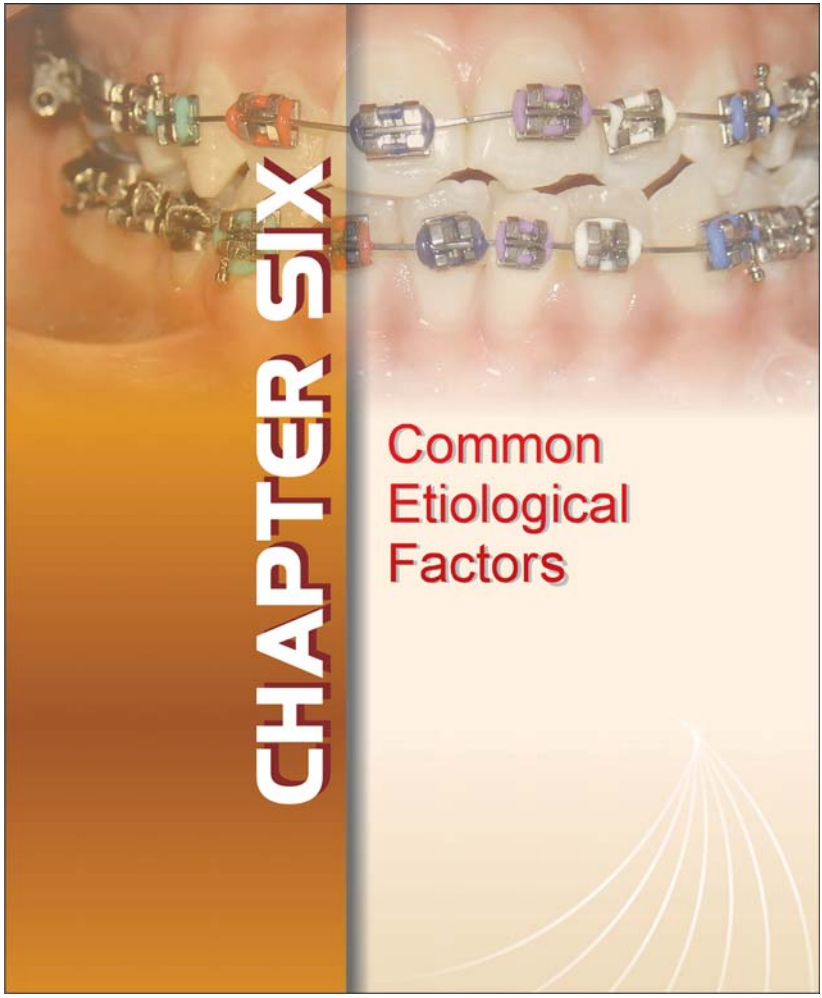


Fig. 5.7Bii: The mandibular incisal edges lie posterior to the cingulum plateau of the maxillary central incisors with decreased overjet

Class 3

The mandibular incisor edges lie anterior to the cingulum plateau of the upper central incisors; the over jet is reduced or reversed (Fig. 5.7C).

Fig. 5.7C: The mandibular incisor edges lie anterior to the cingulum plateau of the upper central incisor with a reduced or negative overjet


CHAPTER SIX
Common
Etiological
Factors

Self Correcting Anomalies

The most common self correcting anomaly is the ugly duckling stage.

Ugly duckling stage (Figs 6.1A and B): Midline diastema may persist even after the "ugly ducking stage" or close simultaneously. This depends on the amount of fibers crossing over inter-dentally and the eruption of upper canines at their proper place in the oral cavity.

