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APPENDICES

APPENDIX A

Definitions of landmarks and cephalometric measurements

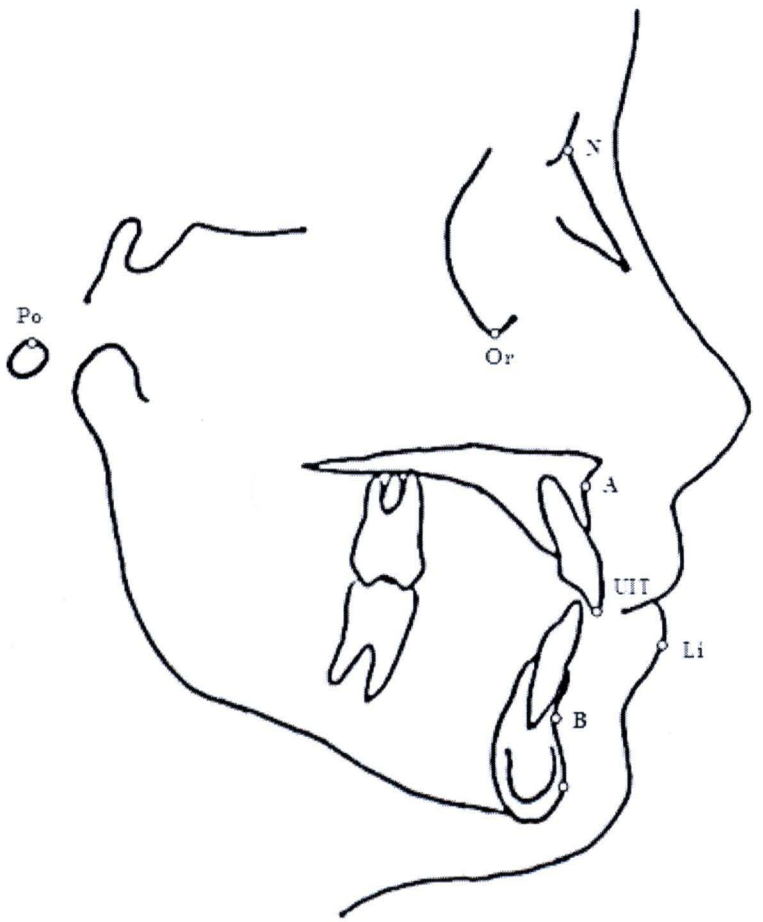

Figure A-1 Cephalometric landmarks used in this study:

N: Nasion

Or: Orbitale

Po: Porion

A, A-point: Subspinale

B, B-point: Supramentale

UIT: Upper incisor tip

Pog: Pogonion

Li: Labrale inferius

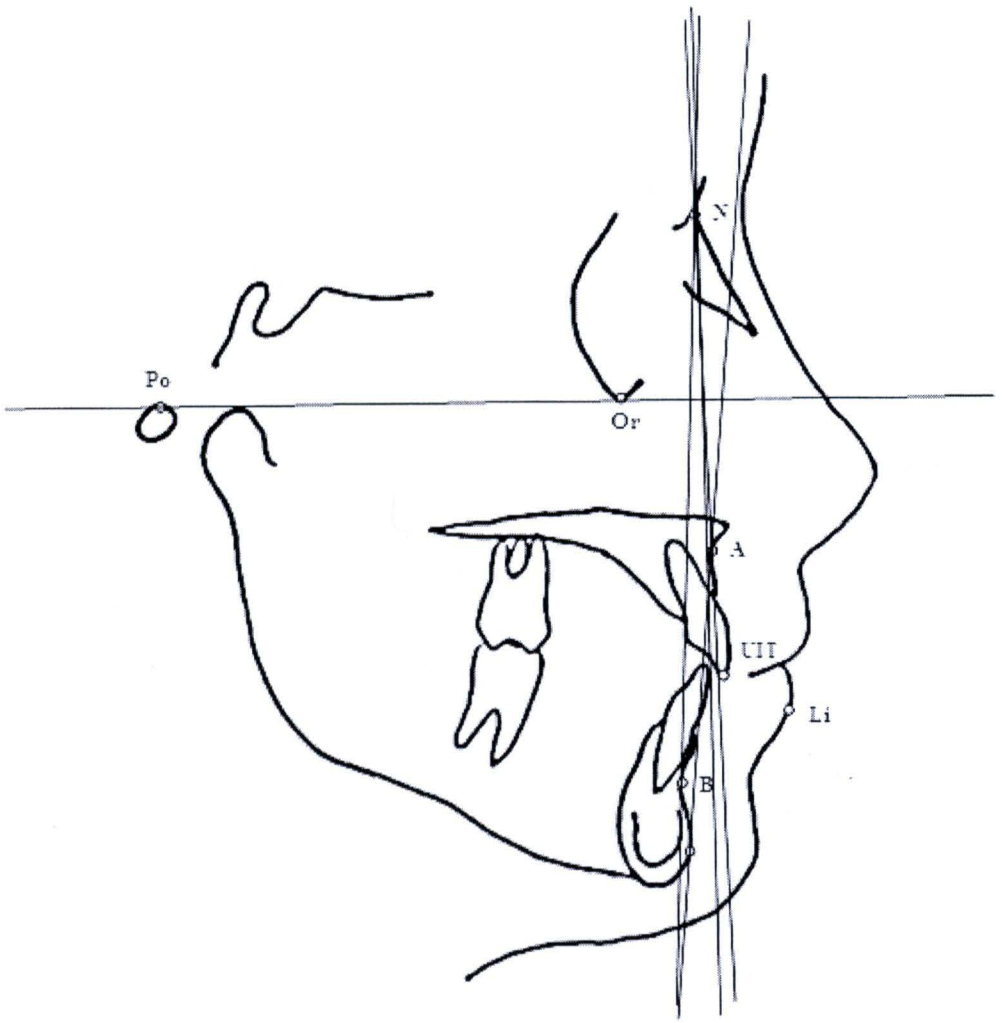

Figure A-2 Cephalometric measurements in this study:

ANB (deg)

U1 - APog (mm.)

L lip - N perp. (mm.)

Table A-1 The definitions of landmarks used in the present study.

No	Landmarks	Definition
1.	Nasion (N)	The junction of the frontal and nasal bones at the naso-frontal suture.[106]
2.	Orbitale (Or)	The lowest point on the infraorbital margin.[107]
3.	Sella Turcica (S)	The center point of the imaginary circle of the sella turcica.[107]
4.	Subspinale (A, A-point)	The deepest point on the anterior curvature of the maxilla between anterior nasal spine and alveolar crest.[107]
5.	Upper incisor tip (UIT)	A point on the incisal edge of the most prominent maxillary central incisor.[107]
6.	Supramentale(B, B-point)	The deepest point on the anterior curvature of the mandible between the alveolar crest and the pogonion.[107]
7.	Pogonion (Pog)	The most anterior point of the mandibular symphysis.[107]
8.	Porion (Po)	The most postero-superior point of the bony external auditory meatus.[106]
9.	Labrale inferius (Li)	A point indicating the mucocutaneous border of the lower lip.[108]

Table A-2 The definitions of reference lines used in the present study

No	Reference lines	Definition
1.	Frankfort Horizontal plane (FH)	A horizontal plane is drawn from Porion point to Orbitale point.[109]
2.	NA line	A line is drawn from Nasion point to Subspinale point or A-point.[110]
3.	N perpendicular line (N-perp. line)	A line is projected from Nasion point perpendicular to Frankfort horizontal plane.[112]
4.	NB line	A line is formed Nasion point and Supramentale point or B-point.[110]
5.	APog line	A line is drawn pass Subspinale point or A-point and Pogonion point.[113]

Table A-3 Cephalometric measurements used in the present study.[154]

Reference	Measurement	Definition
Steiner 1960	ANB (deg)	The angle at the meeting point of the NA line and NB line. Moreover, if the B-point is more in front of the A-point, the ANB angle will be minus (-).[110]
Ricketts 1981	U1 - APog (mm)	The shortest distance in millimeter from upper central incisal edge to APog line.[113]
Singhawannakul 2008	L lip - Nperp. (mm.)	The horizontal distance in millimeter from Li point to N perp. line.[22]

APPENDIX B

The variables in SPSS® statistical analysis of the study

Table B The variables in SPSS® statistical analysis of the study.

No	Variables	Types	Meaning
1.	**Gender**	1. Male 2. Female	
2.	**Age**		In years
3.	**Age range**	1. 5 - 11 years 2. 12 - 14 years 3. 15 - 18 years 4. 19 - 29 years	
4.	**Cleft type**	1. Unilateral cleft lip and palate 2. Bilateral cleft lip and palate 3. Cleft lip with or without 5. cleft alveolus 4. Cleft palate only	
5.	**Treatment categories**	1. Orthodontic treatment alone 2. Additional orthognathic surgery	Evaluation from the actual received treatment plan
6.	**ANB (deg)**		In degrees
7.	**U1 - Apog (mm)**		In millimeters
8.	**L lip - N perp. (mm)**		In millimeters
9.	**D score**		Calculation from the FOSP

APPENDIX C

Raw data

Table C General characteristic, cephalometric measurements, and the D scores of 105 subjects

No. of cases	Gender	Age	Age range	Cleft type	Treatment categories	ANB (degree)	U1-APog (mm)	L lip-Nperp. (mm)	d score
1.	1	15	3	1	1	-3.75	7.75	17.25	-0.117
2.	1	12	2	2	2	-0.50	0.00	10.50	-0.318
3.	1	10	1	1	1	2.00	3.50	10.50	-2.120
4.	1	17	3	1	2	0.50	4.00	15.50	-1.031
5.	2	9	1	1	1	5.00	2.50	11.50	-2.880
6.	1	16	3	3	1	-1.00	6.00	5.00	-2.308
7.	1	9	1	1	1	7.00	4.00	13.50	-3.746
8.	1	8	1	2	2	9.00	-10.50	20.25	-0.078
9.	1	13	2	1	1	1.00	9.00	23.00	-1.477
10.	1	8	1	1	1	0.50	1.75	11.50	-0.995
11.	2	16	3	1	2	-2.50	0.00	19.50	1.600
12.	2	11	1	2	2	6.25	3.00	20.50	-2.314
13.	2	10	1	1	2	-4.75	-1.50	23.00	3.269
14.	2	14	2	2	1	6.50	9.00	26.00	-3.169
15.	2	9	1	1	1	-0.50	-1.50	17.25	0.940
16.	2	14	2	1	2	3.75	3.00	14.00	-2.208
17.	2	9	1	3	1	11.00	-2.50	15.00	-3.472
18.	2	9	1	1	1	7.25	6.75	19.50	-3.740
19.	2	14	2	3	2	-8.50	5.50	22.50	2.907
20.	1	15	3	3	1	2.00	7.25	23.00	-1.426
21.	1	8	1	2	2	-0.25	-3.25	27.50	2.577
22.	1	10	1	3	1	1.25	3.00	16.25	-0.972
23.	1	8	1	1	1	0.50	3.00	11.00	-1.366
24.	1	9	1	2	2	-1.25	-7.00	26.50	3.745
25.	2	10	1	3	2	1.00	3.00	18.50	-0.588
26.	2	12	2	1	2	-5.75	1.00	32.00	4.196
27.	2	7	1	1	2	-1.00	4.00	17.00	-0.270
28.	1	10	1	2	2	2.50	2.50	22.00	-0.581
29.	1	9	1	1	2	-6.25	-0.75	8.00	1.717

Table C General characteristic, cephalometric measurements, and the D scores of 105 subjects (Cont.)

No. of cases	Gender	Age	Age range	Cleft type	Treatment categories	ANB (degree)	U1-APog (mm)	L lip-Nperp. (mm)	d score
30.	1	14	2	2	2	1.50	-7.50	20.00	1.990
31.	2	11	1	1	2	-8.00	-0.75	16.00	3.411
32.	2	10	1	3	1	5.00	-2.75	17.50	-0.820
33.	2	15	3	1	2	-9.50	-5.50	23.50	6.109
34.	2	17	3	1	2	-7.75	2.50	25.50	3.746
35.	2	8	1	1	2	-1.25	-2.75	20.50	1.930
36.	1	9	1	1	1	-1.75	-1.75	19.50	1.745
37.	2	10	1	3	1	5.00	5.25	19.25	-2.554
38.	2	11	1	3	1	-1.50	5.00	4.50	0.255
39.	2	7	1	1	1	4.75	6.00	16.00	-3.063
40.	2	8	1	1	1	5.25	4.75	9.75	-3.752
41.	2	11	1	1	1	-5.25	4.00	23.50	2.175
42.	2	16	3	2	2	8.50	2.50	19.00	-3.236
43.	2	13	2	1	2	-7.00	-2.00	19.00	3.726
44.	1	16	3	2	2	3.75	-1.50	14.50	-1.041
45.	1	14	2	3	1	0.50	9.00	30.50	-0.340
46.	1	14	2	2	2	-1.25	0.00	30.00	2.482
47.	2	23	4	1	2	2.75	10.00	6.75	-4.480
48.	1	24	4	3	1	2.50	4.75	19.00	-1.519
49.	1	20	4	1	1	1.00	2.50	18.50	-0.465
50.	2	17	3	3	1	6.00	7.00	20.00	-3.264
51.	2	16	3	1	1	-0.75	0.50	17.50	0.558
52.	2	16	3	4	1	-1.00	6.25	19.00	-0.563
53.	2	26	4	1	2	-3.00	-6.50	13.25	2.575
54.	2	14	2	1	1	-0.50	3.00	27.00	1.076
55.	2	11	1	2	1	1.50	-5.75	18.00	1.303
56.	1	18	3	3	1	-0.25	-0.50	27.00	1.839

Table C General characteristic, cephalometric measurements, and the D scores of 105 subjects (Cont.)

No. of cases	Gender	Age	Age range	Cleft type	Treatment categories	ANB (degree)	U1-APog (mm)	L lip-Nperp. (mm)	d score
57.	1	10	1	2	2	6.00	-6.00	19.00	-0.208
58.	2	16	3	1	1	6.00	5.75	16.00	-3.474
59.	1	14	2	2	1	7.50	2.00	22.00	-2.348
60.	2	9	1	2	1	2.25	-2.00	16.25	-0.125
61.	2	9	1	1	1	6.50	3.75	16.00	-3.173
62.	2	10	1	1	1	-0.50	3.50	15.25	-0.562
63.	1	12	2	1	2	-2.00	-3.00	16.75	1.791
64.	2	13	2	3	1	5.75	2.75	13.00	-3.031
65.	1	5	1	1	2	-0.75	-1.00	22.00	1.506
66.	1	9	1	1	1	-1.25	0.50	6.00	-0.737
67.	1	13	2	1	1	-4.50	0.00	18.50	2.227
68.	2	9	1	2	2	6.50	-5.00	15.00	-1.158
69.	2	18	3	1	2	-3.25	2.50	25.50	2.045
70.	1	19	4	3	1	-1.25	4.00	18.50	0.018
71.	2	20	4	2	1	0.50	5.00	16.25	-1.179
72.	2	9	1	1	2	-0.50	0.00	18.00	0.650
73.	2	13	2	3	1	6.00	18.00	4.50	-5.766
74.	1	13	2	1	2	-6.25	-4.00	30.50	5.416
75.	2	12	2	1	2	-8.00	-4.00	16.00	4.207
76.	1	14	2	2	2	-11.75	-8.50	13.50	6.405
77.	1	11	1	1	1	-3.50	-2.00	22.00	2.790
78.	2	12	2	1	1	2.25	-1.50	23.50	0.688
79.	2	12	2	1	1	1.00	0.00	15.25	-0.272
80.	1	14	2	1	1	4.25	4.50	12.50	-2.958
81.	1	17	3	1	2	-3.00	3.00	11.25	-0.011
82.	1	14	2	2	2	-5.00	-3.75	31.00	4.947
83.	1	8	1	1	1	-1.00	-0.50	14.50	0.510
84.	1	14	2	1	2	1.00	-2.25	19.75	0.860
85.	2	7	1	1	1	4.25	8.25	24.00	-2.393

Table C General characteristic, cephalometric measurements, and the D scores of 105 subjects (Cont.)

No. of cases	Gender	Age	Age range	Cleft type	Treatment categories	ANB (degree)	U1-APog (mm)	L lip-Nperp. (mm)	d score
86.	1	18	3	4	1	-3.75	0.50	26.50	2.853
87.	2	18	3	1	2	-1.50	3.00	20.75	0.648
88.	1	14	2	1	1	6.00	-2.00	25.75	-0.317
89.	1	13	2	1	1	2.50	5.00	4.00	-1.322
90.	2	12	2	1	1	1.25	4.00	23.00	-0.347
91.	2	8	1	3	1	10.00	5.00	16.00	-4.802
92.	1	9	1	1	2	-3.50	0.00	20.50	2.107
93.	1	29	4	2	2	-1.75	-0.50	15.00	0.858
94.	2	14	2	1	2	-7.00	-4.50	17.00	4.081
95.	2	12	2	1	2	-3.50	-0.50	16.00	1.649
96.	2	12	2	1	1	0.50	5.50	4.75	-0.592
97.	2	12	2	1	1	-2.00	4.50	12.50	-0.595
98.	1	15	3	2	2	-7.00	-9.50	33.50	7.434
99.	2	15	3	3	1	-3.25	8.75	16.25	-0.680
100.	2	28	4	3	1	5.25	6.00	23.50	-2.284
101.	1	11	1	1	2	-3.00	-1.00	23.75	2.582
102.	2	21	4	1	1	-1.25	7.00	24.00	-0.007
103.	2	10	1	2	2	0.50	-7.00	25.75	2.987
104.	2	10	1	1	2	-1.25	6.50	19.25	-0.498
105.	2	15	3	2	1	-2.25	-4.75	27.25	3.669

APPENDIX D

Sensitivity, specificity, accuracy, positive and negative likelihood ratios (LR) at different cutoff D scores

Table D Detailed report of sensitivity and specificity at different cutoff D scores

Cutpoint	Sensitivity	Specificity	Accuracy	LR+	LR-
(>= -5.7655)	100.00%	0.00%	44.76%	1.0000	
(>= -4.802)	100.00%	1.72%	45.71%	1.0175	0.0000
(>= -4.47975)	100.00%	3.45%	46.67%	1.0357	0.0000
(>= -3.7515)	97.87%	3.45%	45.71%	1.0137	0.6170
(>= -3.7455)	97.87%	5.17%	46.67%	1.0321	0.4113
(>= -3.73975)	97.87%	6.90%	47.62%	1.0512	0.3085
(>= -3.47375)	97.87%	8.62%	48.57%	1.0711	0.2468
(>= -3.4715)	97.87%	10.34%	49.52%	1.0917	0.2057
(>= -3.264)	97.87%	12.07%	50.48%	1.1131	0.1763
(>= -3.2355)	97.87%	13.79%	51.43%	1.1353	0.1543
(>= -3.17275)	95.74%	13.79%	50.48%	1.1106	0.3085
(>= -3.169)	95.74%	15.52%	51.43%	1.1333	0.2742
(>= -3.0625)	95.74%	17.24%	52.38%	1.1569	0.2468
(>= -3.03125)	95.74%	18.97%	53.33%	1.1815	0.2244
(>= -2.9575)	95.74%	20.69%	54.29%	1.2072	0.2057
(>= -2.88)	95.74%	22.41%	55.24%	1.2340	0.1899
(>= -2.554)	95.74%	24.14%	56.19%	1.2621	0.1763
(>= -2.39275)	95.74%	25.86%	57.14%	1.2914	0.1645
(>= -2.348)	95.74%	27.59%	58.10%	1.3222	0.1543
(>= -2.314)	95.74%	29.31%	59.05%	1.3544	0.1452
(>= -2.308)	93.62%	29.31%	58.10%	1.3243	0.2178
(>= -2.284)	93.62%	31.03%	59.05%	1.3574	0.2057
(>= -2.2075)	3.62%	932.76%	60.00%	1.3923	0.1948
(>= -2.12)	91.49%	32.76%	59.05%	1.3606	0.2598
(>= -1.51875)	91.49%	34.48%	60.00%	1.3964	0.2468
(>= -1.477)	91.49%	36.21%	60.95%	1.4342	0.2351
(>= -1.42625)	91.49%	37.93%	61.90%	1.4740	0.2244
(>= -1.366)	91.49%	39.66%	62.86%	1.5161	0.2146
(>= -1.322)	91.49%	41.38%	63.81%	1.5607	0.2057
(>= -1.17875)	91.49%	43.10%	64.76%	1.6080	0.1974
(>= -1.158)	91.49%	44.83%	65.71%	1.6582	0.1899
(>= -1.0405)	89.36%	44.83%	64.76%	1.6197	0.2373
(>= -1.0305)	87.23%	44.83%	63.81%	1.5811	0.2848
(>= -.99525)	85.11%	44.83%	62.86%	1.5426	0.3322
(>= -.97225)	85.11%	46.55%	63.81%	1.5923	0.3199

Table D Detailed report of sensitivity and specificity at different cutoff D scores (Cont.)

Cutpoint	Sensitivity	Specificity	Accuracy	LR+	LR-
(>= -.81975)	85.11%	48.28%	64.76%	1.6454	0.3085
(>= -.737)	85.11%	50.00%	65.71%	1.7021	0.2979
(>= -.68)	85.11%	51.72%	66.67%	1.7629	0.2879
(>= -.595)	85.11%	53.45%	67.62%	1.8282	0.2787
(>= -.59175)	85.11%	55.17%	68.57%	1.8985	0.2699
(>= -.5875)	85.11%	56.90%	69.52%	1.9745	0.2618
(>= -.5805)	82.98%	56.90%	68.57%	1.9251	0.2992
(>= -.56325)	80.85%	56.90%	67.62%	1.8757	0.3366
(>= -.56225)	80.85%	58.62%	68.57%	1.9539	0.3267
(>= -.49775)	80.85%	60.34%	69.52%	2.0389	0.3173
(>= -.465)	78.72%	60.34%	68.57%	1.9852	0.3526
(>= -.3465)	78.72%	62.07%	69.52%	2.0754	0.3428
(>= -.3205)	78.72%	63.79%	70.48%	2.1743	0.3335
(>= -.3175)	78.72%	65.52%	71.43%	2.2830	0.3247
(>= -.31725)	76.60%	65.52%	70.48%	2.2213	0.3572
(>= -.27175)	76.60%	67.24%	71.43%	2.3382	0.3481
(>= -.27)	76.60%	68.97%	72.38%	2.4681	0.3394
(>= -.208)	74.47%	68.97%	71.43%	2.3995	0.3702
(>= -.12525)	72.34%	68.97%	70.48%	2.3310	0.4011
(>= -.117)	72.34%	70.69%	71.43%	2.4681	0.3913
(>= -.07825)	72.34%	72.41%	72.38%	2.6223	0.3820
(>= -.01075)	70.21%	72.41%	71.43%	2.5452	0.4113
(>= -.0075)	68.09%	72.41%	70.48%	2.4681	0.4407
(>= .018)	68.09%	74.14%	71.43%	2.6326	0.4305
(>= .2545)	68.09%	75.86%	72.38%	2.8207	0.4207
(>= .51)	68.09%	77.59%	73.33%	3.0376	0.4113
(>= .5575)	68.09%	79.31%	74.29%	3.2908	0.4024
(>= .64775)	68.09%	81.03%	75.24%	3.5899	0.3938
(>= .65)	65.96%	81.03%	74.29%	3.4778	0.4201
(>= .6875)	63.83%	81.03%	73.33%	3.3656	0.4464
(>= .858)	63.83%	82.76%	74.29%	3.7021	0.4371
(>= .86)	61.70%	82.76%	73.33%	3.5787	0.4628

Table D Detailed report of sensitivity and specificity at different cutoff D scores (Cont.)

Cutpoint	Sensitivity	Specificity	Accuracy	LR+	LR-
(>= .92075)	59.57%	82.76%	72.38%	3.4553	0.4885
(>= 1.076)	59.57%	84.48%	73.33%	3.8392	0.4785
(>= 1.30275)	59.57%	86.21%	74.29%	4.3191	0.4689
(>= 1.5055)	59.57%	87.93%	75.24%	4.9362	0.4597
(>= 1.5995)	57.45%	87.93%	74.29%	4.7599	0.4839
(>= 1.6485)	55.32%	87.93%	73.33%	4.5836	0.5081
(>= 1.71725)	53.19%	87.93%	72.38%	4.4073	0.5323
(>= 1.74475)	51.06%	87.93%	71.43%	4.2310	0.5565
(>= 1.79075)	51.06%	89.66%	72.38%	4.9362	0.5458
(>= 1.839)	48.94%	89.66%	71.43%	4.7305	0.5696
(>= 1.92975)	48.94%	91.38%	72.38%	5.6766	0.5588
(>= 1.9895)	46.81%	91.38%	71.43%	5.4298	0.5821
(>= 2.0445)	44.68%	91.38%	70.48%	5.1830	0.6054
(>= 2.1065)	42.55%	91.38%	69.52%	4.9362	0.6287
(>= 2.175)	40.43%	91.38%	68.57%	4.6894	0.6519
(>= 2.2265)	40.43%	93.10%	69.52%	5.8617	0.6399
(>= 2.4815)	40.43%	94.83%	70.48%	7.8156	0.6282
(>= 2.57475)	38.30%	94.83%	69.52%	7.4043	0.6507
(>= 2.57725)	36.17%	94.83%	68.57%	6.9929	0.6731
(>= 2.58175)	34.04%	94.83%	67.62%	6.5816	0.6956
(>= 2.79)	31.91%	94.83%	66.67%	6.1702	0.7180
(>= 2.8525)	31.91%	96.55%	67.62%	9.2553	0.7052
(>= 2.907)	31.91%	98.28%	68.57%	18.5107	0.6928
(>= 2.98675)	29.79%	98.28%	67.62%	17.2766	0.7144
(>= 3.269)	27.66%	98.28%	66.67%	16.0426	0.7361
(>= 3.41075)	25.53%	98.28%	65.71%	14.8085	0.7577
(>= 3.6685)	23.40%	98.28%	64.76%	13.5745	0.7794
(>= 3.726)	23.40%	100.00%	65.71%		0.7660
(>= 3.745)	21.28%	100.00%	64.76%		0.7872
(>= 3.7455)	19.15%	100.00%	63.81%		0.8085
(>= 4.0805)	17.02%	100.00%	62.86%		0.8298
(>= 4.1955)	14.89%	100.00%	61.90%		0.8511
(>= 4.207)	12.77%	100.00%	60.95%		0.8723
(>= 4.94675)	10.64%	100.00%	60.00%		0.8936

Table D Detailed report of sensitivity and specificity at different cutoff D scores (Cont.)

Cutpoint	Sensitivity	Specificity	Accuracy	LR+	LR-
(>= 5.416)	8.51%	100.00%	59.05%		0.9149
(>= 6.109)	6.38%	100.00%	58.10%		0.9362
(>= 6.4045)	4.26%	100.00%	57.14%		0.9574
(>= 7.434)	2.13%	100.00%	56.19%		0.9787
(> 7.434)	0.00%	100.00%	55.24%		1.0000

APPENDIX E

Reliability and validity of the FOSP for prediction of the need for orthognathic surgery of each age group

Table E-1 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in age group of 5 - 11 years

Predicted treatment plan	**Actual treatment plan**		**Total**
	Additional orthognathic surgery (%)	**Orthodontic treatment alone (%)**	
Additional orthognathic surgery	11 (25.00%)	5 (11.36%)	16 (36.36%)
Orthodontic treatment alone	8 (18.18%)	20 (45.45%)	28 (63.64%)
Total	19 (43.18%)	25 (56.82%)	44 (100.00%)
Sensitivity (%) = 57.9% (95% CI: 33.5 - 79.7%)			
Specificity (%) = 80.0% (95% CI: 59.3 - 93.2%)			
Accuracy (%) = 70.5% (95% CI: 57.0 - 83.9%)			
Positive predictive value = 68.8% (95% CI: 41.3 - 89.0%)			
Negative predictive value = 71.4% (95% CI: 51.3 - 86.8%)			
LR+ = 2.89 (95% CI: 1.21 - 6.93)			
LR- = 0.53 (95% CI: 0.30 - 0.92)			
Odds ratio = 5.50 (95% CI: 1.48 - 20.30)			
Kappa = 0.39 (95% CI: 0.11 – 0.66; p-value = 0.005)			

Table E-2 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in age group of 12 - 14 years

Predicted treatment plan	**Actual treatment plan**		**Total**
	Additional orthognathic surgery (%)	**Orthodontic treatment alone (%)**	
Additional orthognathic surgery	13 (41.94%)	3 (9.68%)	16 (51.61%)
Orthodontic treatment alone	2 (6.45%)	13 (41.94%)	15 (48.39%)
Total	15 (48.39%)	16 (51.61%)	31 (100.00%)
Sensitivity (%) = 86.7% (95% CI: 59.5 - 98.3%)			
Specificity (%) = 81.3% (95% CI: 54.4 - 96.0%)			
Accuracy (%) = 83.9% (95% CI: 70.9 - 96.8%)			
Positive predictive value = 81.3% (95% CI: 54.4 - 96.0%)			
Negative predictive value = 86.7% (95% CI: 59.5 - 98.3%)			
LR+ = 4.62 (95% CI: 1.64 - 13.1)			
LR- = 0.16 (95% CI: 0.04 - 0.61)			
Odds ratio = 28.17 (95% CI: 4.33 - 179.0)			
Kappa = 0.68 (95% CI: 0.42 - 0.94; p-value < 0.001)			

Table E-3 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in age group of 15 - 18 years

Predicted treatment plan	Actual treatment plan		Total
	Additional orthognathic surgery (%)	Orthodontic treatment alone (%)	
Additional orthognathic surgery	6 (28.57%)	3 (14.29%)	9 (42.86%)
Orthodontic treatment alone	4 (19.05%)	8 (38.10%)	12 (57.14%)
Total	10 (47.62%)	11 (52.38%)	21 (100.00%)
Sensitivity (%) = 60.0% (95% CI: 26.2 - 87.8%)			
Specificity (%) = 72.7% (95% CI: 39.0 - 94.0%)			
Accuracy (%) = 66.7% (95% CI: 46.5 - 86.8%)			
Positive predictive value = 66.7% (95% CI: 29.9 - 92.5%)			
Negative predictive value = 66.7% (95% CI: 34.9 - 90.1%)			
LR+ = 2.20 (95% CI: 0.74 - 6.54)			
LR- = 0.55 (95% CI: 0.24 - 1.28)			
Odds ratio = 4.00 (95% CI: 0.68 - 23.4)			
Kappa = 0.33 (95% CI: 0.00 – 0.73; p-value = 0.065)			

Table E-4 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in age group of 19 - 29 years

Predicted treatment plan	**Actual treatment plan**		**Total**
	Additional orthognathic surgery (%)	**Orthodontic treatment alone (%)**	
Additional orthognathic surgery	2 (22.22%)	0 (0.00%)	2 (22.22%)
Orthodontic treatment alone	1 (11.11%)	6 (66.67%)	7 (77.78%)
Total	3 (33.33%)	6 (66.67%)	9 (100.00%)
Sensitivity (%) = 66.7% (95% CI: 9.4 - 99.2%)			
Specificity (%) = 100.0% (95% CI: 54.1 - 100.0%)			
Accuracy (%) = 88.9% (95% CI: 68.4 - 100.0%)			
Positive predictive value = 100.0% (95% CI: 15.8 - 100.0%)			
Negative predictive value = 85.7% (95% CI: 42.1 - 99.6%)			
LR+ = -*			
LR- = -*			
Odds ratio = -*			
Kappa = 0.73 (95% CI: 0.24 – 1.00; p-value = 0.012)			

* Unable to calculate due to limited sample size in this age group

APPENDIX F

Reliability and validity of the FOSP for prediction of the need for orthognathic surgery of each gender

Table F-1 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in males

Predicted treatment plan	**Actual treatment plan**		**Total**
	Additional orthognathic surgery (%)	**Orthodontic treatment alone (%)**	
Additional orthognathic surgery	15 (32.61%)	5 (10.87%)	20 (43.48%)
Orthodontic treatment alone	7 (15.22%)	19 (41.30%)	26 (56.52%)
Total	22 (47.83%)	24 (52.17%)	46 (100.00%)
Sensitivity (%) = 68.2% (95% CI: 45.1 - 86.1%)			
Specificity (%) = 79.2% (95% CI: 57.8 - 92.9%)			
Accuracy (%) = 73.9% (95% CI: 61.2 - 86.6%)			
Positive predictive value = 75.0% (95% CI: 50.9 - 91.3%)			
Negative predictive value = 73.1% (95% CI: 52.2 - 88.4%)			
LR+ = 3.27 (95% CI: 1.43 - 7.51)			
LR- = 0.40 (95% CI: 0.21 - 0.77)			
Odds ratio = 8.14 (95% CI: 2.20 - 30.00)			
Kappa = 0.48 (95% CI: 0.22 – 0.73; p-value < 0.001)			

Table F-2 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in females

Predicted treatment plan	**Actual treatment plan**		**Total**
	Additional orthognathic surgery (%)	**Orthodontic treatment alone (%)**	
Additional orthognathic surgery	17 (28.81%)	6 (10.17%)	23 (38.98%)
Orthodontic treatment alone	8 (13.56%)	28 (47.46%)	36 (61.02%)
Total	25 (42.37%)	34 (57.63%)	59 (100.00%)
Sensitivity (%) = 68.0% (95% CI: 46.5 - 85.1%)			
Specificity (%) = 82.4% (95% CI: 65.5 - 93.2%)			
Accuracy (%) = 76.3% (95% CI: 65.4 - 87.1%)			
Positive predictive value = 73.9% (95% CI: 51.6 - 89.8%)			
Negative predictive value = 77.8% (95% CI: 60.8 - 89.9%)			
LR+ = 3.85 (95% CI: 1.78 - 8.36)			
LR- = 0.39 (95% CI: 0.22 - 0.70)			
Odds ratio = 9.92 (95% CI: 2.99 - 32.8)			
Kappa = 0.51 (95% CI: 0.29 - 0.73; p-value < 0.001)			

APPENDIX G

Reliability and validity of the FOSP for prediction of the need for orthognathic surgery of each cleft type

Table G-1 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in subjects with unilateral cleft lip and palate (UCLP)

Predicted treatment plan	**Actual treatment plan**		**Total**
	Additional orthognathic surgery (%)	**Orthodontic treatment alone (%)**	
Additional orthognathic surgery	22 (36.07%)	7 (11.48%)	29 (47.54%)
Orthodontic treatment alone	6 (9.84%)	26 (42.62%)	32 (52.46%)
Total	28 (45.90%)	33 (54.10%)	61 (100.00%)
Sensitivity (%) = 78.6% (95% CI: 59.0 - 91.7%)			
Specificity (%) = 78.8% (95% CI: 61.1 - 91.0%)			
Accuracy (%) = 78.6% (95% CI: 66.3 - 88.1%)			
Positive predictive value = 75.9% (95% CI: 56.5 - 89.7%)			
Negative predictive value = 81.3% (95% CI: 63.6 - 92.8%)			
LR+ = 3.70 (95% CI: 1.87 - 7.35)			
LR- = 0.27 (95% CI: 0.13 - 0.56)			
Odds ratio = 13.62 (95% CI: 4.06 - 45.67)			
Kappa = 0.57 (95% CI: 0.37 - 0.78; p-value < 0.001)			

Table G-2 Reliability and validity of the use of FOSP for comparing predicted and actually received type of treatment in subjects with bilateral cleft lip and palate (BCLP)

