

Eruption Sequence Similarities in the Maxilla and Mandible

STANLEY M. GARN and B. HOLLY SMITH

Center for Human Growth & Development, The University of Michigan, Ann Arbor, Michigan 48109

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Maxillary and mandibular dentitions exhibit correspondences to a truly remarkable degree. Correlations of upper and lower opponents (isomers) in both the deciduous and permanent dentitions are exceeded only slightly by right-left (antimere) correspondences, both in crown size (Garn and Burdi, *J Dent Res* 50:1407, 1971) and in tooth emergence timing (Garn and Smith, *J Dent Res*, in press, 1980). Under these circumstances one might also expect inter-jaw correspondences in the order of tooth emergence, such that an M2P2 or P2M2 emergence order in one jaw would be associated with the same sequence in the opposing dentition.

To explore this possibility we have made use of two data sources, restricting data analysis to those boys and girls for whom sequences were completely clear for both upper and lower dentitions. The first data base, which we have extensively explored, is that of the Ten-State Nutritional Survey of 1968-1970 (Garn *et al.*, *J Dent Res* 51:1506, 1972). The second data base includes the participants of the University of Michigan Longitudinal Study (Moyers *et al.*, *Standards of Human Occlusal Development*, Ann Arbor, Center for Human Growth and Development, 1976). The first data base provides 220 black individuals and 284 white individuals, analyzed separately because of population differences in emergence sequence and timing. The second data base yields a total of 60 boys and

girls with unambiguous sequences (M2P2 or P2M2) in both jaws.

As shown in the table, there is an unquestionably large intra-individual correspondence between the M2P2/P2M2 eruption sequences in the mandible and maxilla. Although there are population differences in the incidences of the M2P2/P2M2 sequence polymorphism (as shown in the table) and possibly between the two series of white individuals, the trends are very much the same for all three subsamples, and all are highly significant by the Chi-squared tests. The children with the rarer M2P2 sequence in the mandible (found in approximately 25% of cases) also tend to show the M2P2 sequence in the maxilla. Conversely, boys and girls with the P2M2 sequence in the maxilla (where it is the overwhelming proportion) show a great excess of this sequence in the mandible as well. The strength of association ranges from .38 to .59 by the coefficient of contingency (C.C.). Attained Chi-squared values are between 30 and 115; the values are unusually high for samples in this size range and consistent for all three populations.

Thus synchronism in developmental sequence between the two jaws is confirmed. Despite differences in absolute timing of eruption of corresponding maxillary and mandibular teeth, and an intriguing gradient of precedence in eruption timing of upper and lower opponents (Israel *et al.*, *J Dent Res* 46:456, 1967), the patterned developmental sequences that characterize the mandible (Garn *et al.*, *J Dent Res* 35:555, 1956) can now be shown to replicate in the maxilla. In addition to developmental "fields" controlling specific teeth, adjacent teeth, and antimeres, this new evidence indicates the existence of fields of synchronism in emergence orders affecting both jaws.

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TABLE
ASSOCIATION OF MAXILLARY AND MANDIBULAR ERUPTION SEQUENCES

Mandibular Sequence	Maxillary Sequence in					
	Ten-State Blacks		Ten-State Whites		University Whites	
	M2P2	P2M2	M2P2	P2M2	M2P2	P2M2
M2P2	29	14	17	33	8	6
P2M2	4	173	8	226	0	46
Chi-squared		115*		48*		30*

*Significant at $p = .001$ or better, corresponding to a coefficient of contingency of 0.59, 0.38, and 0.58, respectively.