Fig. 6.1A: As the maxillary canines erupt they exert pressure on the roots of the maxillary lateral incisors–flaring them. These unsightly spacing between the front teeth lead parents to consult an orthodontist

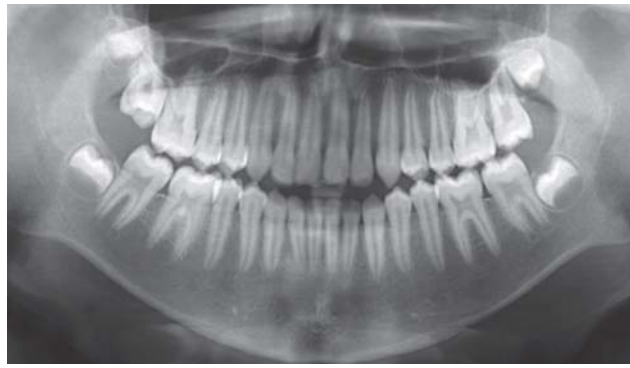


Fig. 6.1B: Spontaneous closure of spacing between the maxillary front teeth on the completion of eruption of the maxillary canine leads the “Ugly Duckling” turn into a beautiful “Swan”

Anomalies of Number

Supernumerary Teeth (Figs 6.2Ai to D)

Figure 6.2Ai: "Mesiodens" is usually situated between the maxillary central incisors and can vary considerably in shape.

Supernumerary teeth are extra teeth in the oral cavity which may or may not bear resemblence to the permanent teeth. The most common is the mesiodens, which occurs in the region of upper central incisors.

Fig. 6.2Ai: A mesiodens between the central incisors, leading to the left lateral incisor erupting palatally

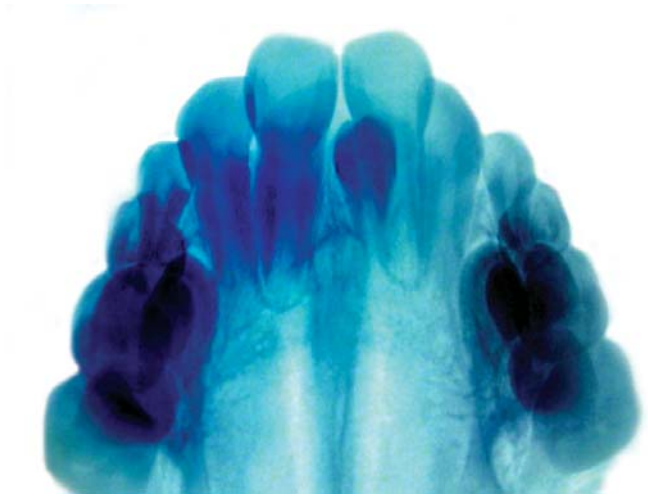


Fig. 6.2Aii: Radiographic appearance of a maxillary mesiodens in occlusal view

Fig. 6.2Aiii: Mesiodens causing the impaction of the maxillary right central incisor as seen in an orthopantomogram (OPG)

Fig. 6.2B: “Mesiodens” in the mandibular arch

Supplemental teeth: Supernumerary teeth, which bear a close resemblance to a particular group of teeth and erupt close to the original sight of these teeth, are called the supplemental teeth.

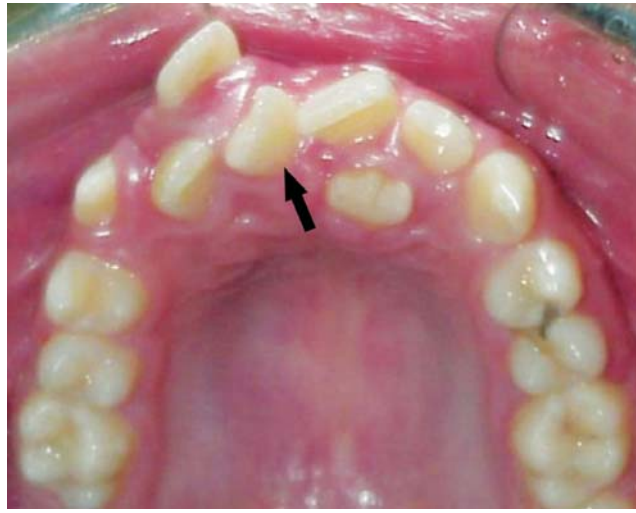


Fig. 6.2C: Supplemental tooth between the maxillary central incisors bearing resemblance to the adjacent permanent teeth

