Morphological Significance of Root Length Variability in Comparison with Other Crown Dimensions

I. Basic Statistics and Sex Difference

by

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Introduction

Although many studies on variability and correlation in crown dimensions have been done^[1,2,3,9,13,14,16], there are few reports available on root measurements. Root length has been said to be quite variable individually compared with crown dimensions^[8], because the root develops later than the crown, extending to grow into the developing mandible or maxilla which can potentially control the formation and growth of the root. The form of the crown is more genetically determined, but that of the root is much influenced by the physiological circumstances of the alveolar bone during development.

However, there are no exact data available on root variability within an individual and among individuals. We present in this paper the results of a basic statistical study of root length and other tooth dimensions, which was considered necessary for an understanding of root length variability and to serve as a basis for further multivariate analysis.

Materials and Methods

The materials used for this study were permanent teeth extracted from adult Japanese individuals consisting of 452 males and 76 females. The average number of teeth from one individual was 15.8. The teeth were kept at the Department of Anatomy, University of Tokyo. Parameters for measurement were crown height, buccolingual crown diameter, mesiodistal crown diameter, root length and total length. They were measured with a sliding caliper with an accuracy of 0.05 mm on the basis of Fujita's measuring technique^[4]. The calculation for statistics was carried out on a HITAC 8800/8700 (OS-7) computer at the University of Tokyo Computer Center with the aid of the SAS program package.

Results and Discussion

Means, standard deviations and coefficients of variation for 5 parameters of

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Table 1 Basic data of 40 measurements in male upper dentition

Parameters		Left					Right						
		N	Mean	SD	CV	Min.	Max.	N	Mean	SD	CV	Min.	Max.
Crown height	I ¹	239	11.04	.93	8.4	8.25	13.35	228	11.15	.96	8.6	8.00	13.60
	I ²	234	9.59	.83	8.7	7.00	12.00	229	9.74	.94	9.7	7.00	12.10
	C	139	10.78	1.02	9.5	7.90	13.75	147	10.79	1.07	9.9	8.10	13.25
