Table 1. Cephalometric variables

VARIABLE NAME	CONCEPTUAL DEFINITION	OPERATIONAL DEFINITION
(SNA) UPPER MAXILLARY POSITION	Anteroposterior position of the maxilla relative to cranial base	Posteroinferior angle formed between planes (S-N) (N-A)
(SNB) MANDIBULAR POSITION	Anteroposterior position of the mandible relative to cranial base	Posteroinferior angle formed between planes (S-N) (N-B)
(ANB) SAGITTAL SKELETAL CLASSIFICATION	Anteroposterior ratio of maxilla and mandible	Difference in degrees between (SNA) (SNB)
(WITS) SAGITTAL SKELETAL CLASSIFICATION	Anteroposterior ratio of maxilla and mandible	Difference in mm on the occlusal plane between the perpendicular of the occlusal plane to A and the perpendicular of the occlusal plane to B
(SN-GOGN) PRE-TREATMENT VERTICAL SKELETAL PATTERN	Inclination of mandibular plane relative to cranial base	Posteroinferior angle formed between planes (S-N) and (Go-Gn) moving this at the S level
(ENP-ENA) U1: IMAX	Inclination of upper incisor relative to palatal plane	Posteroinferior angle formed between planes (ENP-ENA) (Iua-Iu)
(GO-M) L1 IMPA	Inclination of lower incisor relative to the mandibular plane	Posterosuperior angle formed between planes (Iia-Ii) (Go-M)
(IU/A-PG) UPPER INCISOR POSITION	Position of upper incisor relative to (A-Pg)	Distance from Point Iu to Plane (A-Pg)
(II/A-PG) LOWER INCISOR POSITION	Position of lower incisor relative to (A-Pg)	Distance from point Ii to plane (A-Pg)
SNA DIFFERENCE	Change in maxillary position during orthodontic treatment	Difference between SNA measured pre-treatment and post-treatment
SNB DIFFERENCE	Change in mandibular position during orthodontic treatment	Difference between SNB measured pre-treatment and post-treatment
ANB DIFFERENCE	Change in skeletal classification during orthodontic treatment	Difference between ANB measured pre-treatment and post-treatment
WITS DIFFERENCE	Change in skeletal classification during orthodontic treatment	Difference between Wits measured pre-treatment and post-treatment
IMAX/IMPA DIFFERENCE	Change in incisors inclination incisors during orthodontic treatment	Difference between IMAX measured pre-treatment and post-treatment Difference between IMPA measured pre-treatment and post-treatment
IU/A-PG DIFFERENCE	Change in upper incisors position during orthodontic treatment	Difference between the upper dental position measured pre-treatment and post-treatment
II/A-PG DIFFERENCE	Change in lower incisors position during orthodontic treatment	Difference between the lower dental position measured pre-treatment and post-treatment
DIFFERENCE SN-GOGN	Change in skeletal pattern during orthodontic treatment	Difference between SN-GoGn measured pre-treatment and post-treatment

Source: by the authors

Table 2. Descriptive analysis of variables

Demographic Variables	***n***	***%***		
Sex				
Male	56	44.4		
Female	70	55.6		
Age	***M***	***SD***		
	27.62	11.03		
Biological Variables	***n***	***%***		
Systemic history				
Respiratory diseases	13	10.31		
Cardiovascular diseases	2	1.58		
Articular diseases	3	2.38		
Thyroid diseases	4	3.17		
Allergies	5	3.96		
Immune diseases	1	0.79		
Hepatitis	5	3.79		
Overjet pre-treatment				
Inverted< 0mm	5	3.97		
Edge-edge 0-1mm	29	30.9		
Normal 2-3mm	68	53.9		
Increased >3mm	14	11.11		
Prior EARR				
No	116	92.06		
Yes	10	7.93		
Skeletal classification				
Class I	74	58.27		
Class II	40	31.50		
Class III	13	10.24		
Variables Related to orthodontic treatment	***n***	***%***		
Premolar Extractions				
No	108	85.72		
4 premolars	11	8.73		
Upper premolars	6	4.76		
Lower premolars	1	0.79		
Technique				
Standard	27	21.43		
Self-ligating	47	37.30		
MBT	52	41.27		
Bracket type				
Conventional	78	61.90		
Self-ligating	48	38.09		
Highest caliber arch used				
Round	19	15.08		
Rectangular	107	84.92		
Duration of treatment	***m***	***SD***	***Range***	***CI 95%***
	18.25	8.34	6-49	17.90–20.79

Source: by the authors

Table 3. Descriptive analysis of EARR

EARR	12	11	21	22	32	31	41	42	Upper lateral	Upper central	Lower lateral	Lower central
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
No	114 (90.48)	100 (79.37)	104 (82.54)	111 (88.10)	117 (92.86)	110 (7.30)	114 (90.48)	122 (96.83)	225 (89.28)	204 (80.95)	239 (94.84)	224 (96.82)
Yes	12 (9.52)	26 (20.63)	22 (17.46)	15 (11.90)	9 (7.14)	16 (12.70)	12 (9.52)	4 (3.117)	27 (10.71)	48 (19.04)	13 (5.15)	28 (11.11)

Source: by the authors

Table 4. Bivariate analysis of the relationship between moderate/severe root resorption and independent variables