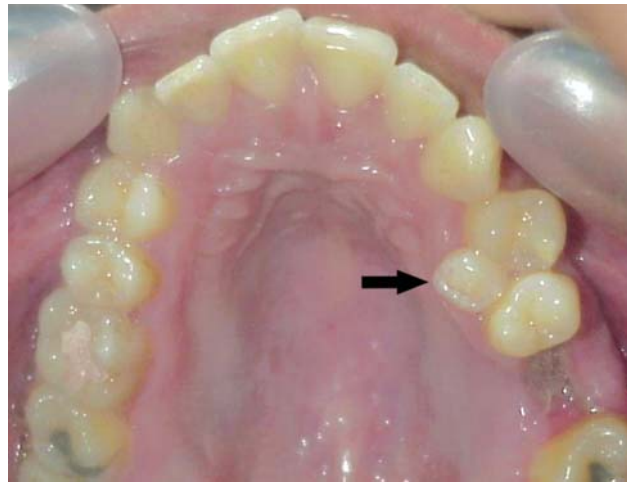


Fig. 6.2D: Supernumerary tooth in relation to the upper left 1st and 2nd premolars

Missing Teeth (Congenital Absence (Figs 6.3A and B) or Loss due to Trauma, Caries, etc.)

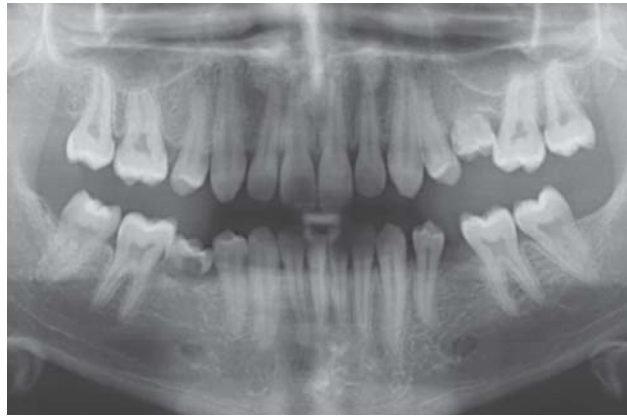


Fig. 6.3A: Congenitally missing second premolars in all quadrants as seen in an orthopantomogram

Fig. 6.3B: Teeth lost due to caries in the mandibular arch (occlusal view)

Anomalies of Tooth Size

- Microdontia
- Macrodontia
- True generalized macrodontia, where all the teeth are larger than normal is seen in cases of pituitary gigantism.
- Relative generalized microdontia may be seen, but is an illusion of the true condition (Figs 6.4A and B).

Fig. 6.4A: Relative microdontia

- *Localized microdontia:* Individual tooth is smaller than the normal size. 'Peg lateral' is the most commonly seen localized microdontia, it involves the maxillary lateral incisors (Fig. 6.4B).

Fig. 6.4B: Peg-shaped maxillary left lateral incisor

Anomalies of Tooth Shape (Figs 6.5Ai to Fii)

- *True fusion:* When the tooth arises through the union of two normally separated tooth germs (Figs 6.5Ai to Aiii).

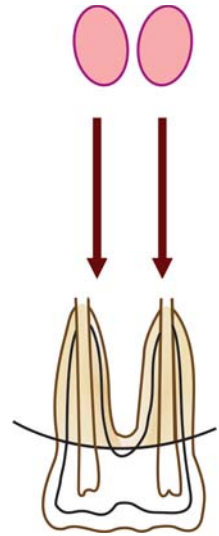


Fig. 6.5Ai: True fusion

Fig. 6.5Aii: Fusion of two permanent mandibular incisors

Fig. 6.5Aiii: Fusion of two deciduous mandibular incisors

- *Germination:* These arise from division of a single tooth germ by an invagination, leading to formation of two incomplete teeth (Fig. 6.5B).

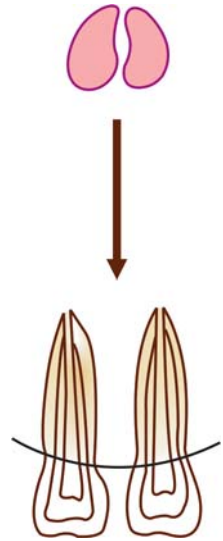


Fig. 6.5B: Germination

- *Concrescence:* Fusion of teeth which occurs after root formation is complete (Fig. 6.5C).

