

# Compendium

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SPECIAL ISSUE

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Thematic Issue  
**ORTHODONTICS IN RESTORATIVE-DRIVEN  
INTERDISCIPLINARY THERAPY**

**CONTINUING EDUCATION:**

Management of Dentoalveolar Ridge Defects

*Brian S. Vence, DDS; George A. Mandelaris, DDS, MS;  
and David P. Forbes, DDS, PhD*

**CONTINUING EDUCATION:**

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Origins of Dental Crowding and Malocclusions

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## CE 1

### Management of Dentoalveolar Ridge Defects for Implant Site Development: An Interdisciplinary Approach

Brian S. Vence, DDS; George A. Mandelaris, DDS, MS; and David P. Forbes, DDS, PhD

## CE 2

### Surgically Facilitated Orthodontic Therapy: A New Tool for Optimal Interdisciplinary Results

Richard D. Roblee, DDS, MS; Scotty L. Bolding, DDS, MS; and Jason M. Landers, DDS, MS

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## CE Planning Ahead

July/August 2009

To help our course participants and readers plan their continuing education (CE) endeavors, each issue of *Compendium* includes a list of learning objectives for the next month's CE course offerings.\*

## Xerostomia: Prevalence, Diagnosis, and Management

Mahvash Navazesh, DMD; and Satish K.S. Kumar, MDSc

- define xerostomia and salivary gland hypofunction
- know the prevalence and causes, especially in the elderly
- describe the diagnostic work-up and various management options available for elderly patients

## Cone-Beam Computed Tomography in Endodontics

Royeen Nesari, DDS; Louis E. Rossman, DMD; and Samuel I. Kratchman, DMD

- explain cone-beam computed tomography (CBCT) in simple terms
- list the most common clinical applications of CBCT in dentistry
- describe CBCT's possible clinical applications in endodontics

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### Case Report

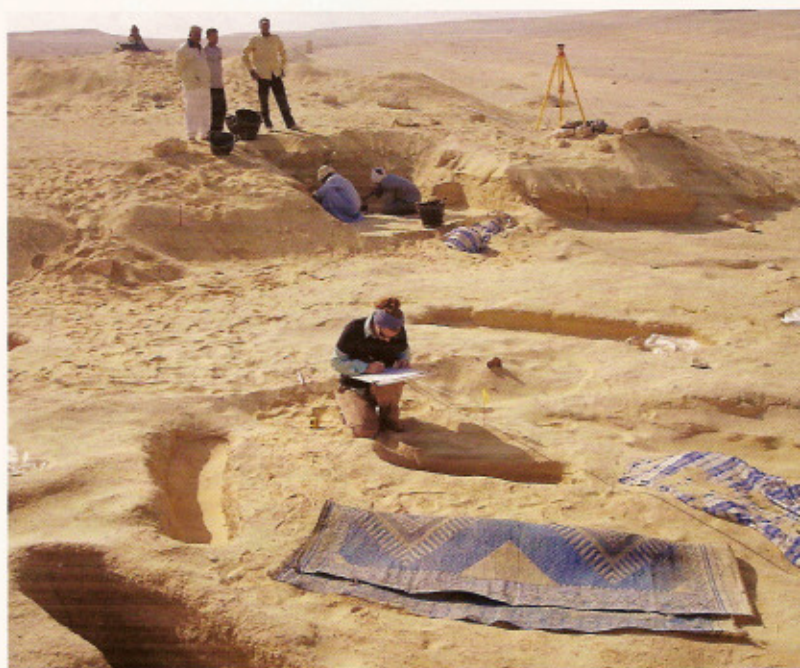
#### Periodontal and Restorative Considerations with Clear Aligner Treatment to Establish a More Favorable Restorative Environment

Robert L. Boyd, DDS

### Interdisciplinary Analysis

#### Origins of Dental Crowding and Malocclusions: An Anthropological Perspective

Jerome C. Rose, PhD; and Richard D. Roblee, DDS, MS



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3-D Interdisciplinary Communication:  
Intermediate Restorative Measures to Enhance Esthetic Outcome  
Brad Jones, DDS; and Richard D. Roblee, DDS, MS

