Review: Dental Implant Placement and Skeletal Maturity: Part 1

Introduction:
1. The most appropriate, earliest age for placement of dental implants is generally held to be the age at which skeletal growth is thought to cease. The end of adolescence and the beginning of young adulthood coincide with the exhaustion of growth potential, but adaptive changes of the jaws continue throughout life. Until recently it was thought that adaptation has little clinical effect on implants.
2. Comparatively; Use of dental implants is normal in patients with ectodermal dysplasia and the influence of maxillary and mandibular skeletal and dental growth on the stability of those implants. For these patients, it is recommended that while deciding the optimal individual time point of implant insertion, the status of skeletal growth, the degree of hypodontia, and extension of related psychological stress should be taken into account in addition to the status of existing dentition and dental compliance of an adolescent patient. Both of above scenarios will be discussed in detail in this new letter.

Normal Growth of the Jaw:
Maxilla: Growth of the maxilla is characterized by remodeling in a posterosuperior direction while simultaneously being displaced in the opposite anteroinferior direction (Fig. 1).

Mandible: Is characterized by displacement away from its articulation in the glenoid fossae as the condyles and rami relocate in a posterosuperior direction (Fig. 2).

Natural tooth movement occurs as a result of eruption and of being carried along passively with the maxilla and mandible, both of which undergo displacement anteroinferior during craniofacial morphogenesis (Fig. 3). Tooth movement facilitates adaptation to changing anatomic relationships as the entire craniofacial assembly changes during this period of great flux.
1. Growth of the maxilla: by remodeling posterosuperiorly and simultaneous displacement anteroinferiorly.
   (B) Anterior view.
2. Growth of the mandible: by relocation of the condyles and rami posterosuperiorly and displacement anteroinferiorly.

3. Natural tooth movement is a net result of eruption (green arrows) and passive displacement anteroinferiorly (red arrow). (A) Lateral view. (B) Anterior view.

Adolescents and Dental Implants Therapy:
1. Owing to an absence of a periodontal ligament, implants behave like ankylosed teeth; that is, they remain stationary and do not erupt together with adjacent teeth. In failing to move together with erupting teeth, implants were found to inhibit local growth and development of the alveolar process.
2. A 3-year prospective clinical study in adolescents with congenitally missing teeth verified that implants do not move during growth of the jaws, and undergo relative submergence of a magnitude proportional to the amount of residual jaw growth.
3. Submergence of an implant is disadvantageous for a number of reasons. (figure 4a and 4b)
   A) An intraocclusion occurs, which disrupts carefully constructed occlusal relationships and leads to compensatory eruption of opposing teeth and tipping of adjacent teeth.
   B) A vertical discrepancy develops between the mucosal margin of the implant and the gingival margins of adjacent teeth.

4: Implant-supported crowns at sites 1.1 and 2.1 in a 22-year-old male demonstrate submergence, an upwardly curved distortion of the intercuspid occlusal plane, discrepancies of the marginal gingivae, compensatory eruption of the mandibular incisors, and mesial tipping of the maxillary lateral incisors and canines. (A) Frontal view. (B) Maxillary occlusal view.

4. Submergence of an implant or an ankylosed tooth appears not to be a passive phenomenon; rather, it exerts an inhibitory effect on eruption of neighboring teeth, the force of which diminishes with distance.
5. The distance over which this field effect is seen is usually restricted to one or two teeth on either side of a submerged implant, and depending on the degree of residual alveolar growth remaining at the time of implant placement, disruption of the occlusal plane can be severe.

Implant Submergence and Esthetic and Occlusal Outcome:
1. In general, the damage caused by implant submergence is not correctable. Although it may be possible to revise or replace the restoration to correct an occlusal discrepancy, the crown/root ratio of the replacement restoration may become unfavorable.
2. In addition, the esthetics of a replacement crown generally will be worse than the original because a soft tissue margin discrepancy cannot be corrected.
3. Moreover, because the field effect disrupts normal local alveolar growth, the submergence and tipping of adjacent teeth cannot be corrected orthodontically without accentuating the implant submergence, aggravating the accompanying aesthetic and occlusal defects, and compounding attachment loss of the orthodontically extruded implant-adjacent teeth (Fig. 5).
4. This situation underscores the importance of ensuring that residual growth has been exhausted before implant placement is attempted, except in some situations where dentoalveolar growth is expected to be minimal or where the value afforded by an anchored prosthesis outweighs the disadvantage of local growth inhibition.

5. Mutilation of maxillary occlusion in a 21-year-old female caused by residual dentoalveolar growth subsequent to placement of a dental implant to replace a congenitally missing maxillary left second premolar at age 15. The implant had been placed to provide orthodontic anchorage. Apparent fenestration of buccal bone and exposure of metal collar are related to surgical placement.

References for the above newsletter: