CHAPTER 4

Results

Prior to assessing the mesiodistal distance, buccolingual alveolar process width, and buccal cortical bone thickness of each interradicular area and different height from the CEJ, the differences between the right and the left side in each variable was assessed. There was no statistically significant difference between the right and left measurements of all variables using the Independent t-test (P<0.05). Based on these results, the right and left measurements were therefore pooled to facilitate determining central trend measurements.

4.1 General information of samples

The samples of the study consisted of CBCT images of 24 pretreatment Thai orthodontic patients, comprising of 12 patients with Class I skeletal pattern and 12 patients with Class II skeletal pattern. Each CBCT image of one patient included 2 sides (left and right) of the maxilla and the mandible, therefore the number of samples were included 24 samples in each group (n = 24/group). The patients with Class I skeletal pattern comprise of eight females and four males, aged 17.92 ± 2.58 years (ranged from 13.30 to 21.50 years) and the patients with Class II skeletal pattern comprise of ten females, aged 19.25 ± 4.67 years (ranged from 13.50 to 29.45 years), as are shown in Table 4.1.

Skeletal nattern	igh	Gen	der e	S e Age (years)			
Skeletal pattern		Female	FemaleMaleMean ± S		Range		
Class I	24	8	4	17.92 ± 2.58	13.30 to 21.50		
Class II	24	10	2	19.25 ± 4.67	13.50 to 29.45		

Table 4.1 Number of samples (n), gender and age of the patients distributed by skeletal pattern in the study.

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4.2 Measurement error

There was no statistically significant difference between the repeated measurements of the CBCT images from 10 randomly selected patients as calculated by the paired Student's t-test (P < 0.05).

4.3 Assessment of the results

4.3.1 Evaluation of three dimensions of interradicular area and cortical bone thickness

Three dimensions of interradicular area were defined as mesiodistal distance (MD) and buccolingual alveolar process width (BL) at different vertical heights from the CEJ. Table 4.2 shows the measurements of the MD at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible of the patients with Class I and Class II skeletal patterns.

In the maxilla of patients with Class I skeletal pattern, the means of MD ranged from 1.24 ± 0.65 to 4.01 ± 1.27 mm, the greatest mean of MD was between the second premolar and the first molar at 10-mm height, whereas the least was between the first and second molars at 6-mm height. The means of MD between the first and second premolars and between the second premolar and the first molar tended to increase increased from the CEJ to the apex. However, statistically, the MD between the first and second premolars and between the second premolar and the first molar at 6, 8, and 10-mm heights were greater than at 2-mm height; and between the second premolar and the first molar and between the first and second molars at 10-mm height were greater than at 2, 4, 6, and 8-mm heights. There were no statistically significant differences between the 4, 6, 8, and 10 mmheights of between the first and second premolars; between the 6 and 8 mmheights of between the second premolar and first molar; and between the 2, 4, 6, and 8 mm-heights of between the first and second molars. Furthermore, the MD between the second premolar and the first molar were greater than

MI)		Class I		4 an	Class II	
Site	Height	4-5	5-6	6-7	4-5	5-6	6-7
	2	1.63 ± 0.61 (a) [a]	2.21 ± 0.55 (a) [b]	1.43 ± 0.61 (a) [a]	1.71 ± 0.49 (a) [a]	2.07 ± 0.58 (a) [b]	1.46 ± 0.42 (a) [a]
	4	2.00 ± 0.75 (ab) [a]	2.63 ± 0.73 (ab) [b]	1.60 ± 0.67 (a) [a]	2.02 ± 0.63 (a) [a]	2.55 ± 0.85 (ab) [b]	1.74 ± 0.63 (a) [a]
Maxilla	6	2.25 ± 0.82 (b) [b]	2.82 ± 0.80 (bc) [c]	1.24 ± 0.65 (a) [a]	2.41 ± 0.63 (b) [b]	2.73 ± 0.97 (b) [b]	1.73 ± 0.83 (a) [a]
	8	2.18 ± 0.89 (b) [b]	3.31 ± 0.90 (c) [c]	1.38 ± 0.68 (a) [a]	2.56 ± 0.79 (b) [ab]	3.07 ± 1.17 (b) [b]	2.01 ± 1.05 (a) [a]
	10	2.25 ± 0.97 (b) [a]	4.01 ± 1.27 (d) [b]	2.07 ± 0.93 (b) [a]	2.78 ± 0.81 (b) [a]	3.77 ± 1.55 (c) [b]	2.62 ± 1.40 (b) [a]
	2	2.60 ± 0.63 (a) [b]	2.22 ± 0.42 (a) [a]	2.60 ± 0.63 (a) [b]	2.47 ± 0.58 (a) [b]	2.12 ± 0.48 (a) [a]	2.53 ± 0.55 (a) [b]
	4	3.27 ± 0.80 (b) [b]	2.71 ± 0.54 (b) [a]	2.97 ± 0.74 (a) [ab]	3.18 ± 0.64 (b) [b]	2.61 ± 0.58 (b) [a]	3.05 ± 0.89 (ab) [b]
Mandible	6	3.91 ± 1.00 (c) [b]	2.94 ± 0.63 (b) [a]	3.21 ± 0.94 (ab) [a]	3.97 ± 0.72 (c) [b]	2.89 ± 0.76 (bc) [a]	3.27 ± 1.11 (ab) [a]
	8	4.46 ± 1.15 (cd) [b]	3.41 ± 0.80 (c) [a]	3.81 ± 1.16 (b) [a]	4.51 ± 0.96 (d) [b]	3.26 ± 0.85 (c) [a]	3.71 ± 1.64 (bc) [a]
	10	4.94 ± 1.20 (d) [b]	4.14 ± 1.13 (d) [a]	5.04 ± 1.51 (c) [b]	5.00 ± 1.16 (e) [b]	4.02 ± 0.99 (d) [a]	4.38 ± 1.80 (c) [ab]