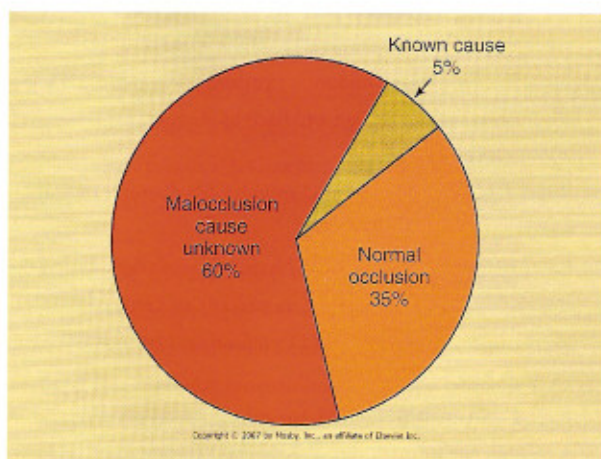
# Origins of Dental Crowding and Malocclusions: An Anthropological Perspective

Jerome C. Rose, PhD;<sup>1</sup> and Richard D. Roblee, DDS, MS<sup>2</sup>

**Abstract:** The study of ancient Egyptian skeletons from Amarna, Egypt reveals extensive tooth wear but very little dental crowding, unlike in modern Americans. In the early 20th century, Percy Raymond Begg focused his research on extreme tooth wear coincident with traditional diets to justify teeth removal during orthodontic treatment. Anthropologists studying skeletons that were excavated along the Nile Valley in Egypt and the Sudan have demonstrated reductions in tooth size and changes in the face, including decreased robustness associated with the development of agriculture, but without any increase in the frequency of dental crowding and malocclusion. For thousands of years, facial and dental reduction stayed in step, more or less. These analyses suggest it was not the reduction in tooth wear that increased crowding and malocclusion, but rather the tremendous reduction in the forces of mastication, which produced this extreme tooth wear and the subsequent reduced jaw involvement. Thus, as modern food preparation techniques spread throughout the world during the 19th century, so did dental crowding. This research provides support for the development of orthodontic therapies that increase jaw dimensions rather than the use of tooth removal to relieve crowding.

Tremendous advancements have been made in orthodontic diagnostics and treatment in the last 150 years. However, significant limitations still remain in predictably treating some malocclusions to optimal function, health, esthetics, and long-term stability. The need for overcoming these limitations is vast, with nearly two-thirds of the US population having some degree of malocclusion<sup>1</sup> (Figure 1). In contrast, most of modern society's ancestors naturally had ideal alignment without malocclusion and their third molars were fully erupted and functioning.

A common denominator today in the most difficult orthodontic problems appears to be a discrepancy between the volume of alveolar bone and tooth mass (Figure 2A through Figure 2C). In adults, these problems traditionally require longer treatment times in which the orthodontist



**Figure 1** From a broad perspective, only about one-third of the US population has normal occlusion, while two-thirds have some degree of malocclusion. In the malocclusion group, a small minority has problems attributable in a specific known cause. The remainder is the result of a complex and poorly understood combination of inherited and environmental influences. Used with permission from Proffit et al; *Contemporary Orthodontics*, 4th ed; Elsevier.

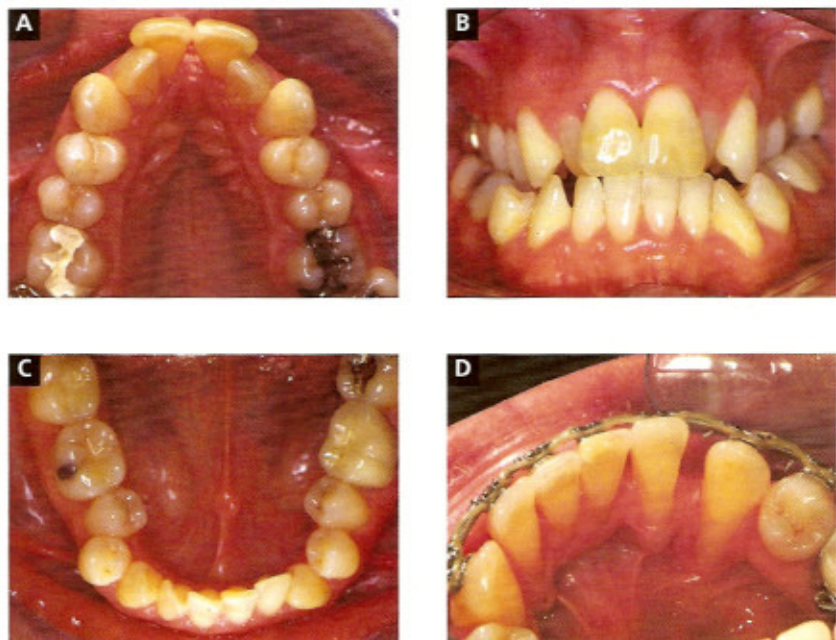
<sup>1</sup>Professor of Anthropology, University of Arkansas, Fayetteville, Arkansas

