

Annotation

Relationship Between Root Lengths and Crown Diameters of Corresponding Teeth

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The fact that root-length measurements may be made on 45° oblique-jaw radiographs of older adolescents with reasonable replicability even on a year-to-year basis (GARN, VAN ALSTINE & COLE, *J Dent Res* 57:A114, 1978) opens the possibility of exploring root-length crown-size correspondences in the mandibular dentition.

Taking, then, root-length measurements for C through M₂ on 122 subjects aged 16 to 17 (69 boys and 53 girls), the cemento-enamel junction-to-apex length measurements were correlated with mesiodistal and buccolingual crown-size measurements of the corresponding teeth. The crown-size measurements were obtained from casts using a tape-punching optical-read-out measuring device (OPTOCOM) as previously described (VAN DER LINDEN ET AL, *J Dent Res* 51:1100, 1972). Correlations were then computer-calculated on a sex-specific basis. Finally, the sex-specific values of r were pooled, using the z transforms of r as described by FISHER (*Statistical Method for Research Workers*, 1970).

As shown in the pooled-sex table, root length and crown size are systematically and positively correlated for both mesiodistal and buccolingual diameters, though to a low order of magnitude. Overall, the root-length crown-size correlations approximate 0.12 and the highest crown-root correlations are on the order of 0.2 to 0.3. Moreover, mesiodistal crown-size measurements apparently show higher correlations with the root lengths ($r = 0.13$) than do the analogous buccolingual crown-size values ($r = 0.11$) in this pilot study.

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While recognizing the limitations of the sample size insofar as correlations are concerned (GARN, COLE & GUIRE, *J Dent Res* 56:1474, 1977) the consistently positive pooled-sex, crown-size/root-length correlations do reveal the existence of a novel dimensional "field" affecting each tooth as a whole. It is impressive that the crowns of permanent teeth that begin to form by the second trimester of prenatal life and that complete their size-attainment in the second to fifth year of postnatal life thus "anticipate" the length of still-to-be-completed roots by 10 years or more. At the same time, the relatively small magnitude of the correlations indicates the possibility of different combinations of root length and crown size, and the further possibility of different crown/root proportions or ratios both between the sexes and among higher and lower taxonomic units. Finally, there is interest in whether relationships between crown dimensions and root lengths can be altered in caloric malnutrition, protein-calorie malnutrition (PCM), malabsorption states, and in conditions like congenital heart disease (CHD) or chronic renal failure (CRF) where somatic growth is systematically inhibited.

TABLE

ROOT-LENGTH CROWN-SIZE CORRELATIONS*

Mandibular Tooth	Mesiodistal		Buccolingual	
	N	r	N	r
C	76	0.20	76	0.13
P ₁	78	0.14	77	0.24
P ₂	72	0.14	72	0.07
M ₁	86	0.11	86	0.05
M ₂	59	0.05	65	0.06

* Cemento-enamel junction to apex is measured on 45° oblique jaw X-rays.