Table 4.2 Means and standard deviations of the mesiodistal distance (MD) at each interradicular area and vertical height (mm) in the maxilla and mandible of the patients with Class I and Class II skeletal patterns

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars;

NS, Not significant; * P < 0.05; ** P < 0.01

Values expressing the Mean \pm SD followed by similar letters in the parentheses (in a same column) or in the square brackets (in a same row) indicate as non-significantly difference at P < 0.05.

Copyright[©] by Chiang Mai University All rights reserved between the first and second premolars and between the first and second molars at all heights of measurement.

In the maxilla of patients with Class II skeletal pattern, the means of MD ranged from 1.46 ± 0.42 to 3.77 ± 1.55 mm, the greatest mean of MD was between the second premolar and the first molar at 10-mm height, whereas the least was between the first and second molars at 2-mm height. The means of MD tended to increase increased from the CEJ to the apex. However, statistically, the MD between the first and second premolars at 6, 8, and 10-mm heights were greater than at 2 and 4-mm heights; MD between the second premolar and the first molar and between the first and second molars at 10-mm height were greater than at 2, 4, 6, and 8-mm heights. There were no statistically significant differences between the 6, 8, and 10 mm-heights of between the first and second premolars; between the 4, 6 and 8 mm-heights of between the second premolar and first molar; and between the 2, 4, 6, and 8 mm-heights of between the first and second molars. Furthermore, the MD between the second premolar and the first molar was greater than between the first and second molars at all heights of measurement; and between the second premolar and the first molar was greater than between the first and second premolars at 2, 4 and 10-mm heights.

In the mandible of patients with Class I skeletal pattern, the means of MD ranged from 2.22 ± 0.42 to 5.04 ± 1.51 mm, the greatest mean of MD was between the first and second molars at 10-mm height, whereas the least was between the second premolar and the first molar at 2-mm height. The means of MD at all interradicular areas tended to increase from the CEJ to the apex. However, statistically, the MD between the first and second premolars at 10-mm height was greater than at 2, 4, and 6-mm height; and between the second premolar and the first molar and between the first and second molars at 10-mm height were greater than at 2, 4, 6, and 8-mm height. There was no statistically significant difference between the 8 and 10 mm-height of between the first and second premolars. Furthermore, the

MD between the first and second premolars was greater than between the second premolar and the first molar at all heights of measurement. No statistically significant difference in MD between the first and second premolars and between the first and second molars at 2, 4, and 10 mm-heights was observed.

In the mandible of patients with Class II skeletal pattern, means of MD ranged from 2.12 ± 0.48 to 5.00 ± 1.16 mm, the greatest mean of MD was between the first and second premolars at 10-mm height, whereas the least was between the second premolar and the first molar at 2-mm height. The means of MD tended to increase from the CEJ to the apex. However, statistically, the MD between the second premolar and the first molar at 10mm height were greater than at 2, 4, 6, and 8-mm heights; and between the first and second molars at 10-mm height were greater than at 2, 4, and 6-mm heights. The MD between the first and second premolars at 10-mm height was greatest, followed by at 8, 6, 4, and 2 mm-heights in descending order. There was no statistically significant difference between the 6 and 8 mmheights of between the second premolar and first molar; and between the 8 and 10 mm-heights of between the first and second molars. Furthermore, the MD between the first and second premolars was greater than between the second premolar and the first molar at all heights of measurement. No statistically significant difference in MD between the first and second premolars and between the first and second molars at 2, 4, and 10 mmheights was observed.

Table 4.3 shows the measurements of the buccolingual alveolar process width (BL) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible of the patients with Class I and Class II skeletal patterns.

In the maxilla of patients with Class I skeletal pattern, the means of BL ranged from 8.16 ± 1.75 to 15.61 ± 1.07 mm, the greatest mean of BL was between the first and second molars at 10-mm height, whereas the least