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may have to compromise relationships, esthetics, and stability through either the extraction of teeth or by positioning the teeth outside the confines of their supporting structures (Figure 2D). To develop better treatment options, determining whether these discrepancies are a tooth-mass excess problem or an alveolar bone deficiency is needed first. Some of the solutions to orthodontic limitations may be found through a better understanding of the causes for the increase of dental crowding and malocclusions in modern society.

### AN ARCHAEOLOGICAL DIG

The reasons for the origins of high malocclusion rates today prompted exploration of Egypt and the Nile Valley where thousands of skeletons—from more than 10,000 years of human history—have been excavated and analyzed. Although dental data is available from a number of Egyptian sites, this paper's specific examples are drawn from the Amarna Project excavations in the Egyptian desert, along the Nile River halfway between Cairo in the north and Luxor in the south (Figure 3). Amarna is the ancient capital of Pharaoh Akhenaton who reigned from 1353 BC to 1333 BC and built his city on empty desert for the monotheistic worship of the sun god the Aten. Three years of excavation in the recently discovered commoners' cemetery yielded 94 individual remains (Figure 4 through Figure 7). Except for the occasional slight incisor crowding and rotation, observation of the teeth indicated that they were well-aligned with very-good-to-excellent occlusion (Figure 8 and Figure 9), in general. Thorough analysis of dental data from the Amarna Project has shown that Egyptian and most ancient teeth have extensive tooth wear with dentin exposure on the occlusal surfaces of even the youngest individuals. Malocclusion is rare in Amarna but very common in America; tooth wear is extensive in Amarna yet rare in America. For almost a century, these contrasting observations have stimulated the search for causes of malocclusion among ancient skeletons.



**Figure 2A through Figure 2D** A 42-year-old male presents for treatment of severe dental crowding and malocclusion. Traditional extraction orthodontic therapy was performed to relieve crowding. Note the roots of Nos. 26 and 27 have been moved through the lingual cortical plate. This patient was treated for excess tooth structure when the underlying problem was an alveolar bone deficiency. Optimal treatment would have included procedures that increased the volume of alveolar bone.

### THE BEGG PHILOSOPHY

Percy Raymond Begg, an innovative Australian orthodontist who trained at the Angle College of Orthodontia in California from 1924 to 1925, wondered why his orthodontic treatments lacked stability even though he followed the methods and philosophy of his mentor, Edward Angle. Angle's idea that malocclusion was a disease of modern society led Begg in the 1920s to study the teeth and jaws of modern and prehistoric Native Australians.<sup>2</sup> Ultimately, Begg found only 13% of approximately 800 Native Australian skulls had Class II malocclusion, while 3% exhibited Class III.<sup>2</sup> He decided that extensive tooth wear with complete loss of cusps and exposure of dentin is the natural condition for humans; this wear transforms the incisor overbite into an edge-to-edge articulation; and interstitial wear reduces the mesiodistal diameters of all teeth so that mesial drift can shorten the tooth arch sufficiently. This enables all the teeth to fit within the jaw.<sup>2</sup> Within three years of returning to Australia and having only begun his research on ancient teeth, he began extracting teeth from his patients' jaws to provide the necessary space for his orthodontic manipulations. In the next decade, Begg completed



Figure 3 The Amarna Project excavations in the Egyptian desert.

his research on ancient teeth, promoted his theories on the development of malocclusion, and created a number of innovative treatment materials and techniques.<sup>2,3</sup>

