Mar 13, 2017

"Monday Morning Pearls of Practice by Bobby Baig"

baig@buildyoursmile.com

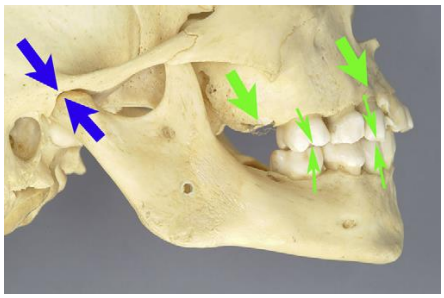
Prosthodontic Associates
2300 Yonge St, suite 905
Toronto, M4P1E4
www.buildyoursmile.com

Review: Dental Implant Placement and Skeletal Maturity: Part II:

Growth and Vertical Dimension of Occlusion:

1. Development of the vertical dimension of occlusion is characterized by balance of vertical growth of the middle cranial fossa and the ramus, with an equivalent vertical development of the naso-maxillary complex and the dentoalveolar processes of the maxilla and mandible (Fig. 1A).
2. In patients who have oligodontia, it is common to see a deficiency in vertical development (Fig. 2), presumably as a result of reduced dentoalveolar development (Fig. 3A-B). Therefore, less potential for vertical development in patients who have greater numbers of congenitally missing teeth would mean that early implant placement in these patients might be expected to have less inhibition on alveolar growth, and hence cause less submergence, than in patients who have only one or two missing teeth.

Pictures are courtesy of R Carmichael at al; 2008 AOMS Clin N Am 1-9

1 a) 

2 

1. Vertical dimension of occlusion is characterized by the balance of vertical growth of the middle cranial foss and rami (Blue arrows) with an equivalent vertical development of the nasomaxillary complex (Large green arrows) and dentoalverolar process of the jaws (small green arrows).
2. Patient with Oligodontia: deficient vertical development.

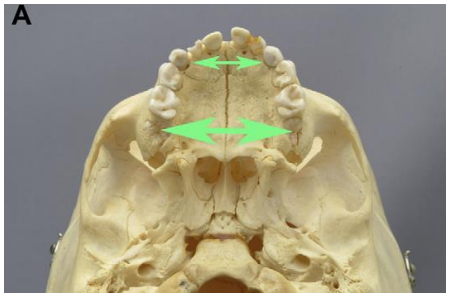
3 a) 

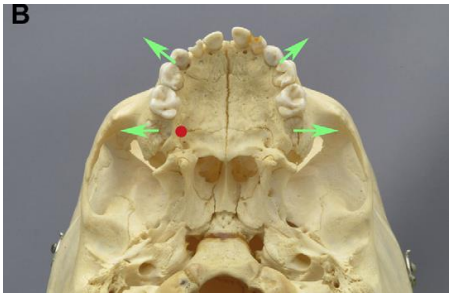
3 b) 

3. Lack of growth demonstrates deficient dentoalveolar development, with resultant deficiencies in the vertical dimension of occlusion and intermaxillary space. (3a and 3b).

Transverse Growth and Development in Maxilla:

1. Transverse development of the maxilla occurs primarily, as a result of, growth at the midpalatal suture, and is greater posteriorly than anteriorly (Fig. 4).
2. Sutural growth ceases at about 17 years of age in boys (i.e., about 2 years earlier than the condylar growth and growth in body height).
3. In order not to constrain transverse development of the maxilla, implants on either side of the midline should not be united with either fixed or removable restorations either anteriorly or posteriorly until the cessation of skeletal growth.
4. In addition to growth at the midpalatal suture, the maxilla grows by remodeling (4). As the maxilla and mandible enlarge, the dentition drifts vertically and horizontally to keep pace.
5. Consequently, implants, like ankylosed teeth, undergo relative palatal/lingual displacement in addition to submergence in areas of dentoalveolar growth. (4A and B)

4A 

B 

4: Transverse development of the maxilla: A) Growth at the midpalatal suture is greater posteriorly than anteriorly. B) Remodelling allows the dentition to drift horizontally. A dental implant (Red circle) will become displaced palatally in addition to becoming submerged) in remodeling regions of the alveolar process.

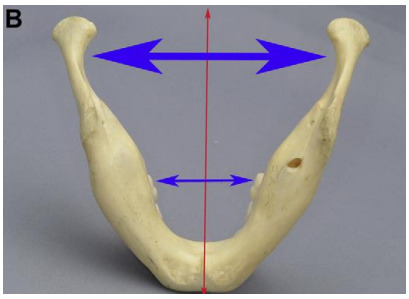
4. Submergence of an implant or an ankylosed tooth appears not to be a passive phenomenon; rather, it exerts an inhibitory effect on eruption of neighboring teeth, the force of which diminishes with distance.
5. The distance over which this field effect is seen is usually restricted to one or two teeth 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.

Transverse Growth and Development in Anterior Mandible:

1. Most studies of mandibular growth suggest that transverse growth of the mandible between the canine regions is minimal, and that which does occur ceases early.
2. Consequently, implants in the anterior mandible and united by a restoration spanning the symphysis may not constrain transverse growth (Fig. 5A).