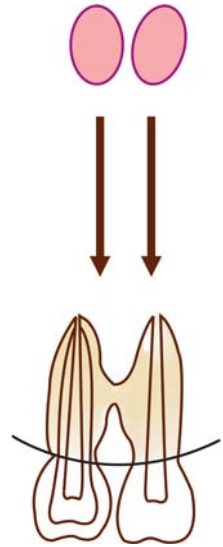


Fig. 6.5C: Concrescence

- *Talon cusp:* The talon cusp, is an anomalous structure projecting lingually from the cingulum area of a maxillary or mandibular permanent incisor (Fig. 6.5Di). It might interfere in proper occlusion (Fig. 6.5Dii).

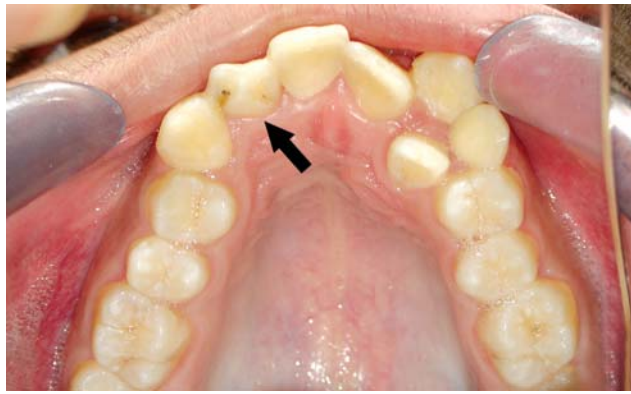


Fig. 6.5Di: Occlusal view, showing a talons cusp on the palatal surface of the maxillary right lateral incisor

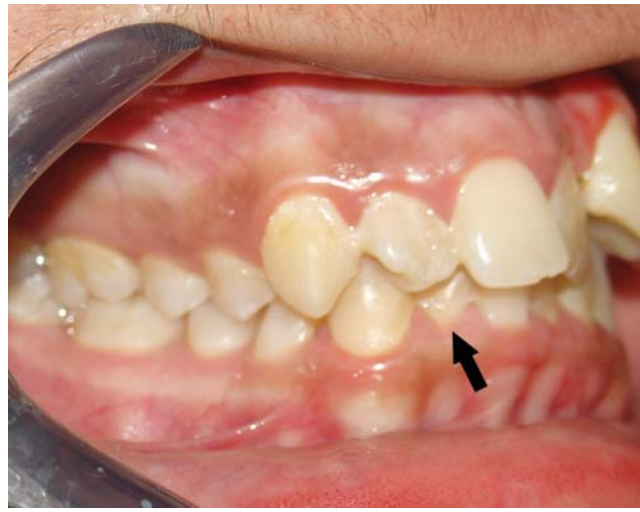


Fig. 6.5Dii: Lateral view, showing the lower lateral incisors being lingually displaced due to interference from the talons cusp on the upper right lateral incisor

- *Dens in dente:* The term 'Dens in dente' is used to denote a developmental variation which radiographically may resemble a tooth within a tooth (Fig. 6.5E). It rarely has any clinical significance from an orthodontic point of view.