## DISCUSSION

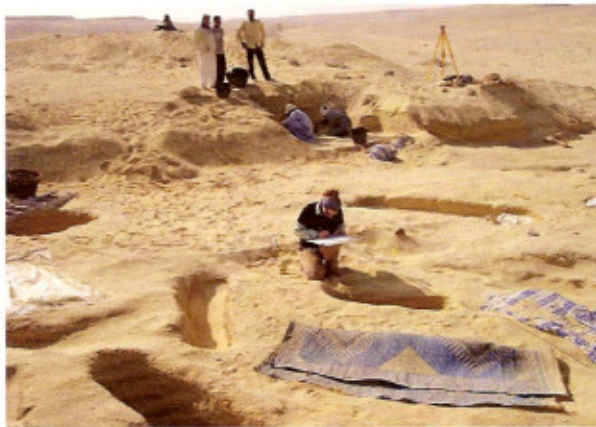
The Amarna teeth illustrate the rationality of Begg's theory. The mandible illustrated in Figure 8 shows good alignment of the teeth, no evidence of crowding, and extensive wear exposing the dentin. The speed of wear was documented by all occlusal enamel having been removed from the first molars, while only the cusp tips were worn on the third molars. Although rapid, this wear was slow enough so that the odontoblasts could keep pace with filling in the

pulp chamber with reparative dentin. Thus, virtually no pathologic consequences of this heavy wear exist at Amarna or elsewhere in the ancient findings. The dentin exposure on all the incisors is the result of an edge-to-edge bite that develops as the incisors erupt and wear both occlusally and interstitially. This high rate of wear also is shown in the maxillary teeth of the 20- to 25-year-old male in Figure 9. Again, good alignment and no crowding are evident. The right central incisor (Figure 10) is loose in the socket from postmortem breakage of the alveolar bone during ancient grave robbing. The incisors are relatively vertical and articulate in an edge-to-edge bite. The first molars were worn flat, while the cusps of the third molars were barely rounded. Figure 10 is a photo of a skull that shows the tooth surfaces worn flat and very good spacing within robust faces. Critical to Begg's interpretation was the extensive interstitial wear that reduced the mesiodistal diameters of all the teeth and hence the jaw space needed to hold the teeth. This loss of interstitial enamel can be seen clearly among teeth Nos. 2 to 5 in Figure 9. Observations such as these prompted Begg to conclude that, without extensive attrition, individuals with a "preponderance of tooth substance over bone substance" would develop malocclusion, while people with high attrition would not.<sup>2</sup> He further justified his unorthodox technique by stating that the removal of teeth to increase space is "not empirical expediency, but a rational procedure with a sound etiological basis."<sup>2</sup>

As logical as Begg's notions appear about the Amarna teeth, anthropologists know that even feral monkeys and apes have as much as 30% malocclusion when slight variations of incisor and premolar rotation are included.<sup>4</sup> In primates and ancient people, a small but significant proportion exists of malocclusions caused by inherited anomalies, developmental disturbances, and other known causes. Thus, it is logical that orthodontic textbooks attribute malocclusion to specific causes, such as teratogens, growth disturbances, developmental anomalies, genetic influences (eg, inherited disproportions between the jaws), genetic admixture of people from many parts of the world, and behaviors (eg, thumb sucking and tongue thrusting).<sup>1</sup> However, most modern malocclusions are caused by disparity between jaw size and total tooth-arch length. Such malocclusions are rare in Amarna and among ancient people worldwide. To see the flaw in Begg's argument, clinicians need to realize that while the degree of occlusal attrition is directly related to the coarseness of the diet (eg, amount of



**Figure 4** Excavation of the Amarna commoners cemetery (photograph courtesy of the Amarna Project, Barry Kemp, Director).



**Figure 5** A cemetery that shows hand excavation with trowels (far center) while the grave outlines are being mapped by the archaeologist (near center) (photograph courtesy of the Amarna Project, Barry Kemp, Director).



**Figure 6** Excellent preservation of the skeleton and teeth of a 13-year-old child in a wooden coffin. Skeletons and artifacts were taken to the on-site laboratory and residential facility for analysis and permanent storage (photograph courtesy of the Amarna Project, Barry Kemp, Director).



**Figure 7** A human skeleton arranged in anatomic order for data collection and recording on printed forms (photograph courtesy of the Amarna Project, Barry Kemp, Director).

grit and fiber), the amount of interstitial wear needed to shorten the tooth row is caused by the chewing forces exerted during mastication of food because this wear is caused by enamel rubbing on enamel as the teeth move up and down in their sockets. Again the Nile Valley might provide answers for causes of dental arch to jaw disparity.