Variables	Case		Control		*P*
	n	(%)	n	*(%)*	
Systemic history					
No	44	(68.84)	49	(77.78)	0.417
Yes	19	(30.16)	14	(22.22)	
Overjet pre-treatment					
0-2 m	52	(82.54)	55	(87.30)	0.752
<0 mm	3	(4.76)	2	(3.17)	
>2 mm	8	(12.70)	6	(9.52)	
Prior RR					
No	53	(84.13)	63	(100)	0.001*
Yes	10	(15.87)	0	(0)	
Skeletal classification					
Class I	41	(65.07)	33	(52.38)	0.333
Class II	16	(25.39)	23	(36.50)	
Class III	6	(9.52)	7	(11.11)	
Extractions					
No	51	(80.95)	57	(90.48)	0.127
Yes	12	(19.05)	6	(9.52)	
MBT technique					
No	38	(60.32)	36	(57.14)	0.717
Yes	25	(39.68)	27	(42.86)	
Standard Technique					
No	49	(77.78)	50	(79.37)	0.828
Yes	14	(22.22)	13	(20.63)	
Self-ligating technique					
No	39	(61.90)	40	(63.49)	0.854
Yes	24	(38.10)	23	(36.51)	
Bracket Type					
Conventional	38	(60.32)	40	(63.49)	0.714
Self-ligating	25	(39.68)	23	(36.51)	
Higher arc caliber					
Round	9	(14.29)	10	(15.87)	0.803
Rectangular	54	(85.71)	53	(84.13)	
Treatment duration					
18 months	30	(46.88)	34	(53.12)	0.476
>18 months	33	(53.23)	29	(46.77)	

*Chi^2 test. Statistically significant at *p<0.05; **p<0.01; ***p<0.001; ****p<0.0001*

Source: by the authors

Table 5. Bivariate analysis of the relationship between moderate/severe root resorption and continuous variables

	Case		Control		
Variables	**Average**	**SD**	**Average**	**SD**	***p***
Age	27.626	11.034	27.595	11.100	0.949
Treatment duration	20.428	9.053	18.269	7.198	0.232
Pre-treatment SNA	83.966	3.969	83.888	3.674	0.9093Ł
SNA Difference	0.022	0.72	0.065	0.58	0.8279¥
Pre-treatment SNB	80.633	3.934	80.431	3.849	0.7718Ł
SNB Difference	–0.288	1.182	–0.190	1.133	0.8624
Pre-treatment ANB	2.926	2.3	3.180	2.6	0.4747¥
ANB Difference	0.347	1.2	0.219	1.6	0.4207
Pre-treatment Wits	–0.937	2.498	–0.703	2.825	0.6341Ł
Pre-treatment IMAX	109.898	7.184	110.866	8.171	0.4813Ł
IMAX Difference	0.501	4.437	–0.306	4.452	0.3352
Pre-treatment IMPA	93.382	6.909	92.523	6.677	0.4794Ł
IMPA Difference	2.444	4.843	1.026	4.496	0.912 Ł
SN-GoGn pre-treatment	32.215	5.1	34.933	5	0.0215*
Difference (SN-GoGn)	0.020	0.48	0.619	0.61	0.7123¥
Ii/A-Pg pre-treatment	2.407	2.443	3.514	2.621	*0.0157 *Ł
Difference Ii/A-Pg	0.819	1.425	0.690	1.633	0.6387Ł
Iu/A-Pg pre-treatment	5.476	2.621	6.584	2.657	0.020**Ł
Difference Iu/A-Pg	0.603	1.8	0.144	1.8	0.0942 ¥
Overjet pre-treatment	3.127	0.97	3.236	1.3	0.1959 ¥
Overjet Difference	–0.256	1.2	–0.423	1.4	0.1647¥

*Ł Student t; ¥ U Mann-Whitney. Statistically significant at *p<0.05; **p<0.01; ***p<0.001; **** p<0.0001.*

Difference = pretreatment measure - post-treatment measure

Source: by the authors

Table 6. Multivariate analysis of association of EARR and variables

	Crude OR			Full model adjusted OR			Final model OR		
Variable	**OR**	***p***	**95% CI**	**OR**	***p***	**95% CI**	**OR**	***p***	**CI 95%**
Prior EARR	24.925	0.028*	1.427;435.344	18.599	0.048*	1.029;336.164	20.528	0.039*	1.157;364.034
SN-GoGn	1.091	0.009*	1.021;1.166	1.065	0.080	0.992;1.143	1.079	0.031*	1.007;1.157
IMPA Difference	0.938	0.100	0.869;1.012	0.945	0.229	0.862;1.036	-	-	-
Ii/A-Pg	1.185	0.021*	1.026;1.368	0.940	0.716	0.674;1.310	-	-	-
Iu/A-Pg	1.170	0.026*	1.019 ;1.343	1.150	0.433	0.810 – 1.631	-	-	-
Difference Iu /A- Pg	0.872	0.174	0.717;1.062	1.047	0.739	0.797 – 1.375	-	-	-

*Logistic regression with Firth's correction. Statistically significant at *p<0.05; **p< 0.01; ***p<0.001; ****p<0.0001*

Source: by the authors