	M ¹	275	8.32	.75	9.0	6.35	10.85	254	8.28	.75	9.1	6.25	10.30
	M ²	275	7.53	.70	9.3	5.90	9.95	250	7.53	.71	9.4	5.80	9.60
	m ¹	247	6.69	.60	9.0	5.45	8.45	228	6.73	.57	8.5	5.15	8.40
	m ²	232	6.79	.60	8.8	4.95	8.50	214	6.81	.59	8.7	5.50	8.20
	m ³	128	5.96	.62	10.4	4.60	7.70	127	5.93	.72	12.1	4.05	7.90
Buccolingual crown diameter	I ¹	270	7.22	.42	5.8	6.05	8.55	254	7.25	.42	5.8	6.10	8.45
	I ²	269	6.47	.55	8.5	3.85	7.80	255	6.50	.53	8.2	4.15	7.85
	C	180	8.58	.54	6.3	7.00	10.10	186	8.59	.56	6.5	7.10	10.20
	M ¹	296	9.45	.51	5.4	7.90	10.85	284	9.45	.55	5.8	7.97	11.05
	M ²	295	9.32	.59	6.3	7.30	11.05	283	9.34	.60	6.4	7.45	11.15
	m ¹	257	11.69	.56	4.8	10.30	13.35	241	11.61	.54	4.7	10.30	13.45
	m ²	243	11.81	.70	5.9	9.95	14.25	224	11.75	.65	5.5	10.25	14.85
	m ³	139	10.93	.92	9.4	8.35	13.60	134	10.72	1.08	10.1	7.10	13.70
Mesiodistal crown diameter	I ¹	256	8.48	.54	6.4	6.40	10.05	241	8.50	.53	6.2	6.50	10.05
	I ²	255	6.93	.65	9.4	4.25	8.90	242	6.98	.69	9.9	4.00	8.95
	C	179	7.93	.42	5.5	7.00	9.05	184	7.97	.45	5.7	6.95	9.30
	M ¹	290	7.30	.44	6.0	5.75	8.60	279	7.28	.43	5.9	6.15	8.85
	M ²	290	6.87	.45	6.6	5.75	8.35	277	6.86	.47	6.9	5.50	8.35
	m ¹	253	10.43	.57	5.5	8.70	12.10	237	10.47	.60	5.7	8.65	12.25
	m ²	239	9.61	.62	6.5	7.40	11.65	221	9.73	.59	6.1	7.75	11.45
	m ³	140	8.86	.83	9.4	7.15	10.80	135	8.74	.94	10.8	6.05	10.80
Root length	I ¹	249	12.04	1.54	12.8	6.95	16.10	246	11.95	1.55	13.0	6.45	15.85
	I ²	245	12.06	1.48	12.3	6.80	16.65	244	12.31	1.43	11.6	8.15	15.60
	C	156	15.70	1.79	11.4	11.65	20.30	163	15.65	1.76	11.3	11.35	20.00
	M ¹	256	12.74	1.62	12.7	9.30	18.85	248	12.88	1.75	13.6	8.75	21.15
	M ²	255	13.64	1.89	13.9	8.35	21.70	240	13.59	1.75	12.9	8.45	18.30
	m ¹	236	12.36	1.35	10.9	9.05	18.30	212	12.14	1.27	10.5	8.20	17.15
	m ²	219	12.38	1.50	12.1	8.60	17.85	193	12.09	1.36	11.3	8.80	16.35
	m ³	108	10.76	1.69	15.7	7.35	16.60	103	10.39	1.66	16.0	7.15	14.45
Total length	I ¹	232	23.12	1.75	7.6	18.25	27.75	228	23.02	1.81	7.9	18.55	27.50
	I ²	227	21.84	1.84	8.4	15.90	26.85	226	22.03	1.77	8.0	17.50	26.90
	C	135	26.44	2.09	7.9	22.20	32.60	145	26.39	2.15	8.2	21.80	32.90
	M ¹	263	21.05	1.74	8.3	16.85	27.05	241	21.09	1.92	9.1	13.00	30.25
	M ²	263	21.10	1.96	9.3	15.45	28.60	342	21.04	1.93	9.2	12.15	27.15
	m ¹	236	19.03	1.48	7.8	15.10	25.10	212	18.94	1.34	7.1	15.45	24.45
	m ²	234	19.13	1.63	8.5	15.25	24.95	193	18.95	1.43	7.6	15.30	23.85
	m ³	110	17.76	1.84	11.0	12.10	22.20	104	16.29	1.86	11.4	10.50	21.00