David Greene studied the teeth of skeletons excavated in the Sudan just south of Egypt along the Nile and documented a long-term trend in dental-size reduction for the 10,000-year period.<sup>5</sup> He suggested this reduction in tooth size was from changes in diet and methods of food processing as agriculture was adopted and refined. Analysis of more samples by numerous researchers has established this

general trend in tooth-size reduction that is associated with changes in diet. As the diet has become more refined, the consequent increase in dental decay selected for smaller and less complex teeth has moved distally in relation to the skull, such that the body of the mandible now protrudes forward underneath the alveolar bone producing a chin.<sup>6</sup> Because teeth have become smaller without producing excess room in the jaws, other evolutionary mechanisms must have been at work on the alveolar bone and supporting structures of the maxilla and mandible.

While it was common to use cranial measurements to document migrations, ancient Egyptian skulls also were employed to demonstrate that the development of Egyptian

## Interdisciplinary Analysis

- Greene DL. Environmental influences on Pleistocene hominid dental evolution. *Bioscience*. 20(5):276-279.
- Calcagno JM. *Mechanisms of Human Dental Reduction: A Case Study from Post-Pleistocene Nubia*. Lawrence, KS: University of Kansas Publications in Anthropology; 1989.
- Petrie WMF. The dynastic invasion of Egypt. *Syro-Egypt. Notes on Discovery*. 2:6-9.
- Carlson DS, Van Gerven DP. Masticatory function and post-Pleistocene evolution in Nubia. *Am J Phys Anthropol*. 1977;46(3):495-506.
- Larsen CS. *Bioarchaeology: Interpreting Behavior from the Human Skeleton*. Cambridge, UK: Cambridge University Press; 1997.
- Corruccini RS. Anthropological aspects of orofacial and occlusal variations and anomalies. In: Kelley MA, Larsen CS, eds. *Advances in Dental Anthropology*. New York, NY: Wiley-Liss Inc.; 1991:295-323.
- Corruccini RS. *How Anthropology Informs the Orthodontic Diagnosis of Malocclusion's Causes*. Lewiston, NY: The Edwin Mellen Press; 1999.
- Lieberman DE, Krovitz GE, Yates FW, et al. Effects of food processing on masticatory strain and craniofacial growth in a retrognathic face. *J Hum Evol*. 2004;46(6):655-677.
- Kaifu Y, Kasai K, Townsend GC, et al. Tooth wear and the "design" of the human dentition: a perspective from evolutionary medicine. *Am J Phys Anthropol*. 2003;suppl 37:47-61.
- Kennedy DB, Joondeph DR, Osterberg SK, et al. The effect of extraction and orthodontic treatment on dentoalveolar support. *Am J Orthod*. 1983;84(3):183-190.
- Edwards JG. A study of the anterior portion of the palate as it relates to orthodontic therapy. *Am J Orthod*. 1976;69:249-273.
- Handelman CS. The anterior alveolus: its importance in limiting orthodontic treatment and its influence on the occurrence of iatrogenic sequelae. *Angle Orthod*. 1996;66(2):95-109.
- Sharpe W, Reed B, Subtelny JD, et al. Orthodontic relapse, apical root resorption, and crestal alveolar bone levels. *Am J Orthod Dentofacial Orthop*. 1987;91(3):252-258.
- Melsen B. Limitations in adult orthodontics. In: Melsen B, ed. *Current Controversies in Orthodontics*. 1st ed. Hanover Park, IL: Quintessence Publishing Co, Inc.; 1991:147-180.
- Kaley J, Phillips C. Factors related to root resorption in edge-wise practice. *Angle Orthod*. 1991;61(2):125-132.
- Bolding SL, Roblee RD. Optimizing orthodontic therapy with dentoalveolar distraction osteogenesis. In: Bell WH, Guerrero CA, eds. *Distraction Osteogenesis of the Facial Skeleton*. Hamilton, Ontario: BC Decker Inc.; 2007:167-186.
- Mantzikos T, Shamus I. Forced eruption and implant site development: soft tissue response. *Am J Orthod Dentofacial Orthop*. 1997;112(6):596-606.
- Kinzer GA, Kokich VO Jr. Managing congenitally missing lateral incisors. Part III: single-tooth implants. *J Esthet Restor Dent*. 2005;17(4):202-210.



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