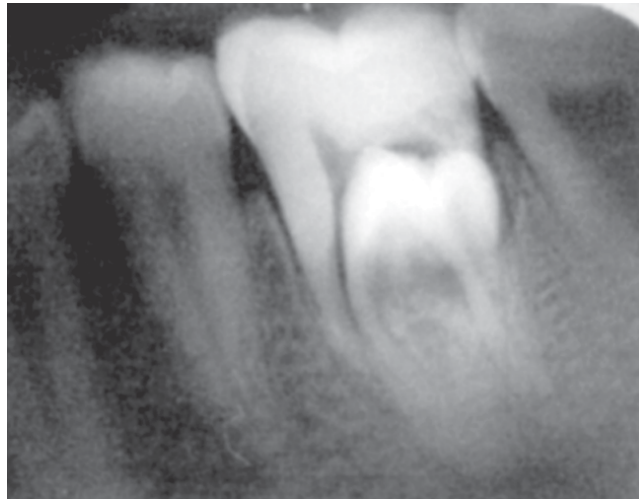


Fig. 6.5E: 10PA shows dens in dente in mandibular 1st permanent molar

- *Dilaceration:* Dilaceration is also an anomaly of the tooth shape in which there is a sharp bend or curve in the root or crown.
  It can effect orthodontic treatment planning (Fig. 6.5Fi) and may require alteration of bracket positioning and may also complicate the extraction of the affected tooth (Fig. 6.5Fii).

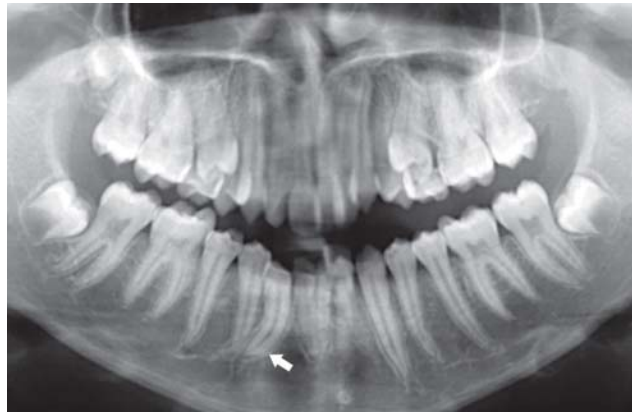


Fig. 6.5Fi: Dilacerated root of the mandibular right permanent canine which will require alteration in bracket positioning during orthodontic treatment

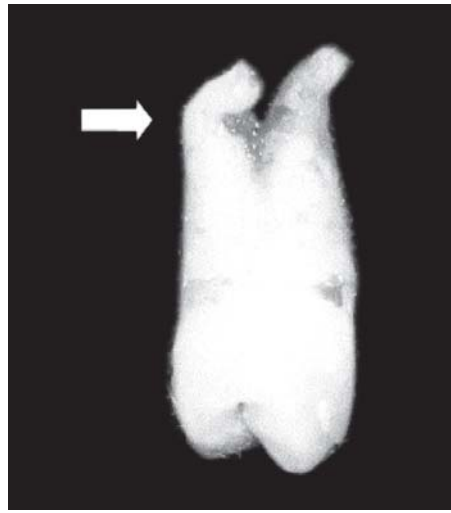


Fig. 6.5Fii: Dilaceration in the apical one-third of a maxillary first premolar may complicate the extraction of such teeth

Mucosal Barriers Abnormal Labial Frenum (Figs 6.6A and B)

Fig. 6.6A: Frontal view, showing a high labial frenum between the maxillary central incisors causing the midline spacing

Fig. 6.6B: Tongue tie

Premature Loss (Fig. 6.7Ai to B)

- The premature Loss of a deciduous tooth can lead to a malocclusion only if the succedaneous tooth is not sufficiently close to the point of eruption.
- This can lead to a decrease in the over all arch length as the posterior teeth have a tendency to migrate mesially (Fig. 6.7A).

Fig. 6.7Ai: Mesial of the mandibular first molar into the vacant space created by the premature loss of a deciduous second mandibular molar drifting can cause the second premolar to become impacted

Fig. 6.7Aii: The mandibular posterior teeth on the left side have moved mesially due to the premature loss of the mandibular deciduous second molar and the decay on the distal aspect of the decidous first molar

- This might cause the permanent successor to erupt malpositioned; impacted or cause a shift in the midline (in case of anterior teeth) (Fig. 6.7B).