Abbreviations for teeth from Tables 1 to 5 are expressed as follows, according to Fujita⁵: I, incisor; C, canine; M, premolar; m, molar.

Table 2 Basic data of 40 measurements in male lower dentition

Parameters		Left					Right						
		N	Mean	SD	CV	Min.	Max.	N	Mean	SD	CV	Min.	Max.
Crown height	I ₁	215	8.51	.95	11.2	5.60	10.85	209	8.50	.86	10.1	6.80	10.70
	I ₂	227	8.92	.96	10.8	6.10	11.05	221	8.84	.91	10.3	6.20	11.30
	C	118	10.91	.94	8.6	8.70	13.30	130	10.85	1.00	9.2	8.50	13.15
	M ₁	220	8.38	.73	8.7	6.60	10.65	217	8.29	.72	8.7	6.30	11.10
	M ₂	218	7.55	.69	9.1	6.00	9.90	214	7.55	.70	9.3	5.50	10.10
	m ₁	158	6.61	.51	9.7	5.25	8.05	145	6.50	.50	7.7	5.30	8.15
	m ₂	141	6.34	.53	8.4	5.05	8.20	135	6.30	.56	8.9	4.50	8.70
	m ₃	104	6.02	.61	10.1	4.40	7.40	100	5.87	.58	9.9	4.65	7.75
Buccolingual crown diameter	I ₁	256	5.88	.36	6.1	4.75	6.85	248	5.90	.47	8.0	4.80	10.85
	I ₂	263	6.39	.39	6.1	5.05	7.50	258	6.42	.42	6.5	5.10	7.50
	C	179	8.11	.50	6.2	6.90	9.55	182	8.14	.48	5.9	6.80	9.45
	M ₁	281	7.94	.53	6.7	6.40	9.70	280	7.94	.50	6.3	6.75	9.50
	M ₂	279	8.37	.54	6.5	6.60	9.80	279	8.34	.52	6.2	6.75	10.00
	m ₁	163	10.82	.54	5.0	9.55	12.20	150	10.79	.49	4.5	9.55	12.30
	m ₂	147	10.45	.56	5.4	9.25	12.40	143	10.40	.54	5.2	8.65	11.65
	m ₃	111	10.15	.76	7.5	7.80	12.10	105	10.08	.76	7.5	7.50	12.75
Mesiodistal crown diameter	I ₁	209	5.51	.38	6.9	4.80	6.95	205	5.50	.37	6.7	4.80	6.80
	I ₂	224	6.16	.39	6.3	5.15	7.40	223	6.13	.41	6.7	5.05	7.25
	C	175	7.11	.42	5.9	5.70	8.20	180	7.06	.41	5.8	6.00	8.10
	M ₁	273	7.13	.40	5.6	6.15	8.10	271	7.10	.44	6.2	5.85	8.80
	M ₂	270	7.32	.43	5.9	6.00	8.45	269	7.26	.45	6.2	5.65	8.40
	m ₁	159	11.58	.62	5.4	9.75	13.50	144	11.50	.56	4.9	10.10	12.80
	m ₂	142	11.22	.57	5.1	9.85	13.00	137	11.21	.67	6.0	8.75	12.75
	m ₃	107	10.70	.89	8.3	8.40	12.85	101	10.63	.96	9.0	8.10	12.50
Root length	I ₁	244	11.42	1.14	10.0	8.80	15.05	234	11.41	1.14	10.0	8.65	14.70
	I ₂	244	12.46	1.22	9.8	9.55	16.25	241	12.43	1.17	9.4	9.05	15.65
	C	145	14.61	1.63	11.1	10.55	19.50	158	14.52	1.64	11.3	11.00	18.90
	M ₁	222	13.28	1.43	10.8	8.40	17.25	221	13.45	1.47	10.9	9.30	18.00
	M ₂	215	13.51	1.55	11.5	10.00	18.65	218	13.45	1.67	12.4	9.35	18.40
	m ₁	151	13.51	1.23	9.1	10.50	16.60	141	13.49	1.20	8.9	10.80	16.55
	m ₂	135	13.14	1.14	8.7	10.40	15.80	127	13.02	1.18	9.1	10.65	16.35
	m ₃	85	11.32	1.54	13.6	7.90	15.30	95	11.51	1.27	11.0	8.75	14.50
Total length	I ₁	204	19.96	1.45	7.3	16.55	24.35	201	20.02	1.33	6.6	16.65	24.05
	I ₂	210	21.39	1.56	7.3	17.00	22.85	208	21.33	1.70	8.0	16.95	26.10
	C	117	25.47	1.94	7.6	20.65	32.00	128	25.27	1.94	7.7	21.05	31.00
	M ₁	207	21.67	1.57	7.3	17.50	26.20	204	21.68	1.56	7.2	17.40	27.25
	M ₂	199	21.06	1.66	7.9	16.00	27.10	199	20.88	1.73	8.3	16.40	26.70
	m ₁	144	20.18	1.31	6.5	16.45	24.20	236	19.92	1.67	8.4	16.55	23.20
	m ₂	127	19.49	1.22	6.3	17.10	23.10	123	19.29	1.23	6.4	15.85	22.90
	m ₃	83	17.38	1.49	8.6	13.60	20.30	90	17.34	1.48	8.5	11.00	20.25

