Morphogenic Interpretation of Cephalometric Data

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Summary

A basic dilemma exists in routine analyses of cephalometric growth data. Useful, meaningful information must be extracted from mosaic growth patterns seen in cephalograms; however, fundamental principles of growth applied to each individual bone must not be violated in the interpretation of these mosaic patterns. The problem is evident when separate but contiguous bones are studied in relation to one another as a composite whole. The upper facial complex is sometimes viewed as a single growing unit without consideration of cumulative interactions between its separate growing parts. Consequently, misleading and sometimes unreal growth patterns can be inferred which give the worker an oversimplified or inaccurate picture of actual growth processes. As an obvious example, routine cephalometric methods produce the familiar picture suggesting a "forward and downward" mode of facial growth. The procedures themselves are often valid for their specific purposes, but it is known that actual growth in each of the facial elements is much more complex than this oversimplified picture. It could even lead to the erroneous belief that the face grows primarily by continued additions on anterior and inferior surfaces.

To gain a more realistic understanding of composite facial growth, several false notions must be discarded. One of these notions is the traditional belief that primary "centers" of growth (sutures, condyles, and so forth) are singularly responsible for virtually all growth increases in any given bone. Another is the mistaken notion that a bone grows by a simple process of overall surface accretion on all of its outer surfaces. Still another is the unqualified acceptance of the "fixed point" concept without a consideration of limitations involved. These and other false concepts must be replaced by basic growth principles that are related to the growth of the different facial bones. Included are the various concepts associated with remodeling processes, the factor of progressive relocation, a consideration of directions involved in local growth, differential surface activities, etc. A particularly relevant factor is the composite nature of growth movements produced as groups of bones grow in relation to each other. A bone or part of a bone can move from one position to another by actual growth, i.e., combinations of resorption and deposition on selected surfaces facing away from and toward directions of local growth. Bones also move by a process of displacement. This is the cumulative result of growth in other nearby bones as well as a bone's own increases in size.

Actual growth and the displacement that is a consequence of growth frequently follow divergent courses, thereby confusing and greatly complicating understanding of the overall growth processes. It is the basis for many of the interpretative difficulties that are encountered in cephalometric analyses. Specific cephalometric procedures must be evaluated for their validity according to such modes of growth and displacement and the varying combinations of each. Both processes must be placed in perspective so that individual contributions to the whole pattern can be accurately visualized. Basic, established principles of bone growth and remodeling must always be applied to cephalometric interpretations. The many individual elements of the craniofacial skeleton must be considered separately before they can be assembled into a "single" growing unit, the face as a whole. Only then can the numerous facets of the composite mechanism be understood and the nature of their specific roles determined.