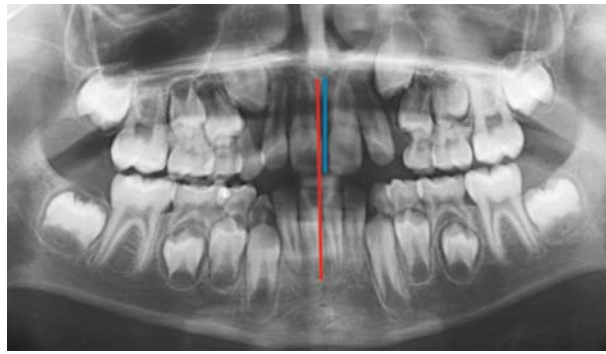


Fig. 6.7B: A shift in the midline of the maxillary arch towards the left side seen due to the premature loss of the maxillary decidous canine

- Prolonged retention (Figs 6.8Ai to C).

Fig. 6.8Ai: Retained maxillary deciduous canines causing the permanent canines to erupt labially

Fig. 6.8Aii: Retained mandibular incisors and canines causing crowding of erupting permanent teeth

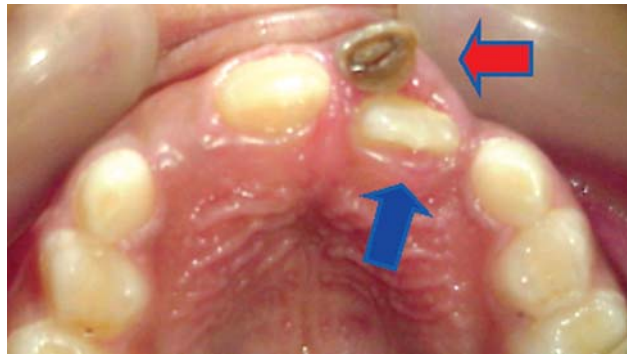


Fig. 6.8B: Retained deciduous central causing the palatal eruption of maxillary left permanent central incisor

Fig. 6.8C: Retained mandibular right deciduous canine caused the eruption of its successor posterior to it, increasing the arch length

- Delayed eruption of permanent teeth (Fig. 6.9).

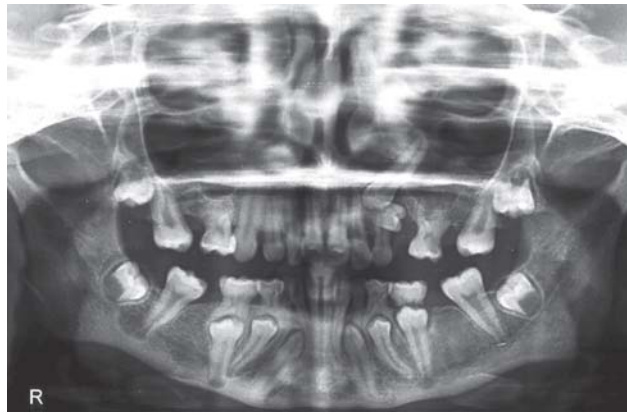


Fig. 6.9: Delayed eruption of multiple teeth in a 16 years old female patient

- Abnormal eruptive path (Figs 6.10A and B).

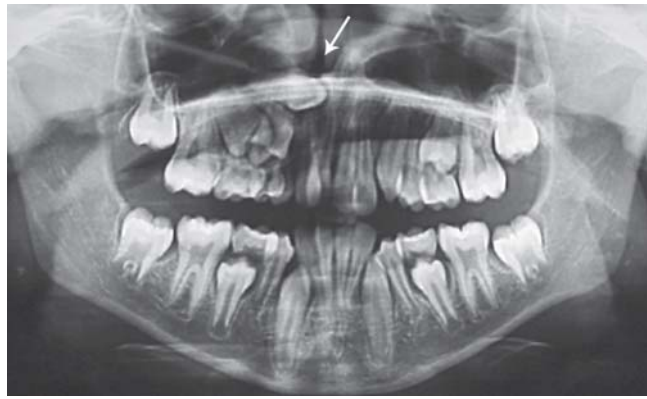


Fig. 6.10A: Abnormal path of eruption of the maxillary right canine

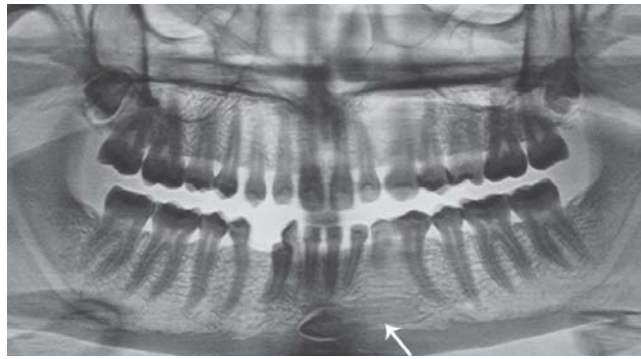


Fig. 6.10B: Abnormal path of eruption of the mandibular left canine

Ankylosis is a condition which involves the union of the root or part of a root directly to the bone, i.e. without the intervening periodontal membrane. Ankylosis or partial ankylosis is encountered relatively frequently during the mixed dentition stage.

- Ankylosis (Fig. 6.11).

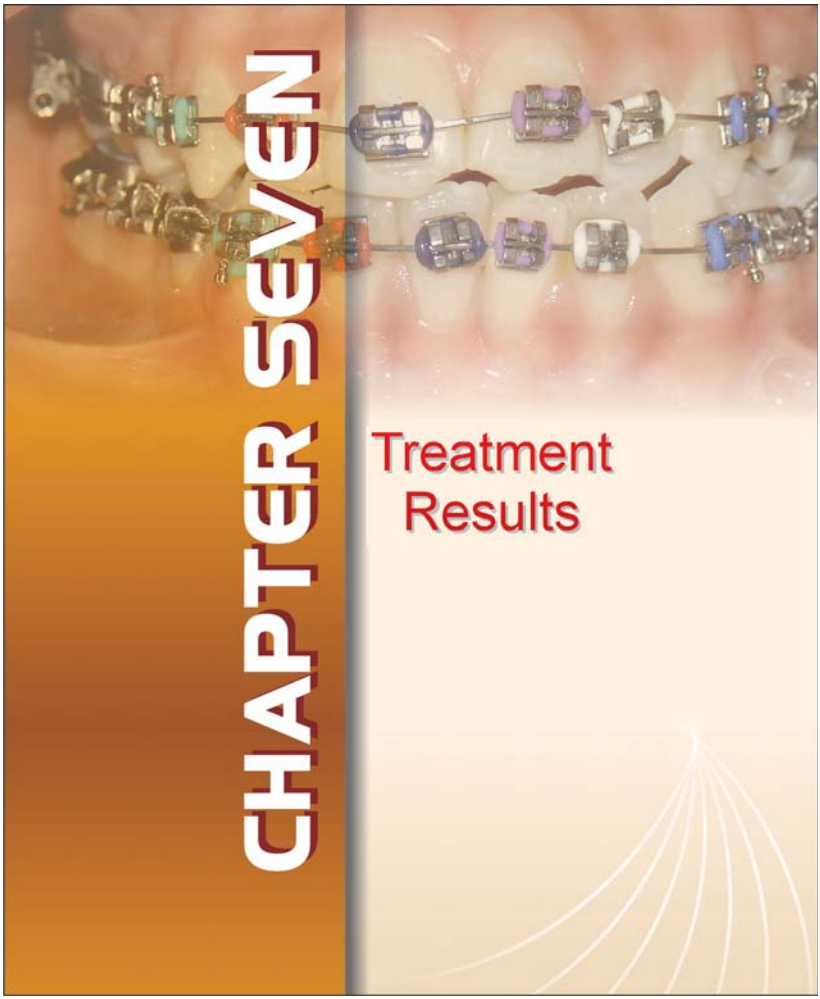
Fig. 6.11: Retained deciduous teeth have a high tendency to get ankylosed. If these teeth fail to erupt at the normal level, they are also called "Submerged teeth" (arrow)

- Dental caries (Fig. 6.12).

Fig. 6.12: Proximal caries on deciduous, as well as permanent teeth can lead to a loss in arch length, as the posterior teeth have a tendency to drift mesially

- Improper dental restorations (Fig. 6.13).