Table 3 Basic data of 40 measurements in female upper dentition

Parameters		Left					Right						
		N	Mean	SD	CV	Min.	Max.	N	Mean	SD	CV	Min.	Max.
Crown height	I ¹	39	10.47	1.14	10.9	8.30	13.75	33	10.57	1.10	10.4	8.90	13.00
	I ²	39	9.28	.99	10.7	7.55	12.65	32	9.34	.84	9.0	7.85	11.35
	C	20	10.03	.81	8.1	8.75	11.85	25	10.00	.85	8.5	8.65	11.70
	M ¹	32	8.05	.77	9.6	6.50	10.25	37	9.15	.71	8.7	6.95	10.30
	M ²	32	7.33	.59	8.1	6.20	9.05	37	7.44	.62	8.3	6.45	8.80
	m ¹	27	6.45	.51	7.9	5.10	7.20	26	6.49	.56	8.6	5.40	7.40
	m ²	26	6.57	.60	9.1	5.40	7.70	23	6.77	.51	7.5	5.85	7.85
	m ³	9	5.92	.56	9.5	5.20	6.90	7	5.69	.47	8.3	5.05	6.50
	Buccolingual crown diameter	I ¹	40	7.00	.46	6.6	6.05	8.00	39	7.03	.42	6.0	6.05
I ²		40	6.17	.48	7.8	4.75	7.05	39	6.13	.54	8.8	4.45	7.00
C		23	8.19	.48	5.9	6.80	9.15	27	8.22	.44	5.4	7.00	9.00
M ¹		35	9.20	.59	6.4	8.20	10.40	38	9.21	.51	5.5	8.00	10.15
M ²		35	9.13	.59	6.5	7.90	10.90	38	9.16	.53	5.8	8.20	10.10
m ¹		27	11.25	.57	5.1	9.85	12.05	26	11.15	.66	5.9	9.80	12.05
m ²		26	11.12	.65	5.9	9.55	12.15	22	11.23	.61	5.4	10.15	12.25
m ³		10	10.47	.86	8.2	9.15	11.70	9	10.64	.98	9.2	9.15	12.00
Mesiodistal crown diameter		I ¹	35	8.16	.62	7.6	6.40	9.50	35	8.18	.63	7.7	6.50
	I ²	35	6.65	.77	11.6	5.05	8.00	35	6.70	.87	13.0	4.60	7.90
	C	21	7.79	.40	5.1	7.10	8.50	26	7.90	.42	5.3	7.00	8.70
	M ¹	35	7.21	.37	5.1	6.50	7.85	37	7.28	.41	5.6	6.50	7.95
	M ²	35	6.82	.49	7.2	5.75	7.80	37	6.87	.45	6.6	5.55	7.60
	m ¹	28	10.22	.57	5.6	9.00	11.30	26	10.33	.57	5.5	9.00	11.25
	m ²	27	9.38	.61	6.5	8.10	10.20	23	9.68	.57	5.9	8.75	11.30
	m ³	10	8.70	.72	8.3	7.80	10.00	9	8.75	.87	9.9	7.75	9.90
	Root length	I ¹	40	10.93	1.63	14.9	8.00	14.05	41	10.90	1.57	14.4	6.85
I ²		40	11.24	1.24	11.0	7.60	13.30	40	11.24	1.18	10.5	9.00	13.70
C		21	14.29	1.63	11.4	11.10	16.80	25	14.32	1.49	10.4	10.80	16.65
M ¹		33	12.14	1.37	11.3	9.10	15.75	36	11.30	1.52	12.4	9.20	14.90
M ²		32	12.65	1.62	12.8	9.65	16.00	35	12.67	1.68	13.3	9.45	15.60
m ¹		27	11.70	1.29	11.0	8.90	14.65	25	11.85	1.35	11.4	9.05	13.95
m ²		24	11.85	1.66	14.0	9.25	14.70	21	11.86	1.67	14.1	7.90	14.75
m ³		7	10.68	1.08	10.1	9.25	12.20	5	10.24	1.26	12.3	8.80	11.70
Total length		I ¹	38	21.42	1.81	8.5	18.10	26.85	32	21.68	1.51	7.0	18.30
	I ²	38	20.43	1.60	7.8	17.35	25.20	31	20.72	1.33	6.4	17.55	22.75
	C	20	24.37	1.73	7.1	20.30	27.40	25	24.38	1.68	6.9	19.80	27.60
	M ¹	32	20.28	1.70	8.4	17.15	24.20	35	20.45	1.57	7.7	16.90	24.25
	M ²	31	19.94	1.62	8.1	16.85	24.40	35	20.16	1.62	8.0	16.80	23.25
	m ¹	26	18.17	1.17	6.4	15.95	21.40	23	18.47	1.35	7.3	16.10	20.90
	m ²	23	18.34	1.70	9.3	16.05	21.90	19	18.76	1.71	9.1	15.15	21.45
	m ³	3	17.57	2.06	11.7	15.25	19.20	6	15.89	1.37	8.6	14.65	17.85