BL	4		Class I	000	4 an	Class II	
Site	Height	4-5	5-6	6-7	4-5	5-6	6-7
	2	8.16 ± 1.75 (a) [a]	9.70 ± 1.46 (a) [b]	12.68 ± 2.55 (a) [c]	7.12 ± 1.20 (a) [a]	8.65 ± 1.93 (a) [b]	11.47 ± 1.82 (a) [c]
	4	10.42 ± 0.95 (b) [a]	12.09 ± 0.98 (b) [b]	14 .76 ± 1.55 (b) [c]	9.86 ± 0.77 (b) [a]	11.59 ± 1.02 (b) [b]	14.66 ± 1.45 (b) [c]
Maxilla	6	10.71 ± 0.84 (b) [a]	12.49 ± 1.20 (b) [b]	15.01 ± 1.08 (b) [c]	10.56 ± 1.01 (bc) [a]	12.54 ± 1.20 (c) [b]	15.44 ± 1.27 (bc) [c]
	8	10.56 ± 1.01 (b) [a]	12.81 ± 1.53 (b) [b]	15.35 ± 0.95 (b) [c]	10.89 ± 1.27 (c) [a]	13.31 ± 1.67 (c) [b]	15.67 ± 1.40 (c) [c]
	10	11.08 ± 1.47 (b) [a]	13.74 ± 1.70 (c) [b]	15.61 ± 1.07 (b) [c]	11.60 ± 1.77 (d) [a]	14.55 ± 2.15 (d) [b]	16.73 ± 1.89 (d) [c]
	2	7.08 ± 1.88 (a) [a]	8.51 ± 1.56 (a) [b]	10.44 ± 2.30 (a) [c]	6.20 ± 1.43 (a) [a]	7.80 ± 1.62 (a) [b]	9.85 ± 1.56 (a) [c]
	4	9.28 ± 1.90 (b) [a]	10.53 ± 1.28 (b) [b]	13.36 ± 2.32 (b) [c]	8.86 ± 1.61 (b) [a]	9.93 ± 1.27 (b) [b]	11.82 ± 1.21 (b) [c]
Mandible	6	10.20 ± 1.63 (bc) [a]	11.75 ± 1.49 (c) [b]	14.86 ± 2.37 (c) [c]	10.35 ± 2.13 (c) [a]	11.07 ± 1.72 (c) [a]	13.50 ± 1.44 (c) [b]
	8	10.75 ± 1.31 (c) [a]	12.51 ± 1.52 (cd) [b]	15.58 ± 2.29 (c) [c]	10.64 ± 2.20 (c) [a]	11.78 ± 2.01 (cd) [b]	14.45 ± 1.44 (d) [c]
	10	11.17 ± 1.29 (c) [a]	13.00 ± 1.55 (d) [b]	15.59 ± 2.37 (c) [c]	10.80 ± 2.07 (c) [a]	12.14 ± 2.08 (d) [b]	14.89 ± 1.68 (d) [c]

Table 4.3 Means and standard deviations of the buccolingual alveolar process width (BL) at each internadicular area and vertical height (mm) in the maxilla and mandible of the patients with Class I and Class II skeletal patterns

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars;

NS, Not significant; * P < 0.05; ** P < 0.01

Values expressing the Mean \pm SD followed by similar letters in the parentheses (in a same column) or in the square brackets (in a same row) indicate as non-significantly difference at P < 0.05.

Copyright[©] by Chiang Mai University All rights reserved was between the first and second premolars at 2-mm height. The means of BL tended to increase from the CEJ to apex and from the anterior to posterior regions. However, statistically, the BL between the first and second premolars and between the first and second molars at 4, 6, 8, and 10-mm heights were greater than at 2-mm height; and between the second premolar and the first molar at 10-mm height were greater than at 2, 4, 6, and 8-mm heights. There were no statistically significant differences between the 4, 6, 8 and 10 mm-heights of between the first and second molars; and between the first and second molars; and between the 4, 6, and 8 mm-heights of between the second premolar and first molar. Furthermore, the BL between the first and second molars was the greatest, followed by between the second premolar and the first and second premolar and between the second premolar and the first molar.

In the maxilla of patients with Class II skeletal pattern, the means of BL ranged from 7.12 ± 1.20 to 16.73 ± 1.89 mm, the greatest mean of BL was between the first and second molars at 10-mm height, whereas the least was between the first and second premolars at 2-mm height. The means of BL tended to increase from the CEJ to apex and from the anterior to posterior regions. However, statistically, the BL between the first and second molars at 10-mm height were greater than at 2, 4, 6, 8, and 10-mm heights. There were no statistically significant differences between the 6 and 8-mm heights of between the first and second molars, between the second premolar and first molar, and between the second molars. Furthermore, the BL between the first and second molars was the greatest, followed by between the second premolar and the first molar and between the first and second molars at 10-mm heights of determine the first and second molars was the greatest.

In the mandible of patients with Class I skeletal pattern, the means of BL ranged from 7.08 ± 1.88 to 15.59 ± 2.37 mm, the greatest mean of BL

was between the first and second molars at 10-mm height, whereas the least was between the first and second premolars at 2-mm height. The means of BL tended to increase from the CEJ to apex and increased from the anterior to posterior regions. However, statistically, the BL between the first and second premolars, between the second premolar and first molar, and between the first and second molars at 6, 8, and 10-mm heights were greater than at 2-mm height. There were no statistically significant differences between the 6, 8 and 10-mm heights of between the first and second premolars and between the first and second molars; and between the 8 and 10 mm-heights of between the second premolar and first molar. Furthermore, the BL between the first and second molars was the greatest, followed by between the second premolar and the first molar and between the first and second premolars in descending order, at all heights of measurement.

In the mandible of patients with Class II skeletal pattern the means of BL ranged from 6.20 \pm 1.43 to 14.89 \pm 1.68 mm, the greatest mean of BL was between the first and second molars at 10-mm height, whereas the least was between the first and second premolars at 2-mm height. The means of BL tended to increase from the CEJ to apex and increased from the anterior to posterior regions. However, statistically, the BL between the first and second premolars at 6, 8, and 10-mm heights were greater than at 2 and 4mm heights; between the second premolar and the first molar at 8 and 10mm heights were greater than at 2 and 4-mm heights; and between the first and second molars at 8 and 10-mm heights were greater than at 2, 4, and 6mm heights. There were no statistically significant differences between the 6, 8, and 10-mm heights of between the first and second premolars; between the 8 and 10-mm heights of between the second premolar and first molar, and between the first and second molars. Furthermore, the BL between the first and second molars was the greatest, followed by between the second premolar and the first molar and between the first and second premolars in descending order, at 2, 4, 8, and 10-mm heights. The BL between the first and second molars at 6-mm height was greater than between the second

premolar and the first molar and between the first and second premolars, but no difference between the second premolar and the first molar and between the first and second premolars was observed.