Predicted treatment plan	**Actual treatment plan**		**Total**
	Additional orthognathic surgery (%)	**Orthodontic treatment alone (%)**	
Additional orthognathic surgery	9 (39.13%)	2 (8.70%)	11 (52.17%)
Orthodontic treatment alone	8 (34.78%)	4 (17.39%)	12 (47.83%)
Total	17 (73.91%)	6 (26.09%)	23 (100.00%)
Sensitivity (%) = 52.9% (95% CI: 27.8 - 77.0%)			
Specificity (%) = 66.7% (95% CI: 22.3 - 95.7%)			
Accuracy (%) = 56.5% (95% CI: 34.5 - 76.8%)			
Positive predictive value = 81.8% (95% CI: 48.2 - 97.7%)			
Negative predictive value = 33.3% (95% CI: 9.9 - 65.1%)			
LR+ = 1.59 (95% CI: 0.47 - 5.36)			
LR- = 0.71 (95% CI: 0.33 - 1.51)			
Odds ratio = 2.25 (95% CI: 0.36 - 13.45)			
Kappa = 0.15 (95%CI: 0.00 - 0.49; p-value = 0.204)			

APPENDIX H

Ethical committee approval document

มหาวิทยาลัยขอนแก่น

หนังสือฉบับนี้ให้ไว้ เพื่อแสดงว่า

โครงการวิจัยเรื่อง: ความเที่ยงตรงและความถูกต้องของการพยากรณ์แผนการรักษาจากสมการทำนายแผนการรักษาทางทันตกรรมจัดฟันในผู้ป่วยปากแหว่งเพดานโหว่

Reliability and validity of predicted treatment plan from the Formula for Orthodontics and Surgery Prediction (FOSP) in patients with cleft lip and cleft palate

ผู้วิจัย: 1. ทันตแพทย์หญิงชุตินารถ ดูรัตน์ชัชวาล

คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น

2. รองศาสตราจารย์ทันตแพทย์หญิงดอกเตอร์ทัศนีย์ วังศรีมงคล

คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น

3. รองศาสตราจารย์ทันตแพทย์มนเทียร มโนสุดประสิทธิ์

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4. รองศาสตราจารย์ทันตแพทย์หญิงสุภาภรณ์ ฉัตรชัยวิวัฒนา

คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น

5. รองศาสตราจารย์ทันตแพทย์สมศักดิ์ กิจสหวงศ์

คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น

สำหรับเอกสาร:

1. เอกสาร ขอปรับปรุงแก้ไขโครงการวิจัยที่ผ่านการรับรองจากคณะกรรมการจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยขอนแก่น ฉบับที่ ศธ 0514.13.3/34 ลงวันที่ 13 มกราคม พ.ศ. 2554
2. แบบรายงานการแก้ไขปรับปรุงโครงการวิจัย ต่อคณะกรรมการจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยขอนแก่น ลงวันที่ 13 มกราคม พ.ศ. 2554
3. เอกสารแสดงรายชื่อและประวัติของนักวิจัย ฉบับลงวันที่ 13 มกราคม พ.ศ. 2554
4. ประวัติ และความชำนาญของนักวิจัย
   - รศ.ทพญ.ดร. ทัศนีย์ วังศรีมงคล
   - รศ.ทพ. มนเทียร มโนสุดประสิทธิ์
   - รศ.ทพญ.ดร. สุภาภรณ์ ฉัตรชัยวิวัฒนา
   - รศ.ทพ.สมศักดิ์ กิจสหวงศ์

ได้ผ่านการรับรองจากคณะกรรมการจริยธรรมการวิจัยในมนุษย์มหาวิทยาลัยขอนแก่น โดยยึดหลักเกณฑ์ตามคำประกาศเฮลซิงกิ (Declaration of Helsinki) และแนวทางการปฏิบัติการวิจัยทางคลินิกที่ดี (ICH GCP)

ให้ไว้ ณ วันที่ 7 กุมภาพันธ์ พ.ศ. 2554

(นายแพทย์เกรียงศักดิ์ เวทีวุฒาจารย์)

ประธานคณะกรรมการจริยธรรมการวิจัยในมนุษย์มหาวิทยาลัยขอนแก่น

คณะกรรมการจริยธรรมการวิจัยในมนุษย์มหาวิทยาลัยขอนแก่น

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RESEARCH PUBLICATIONS

1. **Kuratchatchaval C,** Wangsrimongkol T, Manosudprasit M, Kitsahawong S, Chatrchaiwiwatana S. Reliability and validity of predicted treatment plan from the formula for orthodontics and surgery prediction (FOSP) in patient with cleft lip and cleft palate. Proceedings of the 12th Graduate Research Conference; 2011 Jan 28th; Khon Kaen, Thailand. Khon Kaen University.
2. **Kuratchatchaval C,** Wangsrimongkol T, Manosudprasit M, Kitsahawong S, Chatrchaiwiwatana S. Reliability and validity of predicted treatment plan from the formula for orthodontics and surgery prediction (FOSP) in patients with cleft lip and cleft palate. Final programme booklet of the 87th Congress of the European Orthodontic Society; 2011 Jun 19th-23rd; Istanbul, Turkey. European Orthodontic Society.

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