Table 4 Basic data of 40 measurements in female lower dentition

Parameters	Left						Right					
	N	Mean	SD	CV	Min.	Max.	N	Mean	SD	CV	Min.	Max.
Crown height	I ₁	30	8.29	1.05	12.7	6.05	32	8.23	1.04	12.6	6.10	11.30
	I ₂	33	8.56	.97	11.3	6.90	32	8.62	1.06	12.3	6.95	11.95
	C	23	9.98	.73	7.3	8.65	26	9.84	.68	6.9	8.60	11.00
	M ₁	36	8.13	.74	9.1	6.80	38	7.98	.54	6.8	6.55	9.02
	M ₂	36	7.28	.65	8.9	5.90	37	7.27	.54	7.4	5.90	8.40
	m ₁	13	6.38	.27	4.2	6.00	16	6.45	.49	7.6	5.50	7.25
	m ₂	12	6.02	.35	5.8	5.20	12	6.11	.40	6.6	5.30	6.70
	m ₃	4	5.58	.16	2.9	5.40	6	5.53	.63	11.4	5.10	6.75
Buccolingual crown diameter	I ₁	33	5.72	.25	4.4	5.15	35	5.70	.31	5.4	5.20	6.30
	I ₂	37	6.27	.30	4.8	5.85	36	6.28	.33	5.3	5.65	7.00
	C	29	7.63	.42	5.5	6.85	29	7.62	.42	5.5	6.80	8.70
	M ₁	41	7.65	.46	6.0	6.65	45	7.70	.49	6.4	6.85	9.10
	M ₂	41	8.15	.50	6.1	7.25	45	8.23	.47	5.7	7.30	9.25
	m ₁	12	10.53	.67	6.4	9.35	15	10.38	.59	5.7	9.20	11.55
	m ₂	11	10.02	.49	4.9	9.15	12	11.07	.58	5.3	9.50	11.25
	m ₃	4	9.97	.92	9.2	8.55	6	9.83	1.36	13.8	8.25	11.90
Mesiodistal crown diameter	I ₁	29	5.43	.48	8.8	4.20	31	5.50	.43	7.8	4.20	6.25
	I ₂	33	6.04	.38	6.3	5.20	32	6.05	.39	6.5	5.15	7.00
	C	28	6.78	.36	5.3	5.70	29	6.79	.34	5.0	6.00	7.40
	M ₁	41	7.08	.37	5.2	6.30	43	7.05	.34	4.8	6.30	7.80
	M ₂	40	7.25	.39	5.4	6.30	43	7.21	.38	5.3	6.50	8.25
	m ₁	13	11.27	.40	3.6	10.70	15	11.38	.55	4.8	10.70	12.55
	m ₂	12	10.78	.62	5.8	9.90	12	11.05	.66	6.0	10.30	12.15
	m ₃	4	10.84	1.34	12.4	9.05	6	10.40	1.66	16.0	9.00	12.65
Root length	I ₁	32	10.78	1.06	9.8	8.75	33	10.90	1.07	9.8	8.50	13.15
	I ₂	36	11.98	1.15	9.6	9.60	32	11.88	1.03	8.7	10.10	14.15
	C	26	13.02	1.16	8.9	10.70	26	12.99	1.42	10.9	9.80	15.65
	M ₁	34	12.83	1.31	10.2	9.85	38	12.74	1.25	9.8	9.95	15.70
	M ₂	33	13.10	1.21	9.2	10.65	37	12.85	1.31	10.2	9.90	15.25
	m ₁	12	13.45	1.65	12.3	11.30	17	13.20	.91	6.9	11.70	15.10
	m ₂	11	12.69	1.05	8.3	11.20	13	12.78	.69	5.4	11.40	13.60
	m ₃	3	12.02	2.16	18.0	9.55	4	9.94	1.25	12.6	8.75	11.45
Total length	I ₁	29	19.05	1.55	8.1	15.55	31	19.15	1.49	7.8	16.00	22.75
	I ₂	31	20.49	1.32	6.4	17.40	29	20.55	1.38	6.7	17.95	24.50
	C	22	23.17	1.43	6.2	19.40	25	22.92	1.52	6.6	18.55	25.50
	M ₁	32	20.90	1.51	7.2	17.55	35	20.62	1.38	6.7	17.40	23.20
	M ₂	31	20.27	1.30	6.4	17.80	34	19.93	1.54	7.7	16.20	22.10
	m ₁	12	19.83	1.63	8.2	17.50	15	19.67	1.14	5.8	18.05	22.35
	m ₂	11	18.62	.99	5.3	17.50	11	18.90	.70	3.7	17.70	20.20
	m ₃	3	17.57	2.06	11.7	15.25	4	15.30	1.13	7.4	14.20	16.70