3. In contrast, mandibular growth may be accompanied by an opening hinge movement of its halves around a vertical axis located in or near the symphysis, in a pattern that would obviously be constrained by a cross arch restoration retained by implants placed bilaterally in the posterior mandible (Fig. 5 B)

5 A: 

5B: 

5: Transverse development of the mandible: A) Intercanine growth is minimal and cease early. B) Mandibular growth is characterized by an opening hinge movement of its two halves around an axis passing anterioposteriorly through the symphysis.

Transverse Growth and Development in Posterior Mandible:

1. Mandibular growth will also have implications for patients who have undergone full or posterior arch reconstruction on implants.
2. As the condyles and rami relocate in a posterosuperior direction, displacing the mandible away from its articulation in the glenoid fossae, a posterior open bite develops in the absence of any dental compensation and the mandible rotates anteriorly into a more prognathic position, sometimes into an anterior edge-to-edge relationship of the upper and lower incisors or beyond into a negative overjet.
3. If mandibular growth is asymmetric, a cross bite may develop on the contralateral side.
4. Whether mandibular growth is symmetric or asymmetric, posterior function is diminished, restorative materials in the anterior region wear excessively or fracture, and load distribution can become so disadvantageous as to cause loss of osseointegration.

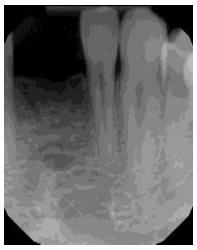
Craniofacial Growth and Adulthood:

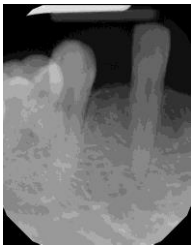
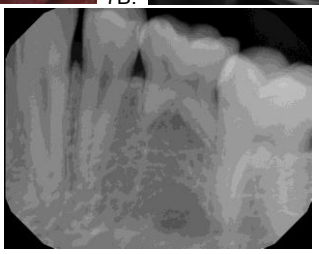
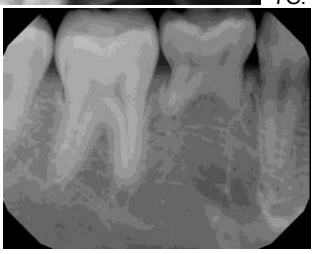
1. Craniofacial growth may continue through adulthood, which may have implications for implant placement. One case report documents submergence of an implant occurring over a decade in an adult, putatively caused by continuing growth of the facial skeleton.
2. Growth in height terminates at around age 17 in girls and age 19 in boys (i.e., skeletal maturity occurs about 2 years sooner in females than in males).
3. Late maturing boys tend to grow taller than early-maturing boys. Individual growth cessation varies by up to 6 years within each gender; consequently, chronologic age cannot be used as a guide in planning implant placement in a young individual.
4. Rather, analysis of skeletal development can be made from carpal radiographs or from superimposition of serial lateral cephalograms.

Case Report:

18-year-old patient referred to my office for a prosthodontic consultation referred by general dentist colleague. The patient underwent orthodontic treatment when he was 14 years old. Currently patient is wearing a removable essex retainer in mandible and fixed retainer in maxilla. Reason for referral: replacement of missing teeth with dental implants and assessment of retained deciduous teeth. Congenitally missing teeth are 31, 41, 42, 35 and 45. (Fig 6A-C) and (Fg 7A-C). Retained deciduous teeth 75 and 85. (8A-B)

6A:  6B:  6C: 

7A:  7B:  7C: 

7 D:  8A:  B: 

(Based on this article) The intercanine region growth ceases early, I have requested the orthodontist for lateral cephalograms taken back to back at baseline-6months and one year for superimposition and overall growth assessment and specifically in the anterior and posterior mandible.

I have referred the patient for a pre surgical consultation to OMFS for assessment of 43, 31 and 41 for bony anatomy and for future implant site assessment. (Fig 6-8)

Maintaining the deciduous molars on a long-term is a challenge by it self, clinical complications that may arise are ankyloses, root resorption, alteration in occlusal plane, constant restoration of the occlusal surface to maintain the opposing occlusal plane and to prevent supra eruption of the opposing teeth can be quiet challenging. In this case based on the radiographs, extraction of these teeth and replacement with dental implants is also a recommended treatment option. (8A-B).

Conclusion:

1. Despite best intentions, radiographic assessment of the cessation of skeletal growth may prove equivocal for technical reasons or because of erratic late growth monitoring.
2. Careful assessment for growth cessation is very critical in adolescent patients who require dental implants due to hypodontia.
3. Team collaboration: Multidisciplinary dental team plays a crucial role in case analysis and treatment sequence.
4. Best recommendation is to involve other specialists at the mixed dentition phase to provide a comprehensive analysis for a long term successful treatment outcome.
5. In growing children, single missing tooth with adjacent natural teeth, implants should not be placed until dentoalveolar development is completed, (two lateral cephalograms one apart with no change).