Fig. 6.13: Improper contact and build-up of maxillary lateral incisor can lead to distal drifting of the central incisor


CHAPTER SEVEN
Treatment
Results

It is easier to accept a treatment if there is ready reference against which one can compare himself or herself. The most difficult part of clinical practice is to make a patient understand why healthy teeth need to be extracted as part of the orthodontic treatment plan. This chapter will show the results that can be achieved with good treatment planning and execution. Various type of extraction and non-extraction treatment cases are presented with a view to convince the patients that these are viable and effective means to better esthetics.

Orthodontic treatment done along with all first four pre-molar extractions (Figs 7.1A to 7.3B).

Fig. 7.1A: Change as seen in the frontal photograph of a growing patient treated with braces along with the extraction of all first pre-molars

Fig. 7.1B: Change as seen in the profile photograph of a growing patient treated with braces along with the extraction of all first pre-molars

Fig. 7.2A: Change as seen in the profile photograph of a non-growing patient treated with braces along with the extraction of all first pre-molars

Fig. 7.2B: Change in the lip protrusion as seen in the profile photograph of a non-growing patient treated with braces along with the extraction of all first pre-molars

Fig. 7.3A: Change in the smile as seen in the frontal photograph of a non-growing patient treated with braces along with the extraction of all first pre-molars. Note the severe crowding of teeth present in the dental arches

Fig. 7.3B: Change in the intra-oral photograph of a non-growing patient treated with braces along with the extraction of all first pre-molars. Note the severe crowding of teeth present in the dental arches and its improvement following correction

Orthodontic treatment done along with upper first pre-molar extractions (Fig. 7.4).

Fig. 7.4: Change in the smile as seen in the frontal photograph of a patient with a typical Class II division 2, treated with braces along with the extraction of upper first pre-molars. Note the severe crowding of teeth present in the dental arches initially

Orthodontic treatment done along with upper left pre-molar extractions (Fig. 7.5).

Fig. 7.5: Change in the smile as seen in the frontal photograph of a patient with a typical Class II subdivision, treated with braces along with the extraction of upper left pre-molar only. Note the severe crowding of teeth present in the dental arches initially

Orthodontic treatment done along resolution of a tongue thrust habit (Fig. 7.6).

Fig. 7.6: Change in the smile as seen in the frontal photograph of a patient with a typical Class I molars with persistent tongue thrust, treated with braces along with a habit breaking appliance. Note the severe spacing of teeth present in the dental arches initially

Non-extraction orthodontic treatment (Figs 7.7 to 7.13B).

Fig. 7.7: Resolution of an anterior open bite caused due to a severe tongue thrust habit using fixed orthodontic appliances along with a fixed tongue crip

Fig. 7.8: Severe crowding in the maxillary arch with molars in Class II relationship treated non-extraction, by distalization of maxillary arch

Fig. 7.9: Severe midline diastema closed using fixed orthodontic appliances and retained with a fixed bonded retainer on the palatal aspect

Fig. 7.10: Non-extraction treatment done in a crowding case. The space for the maxillary lateral incisors in cross-bite was created by proclining the central incisors along with proximal stripping of all the maxillary anteriors

Fig. 7.11: Change in the smile and alignment of a case in which the maxillary left canine erupted palatally because of an over retainer deciduous canine

Fig. 7.12A: Case with a severely constricted maxilla, treated by expanding the maxilla using a rapid maxillary expander and aligning the arches using a fixed orthodontic appliance

Fig. 7.12B: Case with a severely constricted maxilla, treated by expanding the maxilla using a rapid maxillary expander and aligning the arches using a fixed orthodontic appliance. Note the improvement in the maxillary arch contour

Fig. 7.13A: Non-extraction treatment undertaken in a skeletal Class II patient with an under developed mandible. A fixed functional appliance brought about the phenomenal change in the patients appearance

Fig. 7.13B: Non-extraction treatment undertaken in a skeletal Class II patient with an under developed mandible. A fixed functional appliance brought about the phenomenal change in the patients appearance. Note the forward positioning of the chin following treatment

Orthognathic Surgery along with orthodontics (Fig. 7.14).

Fig. 7.14: Treatment involving the segmental set-back of the anterior maxilla, along with orthodontic treatment in a case where the maxilla was extremely prominent

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