Table 5 Parameters showing significant sex differences

	Crown height		Buccolingual crown diameter		Mesiodistal crown diameter		Root length		Total length	
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
I ¹	**	**	**	**	**	**	**	**	**	**
I ²	*	*	**	**	*	*	**	**	**	**
C	**	**	**	**			**	**	**	**
M ¹			**	*			*		*	
M ²							**	**	**	*
m ^{'1}	*	*	**	**			*		**	
m ^{'2}			**	**					*	
I ₁			**	*			**	*	**	**
I ₂	*			*			*	*	**	**
C	**	**	**	**	**	**	**	**	**	**
M ₁		**	**	**				**	*	**
M ₂	*	*	*					*	*	**
m ₁ [']				**						
m ₂ [']	*		*	*	*			*		

*significance: $p < 0.05$; ** $p < 0.01$. Third molars in upper and lower dentition were omitted because of insufficiency of materials.

32 teeth from each sex are shown in Tables 1 to 4. Size differences between mean values obtained for corresponding teeth on the right and left side were not significant. Mean values of all dimensions were greater in males than in females. Every parameter showed significant differences in several teeth, the number of which was greatest for buccolingual diameter (Table 5). On the other hand, significant differences were few in mesiodistal crown diameter in both the upper and lower jaw. A number of significant differences were also found in root length, and also in total length, which involves root length. It was interesting that there were no significant differences in the crown dimensions of the upper second premolar, but there were differences in the root length and total length for this tooth on each side.

It was noted that the coefficients of variation (CV) for upper root length were greater than those of other parameters in both males and females (Tables 1–4). Coefficients for lower root length were not as high as those for upper teeth. Among crown dimensions, CV for crown height were comparably high for both the upper and lower dentition. Buccolingual and mesiodistal diameters seemed to be stable, but CV for the upper lateral incisor and for the upper and lower third molar were relatively high in both males and females. CV for m^{'1} and m₁['], which are the key teeth^[4] of the molar series, were almost always the lowest in both the upper and lower dentition. The CV for total length seemed to be stable in spite of its composition involving the relatively variable parameters of root length and crown height. For example, CV for crown height of the lower right central incisor in males was 10.1 and that for root length in the same tooth was 10.0, but the CV for total length was 6.6. This suggested that total length was genetically controlled and that its stability might be due to compensation between crown height and root length.

Sex differences in tooth size have been observed in several populations. These

have mainly involved crown diameters, the mandibular canine usually showing the most marked difference^[3,5,9,10]. In our study, statistically significant sex differences at the 5% level were observed in all the parameters. The number of teeth showing differences was small for mesiodistal crown diameter, but large for buccolingual diameter. Some authors^[1,16] have reported marked sex differences in mesiodistal crown diameter, but GONDA^[9] has published data showing the same tendency as that found in this study. According to KRAUS^[12], who studied the morphological relationship between the enamel-dentine junction and enamel surface, the thickness of the enamel was greater in the buccolingual direction than in the mesiodistal direction. Because the crown diameter includes enamel thickness as a component part, a difference in enamel thickness might make a difference in crown diameter. The enamel is a tissue controlled by physiological or nutritional conditions in the body, which in turn show differences between male and female. This might be a plausible explanation for the greater difference observed in buccolingual diameter.

The rather frequent appearance of a size difference between the sexes in root length and total length was also considered to be a reflection of the general difference in body size. This possibility is confirmed by the descriptions of GONDA^[9] and GARN et al.^[6-8] that the size difference appears to be relatively greater in root dimensions than in crown dimensions. The upper second premolar showed a particularly marked difference in its root length in spite of its lack of any difference in crown dimensions. The reason for this is probably related to the trend of reduction of this tooth, which usually has a single root, whereas the first premolar has two roots in 42% of cases^[10]. The root length of the second premolar is greater than that of the first premolar, but CV is larger for the second premolar, which indicates a high variability and tendency for reduction. It is reported that the tendency of reduction in tooth morphology appears to be stronger in females than in males^[11,15]. Therefore, it does not seem to be surprising that a remarkable sex difference was found in the root length of the upper second premolar.

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