References:

1. Andreasen JO, Kristerson L, Nilson H, et al. Implants in the anterior region. [chapter 20]. Andreasen JO, Andreasen FM. Textbook and colour atlas of traumatic injuries to the teeth, 3rd edition. Copenhagen (Denmark):Munksgaard; 1994. p. 693.
2. Behrents R. Atlas of growth in the aging craniofacial skeleton. Monograph 18. In: Carlson DS, Ribbins KA. Craniofacial growth series. Ann Arbor (MI): University of Michigan Growth Series, Center for Human Growthand Development; 1986. p. 20–40.
3. Bernard JP, Schatz JP, Christou P, et al. Long-term vertical changes of the anterior maxillary teeth adjacent to single implants in young and mature adults. A retrospective study. J Clin Periodontol 2004;31(11):1024–8.
4. Bishara SE, Treder JE, Damon P, et al. Changes in the dental arches and dentition between 25 and 45 years of age. Angle Orthod 1996;66(6):417–22.
5. Bjork A, Skieller V. Normal and abnormal growth of the mandible. A synthesis of longitudinal cephalometric implant studies over a period of 25 years. Eur J Orthod 1983;5(1):1–46.
6. Bjork A. Sutural growth of the upper face studied by the implant method. Eur J Orthod 2007;29(Suppl 1):I82–8.
7. Chung LK, Hobson RS, Nunn JH, et al. An analysis of the skeletal relationships in a group of young people with hypodontia. J Orthod 2000;27(4):315–8.
8. Cronin RJ Jr, Oesterle LJ. Implant use in growing patients. Treatment planning concerns. Dent Clin North Am 1998; 42(1):1–34.
9. Enlow DH. Handbook of facial growth. 3rd edition. Philadelphia: WB Saunders Company; 1990. p. P46–54. Enlow DH, Hans MG. Essentials of facial growth. Philadelphia: WB Saunders Company; 1996. p. 29–68.
10. Fenton CC, Nish IA, Carmichael RP, et al. Mandibular reconstruction in a child with soft tissue matrix expansion grafting following ablation of a metastatic retinoblastoma. J Oral Maxillofac Surg 2007;65(11):2329–35.
11. Flores-Mir C, Nebbe B, Major PW. Use of skeletal maturation based on hand-wrist radiographic analysis as a predictor of facial growth: a systematic review. Angle Orthod 2004;74:118–24.
12. Forsberg CM, Eliasson S, Westergren H. Face height and tooth eruption in adultsda 20-year follow-up investigation. Eur J Orthod 1991;12(4):249–54.
13. Guckes AD, Scurria MS, King TS, et al. Prospective clinical trial of dental implants in persons with ectodermal dysplasia.J Prosthet Dent 2002;88:21–7.
14. HaÅN gg U, Taranger J. Maturation indicators and the pubertal growth spurt. Am J Orthod 1982;82(4):299–309.
15. HaÅN gg U, Taranger J. Height and height velocity in early, average and later maturers followed to the age of 25: a prospective longitudinal study of Swedish urban children from birth to adulthood. Ann Hum Biol 1991;18(1):47–56.
16. Iseri H, Solow B. Growth displacement of the maxilla studied in girls by the implant method. Eur J Orthod 1990;12(4): 389–98.
17. Iseri H, Solow B. Continued eruption of maxillary incisors and first molars in girls from 9 to 25 years, studied by the implant method. Eur J Orthod 1996;18(3):245–56.
18. Iseri H, Solow B. Change in the width of the mandibular body from 6 to 23 years of age: an implant study. Eur J Orthod 2000;22(3):229–38.
19. KuroÅNl J, OÅN dman J, et al. Treatment alternatives in young patients with missing teeth. Aspects on growth and development.
20. In: Koch G, Bergendal T, Kvint S. Consensus conference on oral implants in young patients: state of the art.
21. JoÅN nkoÅN ping (Sweden): Institute for Postgraduate Dental Research; 1996. p. 77–107.Nodal M, Kjaer I, Solow B. Craniofacial morphology in patients with multiple congenitally missing teeth. Eur J Orthod 1994;16(2):104–9.
22. Oandman J, GroÅN ndahl K, Lekholm U, et al. The effect of osseointegrated implants on the dento-alveolar development. A clinical and radiographic study in growing pigs. Eur J Orthod 1991;13(4):279–86.
23. Oesterle LJ, Cronin RJ Jr. Adult growth, aging, and the single-tooth implant. Int J Oral Maxillofac Implants 2000;15(2): 252–60.
24. Taranger J, HaÅN gg U. The timing and duration of adolescent growth. Acta Odontol Scand 1980;38(1):57–67.
25. Tarlow JL. The effect of adult growth on an anterior single-tooth implant: a clinical report. J Prosthet Dent 2004;92(3): 213–5.
26. Thilander B, OÅN dman J, GroÅN ndahl K, et al. Osseointegrated implants in adolescents. A three year study. Ned Tijdschr
27. Tandheelkd 1995;102(4):383–5.