

Orthodontics

Growth and development

The term growth usually refers to an increase in size or number while the term development will be used to refer to an increase in complexity. Growth is largely an anatomic phenomenon, whereas development is physiologic and behavioral, which means a progress toward maturity.

Why should a dentist or orthodontist be interested in development?

1. Knowledge of general and facial growth provides a background to the understanding of the etiology and development of malocclusion, playing an important part of the diagnosis and treatment planning process.
2. At regular intervals of the growing child, all dentists should be able to identify abnormal or unusual patterns of skeletal growth (e.g. posterior rotational growth of the mandible may lead to skeletal open bite)...
3. The dentist will be able to identify abnormal occlusal development at an early stage in order to undertake suitable interceptive orthodontic treatment (e.g. premature contact may lead to severe skeletal class III)

4. Poorly timed extractions performed by the dentist during growth may have unfortunate consequences on the developing occlusion.
5. Many malocclusions are resulted from skeletal discrepancies between the jaws (maxilla and mandible). Such discrepancies are usually due to differences in the comparative growth of the jaws.
6. Orthodontic treatment may make use of growth spurts (maximum growth period) and other trends. The timing of treatment in relation to these may be important.
7. Most orthodontic treatments are performed in the actively growing child or adolescent and may have an effect on the favorable growth of hard and soft tissues of the area.
8. In some treatments, especially when surgery is being considered, it is important to be able to identify when the majority of facial growth has been completed. (above the age of 17th years)
9. Growth effects can have long-term effects on the stability of the occlusion after treatment. This needs to be considered when a retention regime is planned. (e.g. Class III needs long retention period because there is a continuous possibility of mandibular growth till 20 years of age while maxillary growth usually stopped earlier.)

Control of cranio-facial growth

Three major theories in recent years have attempted to explain the determinants of craniofacial growth as followings:

- 1- Bone, is the primary determinant of its own growth.
- 2- Cartilage is the primary determinant of skeletal growth, while bone responds secondarily and passively.
- 3- The soft tissue matrix in which the skeletal elements are embedded is the primary determinant of growth, and both bone and cartilage are secondary followers.

The major difference in the theories is the location at which genetic control is expressed.

- The first theory implies that genetic control is expressed directly at the level of the bone, and therefore, its locus should be the periosteum. However this theory has been largely discarded from 1960.
- The second, or cartilage, theory suggests that genetic control is expressed in the cartilage, while bone responds passively to being displaced, this theory still controversy till now. This indirect genetic control is called epigenetic.
- The third theory assumes that genetic control is mediated to a large extent outside the skeletal system, and that growth of both bone and cartilage is

controlled epigenetically, occurring only in response to a signal from other tissues (as it proposed that growth of cranium occurs as a result to growth of brain).

If neither bone nor cartilage was the determinant for growth of the craniofacial skeleton, it would appear that the control would have to lie in the adjacent soft tissues. This point of view was put formally in the 1960s by Moss, in his "functional matrix theory" of growth, and was reviewed and updated by him in the 1990s, his theory holds that neither the cartilage of the mandibular condyle nor the nasal septum cartilage is a determinant of jaw growth. Instead, he theorizes that growth of the face occurs as a response to functional needs and is mediated by the soft tissue in which the jaws are embedded. In this conceptual view, the soft tissues grow, and both bone and cartilage react.

Moss theorizes that the major determinant of growth of the maxilla and mandible is the enlargement of the nasal and oral cavities, which grow in response to functional needs.

The theory does not make it clear how functional needs are transmitted to the tissues around the mouth and nose, but it does predict that the cartilages of the nasal septum and mandibular condyles are not important determinants of growth, and that their loss would have little effect on growth if proper function could be obtained.

From the view of this theory, however, absence of normal function would have wide-ranging effects on normal growth. This theory considered as most acceptable one now a day.