Table 4.4 shows the measurements of the buccal cortical bone thickness (BC) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible of the patients with Class I and Class II skeletal patterns.

In the maxilla of patients with Class I skeletal pattern, the means of BC ranged from 0.76 ± 0.24 to 1.38 ± 0.48 mm, the greatest mean of BC was between the first and second molars at 10-mm height, whereas the least was between the first and second premolars at 2-mm height. The means of BC tended to increase from the CEJ to the apex. However, statistically, the BC between the first and second premolars and between the second premolar and the first molar at 10-mm height were greater than at 2 and 4-mm heights; between the first and second molars at 8 and 10-mm heights were greater than at 2, 4, and 6-mm heights. There were no statistically significant differences between the 8 and 10-mm heights of between the first and second premolars, between the second premolar and first molar, and between the first and second molars, at all heights of measurement, were observed.

In the maxilla of patients with Class II skeletal pattern, the means of BC ranged from 0.64 ± 0.14 to 1.37 ± 0.30 mm, the greatest mean of BC was between the first and second premolars at 10-mm height, whereas the least was between the first and second premolars at 2-mm height. The means of BC tended to increase from the CEJ to the apex. However, statistically, the BC between the first and second premolars at 8 and 10-mm heights were greater than at 2 and 4-mm heights; between the second premolar and the first molar at 8-mm height was greater than at 2 and 4-mm heights; and between the first and second molars at 4, 6, 8 and 10-mm heights were greater than at 2-mm height. There were no statistically significant differences between the 8 and 10-mm heights of between the first

BC			Class I	000	400	Class II	
Site	Height	4-5	5-6	6-7	4-5	5-6	6-7
	2	0.76 ± 0.24 (a) [a]	0.84 ± 0.31 (a) [a]	0.81 ± 0.41 (a) [a]	0.64 ± 0.14 (a) [a]	0.68 ± 0.17 (a) [a]	0.74 ± 0.23 (a) [a]
	4	0.98 ± 0.35 (b) [a]	0.95 ± 0.29 (ab) [a]	1.08 ± 0.36 (b) [a]	1.02 ± 0.38 (b) [a]	0.98 ± 0.31 (b) [a]	1.13 ± 0.45 (b) [a]
Maxilla	6	1.12 ± 0.36 (bc) [a]	1.06 ± 0.36 (bc) [a]	1.08 ± 0.36 (b) [a]	1.14 ± 0.38 (bc) [a]	1.14 ± 0.39 (bc) [a]	1.13 ± 0.36 (b) [a]
	8	1.07 ± 0.37 (bc) [a]	1.01 ± 0.26 (abc) [a]	1.24 ± 0.45 (bc) [a]	1.25 ± 0.43 (cd) [a]	1.20 ± 0.30 (c) [a]	1.18 ± 0.37 (b) [a]
	10	1.23 ± 0.35 (c) [a]	1.18 ± 0.44 (c) [a]	1.38 ± 0.48 (c) [a]	1.37 ± 0.30 (d) [a]	1.15 ± 0.32 (bc) [a]	1.35 ± 0.46 (b) [a]
	2	0.96 ± 0.31 (a) [a]	1.12 ± 0.46 (a) [a]	1.77 ± 1.00 (a) [b]	0.91 ± 0.32 (a) [a]	1.09 ± 0.48 (a) [a]	1.42 ± 0.52 (a) [b]
	4	1.46 ± 0.48 (b) [a]	1.42 ± 0.49 (ab) [a]	2.45 ± 1.04 (b) [b]	1.35 ± 0.33 (b) [a]	1.53 ± 0.47 (b) [a]	2.01 ± 0.68 (b) [b]
Mandible	6	1.66 ± 0.52 (bc) [a]	1.69 ± 0.52 (b) [a]	2.93 ± 0.86 (bc) [b]	1.64 ± 0.36 (c) [a]	1.73 ± 0.46 (b) [a]	2.75 ± 0.75 (c) [b]
	8	1.79 ± 0.39 (cd) [a]	2.09 ± 0.65 (c) [a]	3.21 ± 0.75 (c) [b]	1.80 ± 0.33 (cd) [a]	2.02 ± 0.41 (c) [a]	3.03 ± 0.63 (c) [b]
	10	2.00 ± 0.37 (d) [a]	2.39 ± 0.68 (c) [b]	3.19 ± 0.64 (c) [c]	1.92 ± 0.34 (d) [a]	2.35 ± 0.50 (d) [b]	3.12 ± 0.43 (c) [c]

the maxilla and mandible of the patients with Class I and Class II skeletal patterns

Table 4.4 Means and standard deviations of the buccal cortical bone thickness (BC) at each interradicular area and vertical height (mm) in

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars;

NS, Not significant; * *P* < 0.05; ** *P* < 0.01

Values expressing the Mean \pm SD followed by similar letters in the parentheses (in a same column) or in the square brackets (in a same row) indicate as non-significantly difference at P < 0.05.

Copyright[©] by Chiang Mai University All rights reserved and second premolars; between the 6, 8 and 10-mm heights of between the second premolar and first molar; and between the 4, 6, 8 and 10-mm heights of between the first and second molars. Furthermore, no statistically significant differences in BC between the first and second premolars, between the second premolar and first molar, and between the first and second molars, at all heights of measurement, were observed.

In the mandible of patients with Class I skeletal pattern, the means of BC ranged from 0.96 ± 0.31 to 3.21 ± 0.75 mm, the greatest mean of BC was between the first and second molars at 8-mm height, whereas the least was between the first and second premolars at 2-mm height. The means of BC tended to increase from the CEJ to the apex and increased from the anterior to posterior regions. However, statistically, the BC between the first and second premolars and between the second premolar and the first molar at 8 and 10-mm height were greater than at 2, 4, and 6-mm heights; between the first and second molars at 8 and 10-mm heights were greater than at 2 and 4-mm heights. There were no statistically significant differences between the 8 and 10-mm heights of between the first and second premolars, between the second premolar and first molar, and between the first and second molars. Furthermore, the BC between the first and second molars was greater than between the first and second premolars and between the second premolar and first molar, at 2, 4, 6, and 8-mm heights. The BC between the first and second molars was the greatest, followed by between the second premolar and the first molar and between the first and second premolars in descending order, at 10-mm height. No statistically significant difference in BC between the first and second premolars and between the second premolar and the first molar at 2, 4, 6, and 8 mm-heights was observed. s reserve

In the mandible of patients with Class II skeletal pattern, the means of BC ranged from 0.91 ± 0.32 to 3.12 ± 0.43 mm, the greatest mean of BC was between the first and second molars at 10-mm height, whereas the least was between the first and second premolars at 2-mm height. The means of

BC tended to increase from the CEJ to the apex and increased from the anterior to posterior regions. However, statistically, the BC between the first and second premolars at 8 and 10-mm height were greater than at 2 and 4mm heights; between the second premolar and the first molar at 10-mm height was greater than at 2, 4, 6 and 8-mm heights; and between the first and second molars at 6, 8 and 10-mm heights were greater than at 2 and 4mm heights. There were no statistically significant differences between the 8 and 10-mm heights of between the first and second premolars; and between the 6, 8 and 10-mm heights of between the first and second molars. Furthermore, the BC between the first and second molars was greater than between the first and second premolars and between the second premolar and first molar, at 2, 4, 6, and 8-mm heights. The BC between the first and second molars was the greatest, followed by between the second premolar and the first molar and between the first and second premolars in descending order, at 10-mm height. No statistically significant difference in BC between the first and second premolars and between the second premolar and the first molar at 2, 4, 6, and 8 mm-heights was observed.

4.3.2 Comparison between maxilla and mandible

Table 4.5 shows the measurements of the mesiodistal distance (MD) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible in the patients with Class I and Class II skeletal pattern and comparisons between maxilla and mandible.

There were significant differences between maxilla and mandible in MD between the first and second premolars and between the first and second molars in the patients with Class I and Class II skeletal pattern. The MD between the first and second premolars and between the first and second molars, at all heights of measurement, of the mandible were greater than those of the maxilla.

Ν	1D		Maxilla	DI.	0 4	Mandible			Р	
Class	Height	4-5	5-6	6-7	4-5	5-6	6-7	4-5	5-6	6-7
	2	1.63 ± 0.61	2.21 ± 0.55	1.43 ± 0.61	2.60 ± 0.63	2.22 ± 0.42	2.60 ± 0.63	**	NS	**
	4	2.00 ± 0.75	2.63 ± 0.73	1.60 ± 0.67	3.27 ± 0.80	2.71 ± 0.54	2.97 ± 0.74	**	NS	**
Ι	6	2.25 ± 0.82	2.82 ± 0.80	1.24 ± 0.65	3.91 ± 1.00	2.94 ± 0.63	3.21 ± 0.94	*	NS	**
	8	2.18 ± 0.89	3.31 ± 0.90	1.38 ± 0.68	4.46 ± 1.15	3.41 ± 0.80	3.81 ± 1.16	**	NS	**
	10	2.25 ± 0.97	4.01 ± 1.27	2.07 ± 0.93	4.94 ± 1.20	4.14 ± 1.13	5.04 ± 1.51	**	NS	**
	2	1.71 ± 0.49	2.07 ± 0.58	1.46 ± 0.42	2.47 ± 0.58	2.12 ± 0.48	2.53 ± 0.55	**	NS	**
	4	2.02 ± 0.63	2.55 ± 0.85	1.74 ± 0.63	3.18 ± 0.64	2.61 ± 0.58	3.05 ± 0.89	**	NS	**
п	6	2.41 ± 0.63	2.73 ± 0.97	1.73 ± 0.83	3.97 ± 0.72	2.89 ± 0.76	3.27 ± 1.11	**	NS	**
	8	2.56 ± 0.79	3.07 ± 1.17	2.01 ± 1.05	4.51 ± 0.96	3.26 ± 0.85	3.71 ± 1.64	**	NS	**
	10	2.78 ± 0.81	3.77 ± 1.55	2.62 ± 1.40	5.00 ± 1.16	4.02 ± 0.99	4.38 ± 1.80	**	NS	**

Table 4.5 Means and standard deviations of the mesiodistal distance (MD) at each interradicular area and vertical height (mm) of the maxilla and mandible in the patients with Class I and II skeletal pattern and comparisons between maxilla and mandible

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars;

NS, Not significant; * P < 0.05; ** P < 0.01**Copyright[©]** by Chiang Mai University All rights reserved

Table 4.6 shows the measurements of the buccolingual alveolar process width (BL) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible in the patients with Class I and Class II skeletal pattern and comparisons between maxilla and mandible.

In Class I skeletal pattern, there were significant differences between maxilla and mandible in the BL between the first and second premolars, between the second premolar and the first molar, and between the first and second molars. The BL between the first and second premolars, between the second premolar and the first molar, and between the first and second molars, at 2 and 4-mm heights, of the maxilla were greater than those of the mandible.

In Class II skeletal pattern, there were significant differences between maxilla and mandible in the BL between the first and second premolars, between the second premolar and the first molar, and between the first and second molars. The BL between the first and second premolars at 2 and 4-mm heights, between the second premolar and the first molar at 4, 6, 8 and 10-mm heights, and between the first and second molars at all heights of measurement, of the maxilla were greater than those of the mandible.

Table 4.7 shows the measurements of the buccal cortical bone thickness (BC) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible in the patients with Class I and Class II skeletal pattern and comparisons between maxilla and mandible.

There were significant differences between maxilla and mandible in the BC between the first and second premolars, between the second premolar and the first molar, and between the first and second molars in both Class I and Class II skeletal pattern. The BC, at all interradicular areas and all heights of measurement, of the mandible were greater than those of the maxilla in both Class I and Class II skeletal patterns.

I	BL		Maxilla		04	Mandible			Р	
Class	Height	4-5	5-6	6-7	4-5	5-6	6-7	4-5	5-6	6-7
	2	8.16 ± 1.75	9.70 ± 1.46	12.68 ± 2.55	7.08 ± 1.88	8.51 ± 1.56	10.44 ± 2.30	*	**	**
	4	10.42 ± 0.95	12.09 ± 0.98	14.76 ± 1.55	9.28 ± 1.90	10.53 ± 1.28	13.36 ± 2.32	*	*	*
Ι	6	10.71 ± 0.84	12.49 ± 1.20	15.01 ± 1.08	10.20 ± 1.63	11.75 ± 1.49	14.86 ± 2.37	NS	NS	NS
	8	10.56 ± 1.01	12.81 ± 1.53	15.35 ± 0.95	10.75 ± 1.31	12.51 ± 1.52	15.58 ± 2.29	NS	NS	NS
	10	11.08 ± 1.47	13.74 ± 1.70	15.61 ± 1.07	11.17 ± 1.29	13.00 ± 1.55	15.59 ± 2.37	NS	NS	NS
	2	7.12 ± 1.20	8.65 ± 1.93	11.47 ± 1.82	6.20 ± 1.43	7.80 ± 1.62	9.85 ± 1.56	*	NS	**
	4	9.86 ± 0.77	11.59 ± 1.02	14.66 ± 1.45	8.86 ± 1.61	9.93 ± 1.27	11.82 ± 1.21	**	**	**
Π	6	10.56 ± 1.01	12.54 ± 1.20	15.44 ± 1.27	10.35 ± 2.13	11.07 ± 1.72	13.50 ± 1.44	NS	**	**
	8	10.89 ± 1.27	13.31 ± 1.67	15.67 ± 1.40	10.64 ± 2.20	11.78 ± 2.01	14.45 ± 1.44	NS	**	**
	10	11.60 ± 1.77	14.55 ± 2.15	16.73 ± 1.89	10.80 ± 2.07	12.14 ± 2.08	14.89 ± 1.68	NS	**	**

Table 4.6 Means and standard deviations of the buccolingual alveolar process width (BL) at each interradicular area and vertical height (mm) of the maxilla and mandible in the patients with Class I and II skeletal pattern and comparisons between maxilla and mandible

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars;

NS, Not significant; * P < 0.05; ** P < 0.01Copyright[©] by Chiang Mai University All rights reserved

I	BC		Maxilla		0 4	Mandible			Р	
Class	Height	4-5	5-6	6-7	4-5	5-6	6-7	4-5	5-6	6-7
	2	0.76 ± 0.24	0.84 ± 0.31	0.81 ± 0.41	0.96 ± 0.31	1.12 ± 0.46	1.77 ± 1.00	*	*	**
	4	0.98 ± 0.35	0.95 ± 0.29	1.08 ± 0.36	1.46 ± 0.48	1.42 ± 0.49	2.45 ± 1.04	**	**	**
I	6	1.12 ± 0.36	1.06 ± 0.36	1.08 ± 0.36	1.66 ± 0.52	1.69 ± 0.52	2.93 ± 0.86	**	**	**
	8	1.07 ± 0.37	1.01 ± 0.26	1.24 ± 0.45	1.79 ± 0.39	2.09 ± 0.65	3.21 ± 0.75	**	*	**
	10	1.23 ± 0.35	1.18 ± 0.44	1.38 ± 0.48	2.00 ± 0.37	2.39 ± 0.68	3.19 ± 0.64	**	**	**
	2	0.64 ± 0.14	0.68 ± 0.17	0.74 ± 0.23	0.91 ± 0.32	1.09 ± 0.48	1.42 ± 0.52	**	**	**
	4	1.02 ± 0.38	0.98 ± 0.31	1.13 ± 0.45	1.35 ± 0.33	1.53 ± 0.47	2.01 ± 0.68	**	**	**
п	6	1.14 ± 0.38	1.14 ± 0.39	1.13 ± 0.36	1.64 ± 0.36	1.73 ± 0.46	2.75 ± 0.75	**	**	**
	8	1.25 ± 0.43	1.20 ± 0.30	1.18 ± 0.37	1.80 ± 0.33	2.02 ± 0.41	3.03 ± 0.63	**	**	**
	10	1.37 ± 0.30	1.15 ± 0.32	1.35 ± 0.46	1.92 ± 0.34	2.35 ± 0.50	3.12 ± 0.43	**	**	**

Table 4.7 Means and standard deviations of the buccal cortical bone thickness (BC) at each internadicular area and vertical height (mm) of the maxilla and mandible in the patients with Class I and II skeletal pattern and comparisons between maxilla and mandible

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars;

NS, Not significant; *P < 0.05; **P < 0.01

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4.3.3 Comparison between Class I and Class II skeletal patterns

Table 4.8 shows the measurements of the mesiodistal distance (MD) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible of the patients with Class I and Class II skeletal patterns and comparisons between Class I and Class II skeletal patterns.

Significant differences in the MD between Class I and Class II skeletal patterns in the maxilla were observed between the first and second premolars and between the first and second molars. The MD between the first and second premolars at 10-mm height, and between the first and second molars at 6 and 8-mm heights, of the patients with Class II skeletal pattern were greater than those of the patients with Class I skeletal pattern.

No statistically significant difference in the MD between Class I and Class II skeletal patterns in the mandible was observed.

Table 4.9 shows the measurements of the buccolingual alveolar process width (BL) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible of the patients with Class I and Class II skeletal patterns and comparisons between Class I and Class II skeletal patterns.

In the maxilla, significant differences in the BL between Class I and Class II skeletal patterns were observed between the first and second premolars, between the second premolar and first molar, and between the first and second molars. The BL between the first and second premolars at 2 and 4-mm heights, and between the second premolar and the first molar at 2-mm height of the patients with Class I skeletal pattern were greater than those of the patients with Class II skeletal pattern. However, the BL between the first and second molars at 10-mm height, of the patients with Class II skeletal pattern was greater than those of the patients with Class I skeletal pattern.

In the mandible, significant differences in the BL between Class I and Class II skeletal patterns were observed between the first and second molars. The BL between the first and second molars at 4, 6, and 8-mm Table 4.8 Means and standard deviations of the mesiodistal distance (MD) at each interradicular area and vertical height (mm)

of the maxilla and mandible in the patients with Class I and Class II skeletal patterns

Μ	1D		Class I			Class II			Р	
Site	Height	4-5	- 5-6	6-7	4-5	5-6	6-7	4-5	5-6	6-7
	2	1.63 ± 0.61	2.21 ± 0.55	1.43 ± 0.61	1.71 ± 0.49	2.07 ± 0.58	1.46 ± 0.42	NS	NS	NS
	4	2.00 ± 0.75	2.63 ± 0.73	1.60 ± 0.67	2.02 ± 0.63	2.55 ± 0.85	1.74 ± 0.63	NS	NS	NS
Maxilla	6	2.25 ± 0.82	2.82 ± 0.80	1.24 ± 0.65	2.41 ± 0.63	2.73 ± 0.97	1.73 ± 0.83	NS	NS	*
	8	2.18 ± 0.89	3.31 ± 0.90	1.38 ± 0.68	2.56 ± 0.79	3.07 ± 1.17	2.01 ± 1.05	NS	NS	*
	10	2.25 ± 0.97	4.01 ± 1.27	2.07 ± 0.93	2.78 ± 0.81	3.77 ± 1.55	2.62 ± 1.40	*	NS	NS
	2	2.60 ± 0.63	2.22 ± 0.42	2.60 ± 0.63	2.47 ± 0.58	2.12 ± 0.48	2.53 ± 0.55	NS	NS	NS
	4	3.27 ± 0.80	2.71 ± 0.54	2.97 ± 0.74	3.18 ± 0.64	2.61 ± 0.58	3.05 ± 0.89	NS	NS	NS
Mandible	6	3.91 ± 1.00	2.94 ± 0.63	3.21 ± 0.94	3.97 ± 0.72	2.89 ± 0.76	3.27 ± 1.11	NS	NS	NS
-	8	4.46 ± 1.15	3.41 ± 0.80	3.81 ± 1.16	4.51 ± 0.96	3.26 ± 0.85	3.71 ± 1.64	NS	NS	NS
	10	4.94 ± 1.20	4.14 ± 1.13	5.04 ± 1.51	5.00 ± 1.16	4.02 ± 0.99	4.38 ± 1.80	NS	NS	NS

and comparisons between Class I and Class II skeletal patterns

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars; NS, Not significant; * P < 0.05; ** P < 0.01Copyright[©] by Chiang Mai University All rights reserved

Table 4.9 Means and standard deviations of the buccolingual alveolar process width (BL) at each interradicular area and vertical height (mm) of the maxilla and mandible in the patients with Class I and Class II skeletal patterns

В	SL.		Class I			Class II				
Site	Height	4-5	5-6	6-7	4-5	5-6	6-7	4-5	5-6	6-7
	2	8.16 ± 1.75	9.70 ± 1.46	12.68 ± 2.55	7.12 ± 1.20	8.65 ± 1.93	11.47 ± 1.82	*	*	NS
	4	10.42 ± 0.95	12.09 ± 0.98	14 .76 ± 1.55	9.86 ± 0.77	11.59 ± 1.02	14.66 ± 1.45	*	NS	NS
Maxilla	6	10.71 ± 0.84	12.49 ± 1.20	15.01 ± 1.08	10.56 ± 1.01	12.54 ± 1.20	15.44 ± 1.27	NS	NS	NS
	8	10.56 ± 1.01	12.81 ± 1.53	15.35 ± 0.95	10.89 ± 1.27	13.31 ± 1.67	15.67 ± 1.40	NS	NS	NS
	10	11.08 ± 1.47	13.74 ± 1.70	15.61 ± 1.07	11.60 ± 1.77	14.55 ± 2.15	16.73 ± 1.89	NS	NS	*
	2	7.08 ± 1.88	8.51 ± 1.56	10.44 ± 2.30	6.20 ± 1.43	7.80 ± 1.62	9.85 ± 1.56	NS	NS	NS
	4	9.28 ± 1.90	10.53 ± 1.28	13.36 ± 2.32	8.86 ± 1.61	9.93 ± 1.27	11.82 ± 1.21	NS	NS	**
Mandible	6	10.20 ± 1.63	11.75 ± 1.49	14.86 ± 2.37	10.35 ± 2.13	11.07 ± 1.72	13.50 ± 1.44	NS	NS	*
	8	10.75 ± 1.31	12.51 ± 1.52	15.58 ± 2.29	10.64 ± 2.20	11.78 ± 2.01	14.45 ± 1.44	NS	NS	*
	10	11.17 ± 1.29	13.00 ± 1.55	15.59 ± 2.37	10.80 ± 2.07	12.14 ± 2.08	14.89 ± 1.68	NS	NS	NS

and comparisons between Class I and Class II skeletal patterns

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars; NS, Not significant; * P < 0.05; ** P < 0.01Copyright[©] by Chiang Mai University All rights reserved

heights, of the patients with Class I skeletal pattern were greater than those of the patients with Class II skeletal pattern.

Table 4.10 shows the measurements of the buccal cortical bone thickness (BC) at 2, 4, 6, 8, and 10 mm heights from the CEJ in the maxilla and mandible in the patients with Class I and Class II skeletal patterns and comparisons between Class I and Class II skeletal patterns.

In the maxilla, significant differences in the BC between Class I and Class II skeletal patterns were observed between the first and second premolars and between the second premolar and the first molar. The BC between the first and second premolars and between the second premolar and first molar, at 2-mm height, of the patients with Class I skeletal pattern were greater than those of the patients with Class II skeletal pattern. However, the BC between the second premolar and the first molar at 8-mm height of the patients with Class II skeletal pattern those of the patients with Class I skeletal pattern.

No statistically significant difference in the BC between Class I and Class II skeletal patterns in the mandible was observed.

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Table 4.10 Means and standard deviations of the buccal cortical bone thickness (BC) at each interradicular area and vertical height (mm)

of the maxilla and mandible in the patients with Class I and Class II skeletal patterns

В	BC		Class I			Class II			Р	
Site	Height	4-5	• 5-6	6-7	4-5	5-6	6-7	4-5	5-6	6-7
	2	0.76 ± 0.24	0.84 ± 0.31	0.81 ± 0.41	0.64 ± 0.14	0.68 ± 0.17	0.74 ± 0.23	*	*	NS
	4	0.98 ± 0.35	0.95 ± 0.29	1.08 ± 0.36	1.02 ± 0.38	0.98 ± 0.31	1.13 ± 0.45	NS	NS	NS
Maxilla	6	1.12 ± 0.36	1.06 ± 0.36	1.08 ± 0.36	1.14 ± 0.38	1.14 ± 0.39	1.13 ± 0.36	NS	NS	NS
	8	1.07 ± 0.37	1.01 ± 0.26	1.24 ± 0.45	1.25 ± 0.43	1.20 ± 0.30	1.18 ± 0.37	NS	*	NS
	10	1.23 ± 0.35	1.18 ± 0.44	1.38 ± 0.48	1.37 ± 0.30	1.15 ± 0.32	1.35 ± 0.46	NS	NS	NS
	2	0.96 ± 0.31	1.12 ± 0.46	1.77 ± 1.00	0.91 ± 0.32	1.09 ± 0.48	1.42 ± 0.52	NS	NS	NS
	4	1.46 ± 0.48	1.42 ± 0.49	2.45 ± 1.04	1.35 ± 0.33	1.53 ± 0.47	2.01 ± 0.68	NS	NS	NS
Mandible	6	1.66 ± 0.52	1.69 ± 0.52	2.93 ± 0.86	1.64 ± 0.36	1.73 ± 0.46	2.75 ± 0.75	NS	NS	NS
-	8	1.79 ± 0.39	2.09 ± 0.65	3.21 ± 0.75	1.80 ± 0.33	2.02 ± 0.41	3.03 ± 0.63	NS	NS	NS
	10	2.00 ± 0.37	2.39 ± 0.68	3.19 ± 0.64	1.92 ± 0.34	2.35 ± 0.50	3.12 ± 0.43	NS	NS	NS

and comparisons between Class I and Class II skeletal patterns

4-5, between first and second premolars; 5-6, between second premolar and first molar; 6-7, between first and second molars; NS, Not significant; * P < 0.05; ** P < 0.01**Copyright[©]** by Chiang Mai University All rights reserved