Tooth Size Proportion in Patients with First Four Premolars Extraction

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Abstract

Proper occlusal interdigitation, overjet, and overbite between the maxillary and the mandibular teeth in patients with extracted first four premolars depend essentially on proper inter-arch tooth size ratio. The purpose of the study is to report the mathematical inter-arch tooth size ratio and the size of each tooth in normal occlusion patients whom first four premolars were already extracted after orthodontic treatment. We strictly selected dental models of patients with normal occlusion and had first four premolar extraction. The PAR index (peer assessment rating index) was used to select dental models with good occlusion. Then, the selected models were evaluated for incisal inclination by cephalometric analysis measurement. We also included models with normal upper and lower incisors inclined. The study was carried out on 38 patients with four extracted first premolars with normal occlusion. The selected models were scanned and digitized with the virtual model software (3Shape Ortho System, 3Shape A/S, Copenhagen). We calculated mean of tooth size, mathematical inter-arch tooth size ratio. We found that the mean overall "10" ratio and the mean anterior "6" ratio were 90.31±1.86% and 77.47±2.66%, respectively. Additionally, the tooth size mean values of upper central incisor, upper lateral incisor, upper second premolar, upper first molar, lower second premolar and lower first molar were significantly different from another similar study. We also found the variations in overall "10" ratio among the literatures. Also, we found a statistically significant difference of overall "10" ratio between Bolton's, Kayalioglu's and our study. In conclusions, our study suggests that an overall ratio of 90.31±1.86% is practical in diagnosis and a treatment planning for patients with four extracted first premolars.

Keywords: *Inter-arch tooth size ratio/ First four premolars extraction*

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Introduction

For an appropriate intercuspation, the teeth must have an appropriate size, inclination and angulation. If the teeth are disproportionate, an ideal occlusion cannot be achieved. Bolton's analysis is the most well-known method to calculate the tooth size discrepancy. The Bolton's analysis, including overall and anterior ratio, have been accepted worldwide as an important tool to aid the orthodontic treatment. The analysis was defined as the proportion of sum of the mesiodistal widths between the maxillary and mandibular teeth, except the second and third molars. Bolton developed two ratios to identify the tooth size discrepancy. The anterior ratio was made to compare the tooth widths between the anterior mandibular teeth and the anterior maxillary teeth. A statistically significant mean and standard deviation were 77.2±0.22. The overall ratio was determined by the proportion of the mesiodistal widths between the mandibular teeth and the maxillary teeth, except the second and third molars. A statistically significant mean and standard deviation were 91.3±0.26.[1] Many researchers reported that there are statistically significant associations between the ratios of the tooth size and ethnicity.[2,3]As a result, several studies established interarch tooth size ratio norms that were similar to Bolton's analysis for particular populations, such as Thai, Iranian, Chinese, Turkish, Spanish, Indian and Irish.[4-9] Dechkunakorn et al. studied the tooth size and interarch tooth ratio in 100 dental models (50 males, 50 females) of Thai people who had Angle's Class I occlusion. The criteria of Dechkunakorn's study were Angle's class I occlusion, normal overjet, normal overbite, crowding less than 1 mm, spacing less than 1mm, normal tooth shape, no tooth material mesiodistally, no caries, permanent dentition except third molars presented and acceptable profile. The dental models were measured by an electronic digital caliper. They reported the mean of each tooth size, the mean overall ratio and the mean anterior ratio. The mean overall ratio was 92. The mean anterior ratio was 78.53.[10]

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Several studies found that clinically significant tooth-size discrepancies could change reciprocally after extractions. In 1962, Bolton presented the overall ratio was between 87-89% after extracting four premolars.[11] Moreover, Saatci et al. and Varghese et al. found that the extraction of first four premolars created the most severe tooth-size discrepancy.[12] Consequently, Bolton's ratio may not be appropriate in patients with first four premolars extraction. Tooth size analysis after four first premolars extraction is necessary for orthodontists to determine the treatment plan before starting the actual treatment for patients who require four first premolars extraction. Using cast models, we established an interarch tooth size ratio in first four premolars extracted Thai patients with normal occlusion. Since our study is specific to Thai people, we hope our findings will help orthodontists plan the treatment more appropriately in Thai patients requiring first four premolars extraction, the same way Bolton's ratio has been utilized.

The purpose is to report the mathematical interarch tooth size ratio and the size of each tooth in normal occlusion patients who already have first four premolars extraction and normal occlusion.

Materials and Methods

This investigation was designed as a descriptive study to measure the interarch tooth size discrepancy on 'normal' occlusion patients whom first four premolars were already extracted. The study was conducted from posttreatment models of 58 subjects who had orthodontic treatment and had first four premolars extracted at the Department of Orthodontics, Khon Kaen University.

Sampling method

Post-treatment dental models of patients had first four premolars extraction were collected by simple random sampling technique.

Sample size calculation

The sample size was calculated based on the main objective of the study. From pilot study reported that a mathematical tooth-size ratio of first four premolars extraction, the standard deviation value was 1.59 for overall "10" ratio.

N = sample size,

$Z\alpha = 1.96$, $\beta = 0.2$, σ = standard deviation from the pilot study, e = allowable error

$$N = \frac{Z\alpha^2 \sigma^2}{e^2}$$

$$N = \frac{1.96^2 x 1.59^2}{0.5^2} = 38.89$$

Inclusion Criteria

- ☐ Permanent dentition and all first molars presented
- ☐ Four first premolars extraction
- ☐ Occlusion assess by PAR index
  - Class I molar and canine relationship
  - The buccal segment with good interdigitation
  - Overbite 15-30 percent (overbite is a vertical overlap between the incisal edge of maxillary central incisors and the incisal edge of mandibular central incisors)
  - Overjet 1.5-3 mm (overjet is a horizontal distance between the labial surface at incisal edge of maxillary central incisors and the labial surface of mandibular central incisors)
  - No tooth rotation or diastema in the dental arch
  - Curve of Spee 0-2 mm

Exclusion Criteria

- ☐ Incomplete data including posttreatment model and lateral cephalogram
- ☐ Teeth extraction other than the first premolar
- ☐ Obvious loss of tooth material mesiodistally from caries, fractures, congenital defects
- ☐ Large restoration/Crown

The first step was to determine an occlusion. All posttreatment models were selected by the peer assessment rating (PAR) index accordingly to Richmond et al.[13] Each set of plaster models was occluded in maximum intercuspation, and a PAR ruler was used to define a value to each of the 5 components. There were upper anterior segment (UAS), right and left buccal occlusion (RBO and LBO), overjet (OJ), overbite (OB) and midline deviation (MID).

The weighting of the American system was applied: UAS times 1, RBO and LBO times 2, OJ and OB times 3, and MID times 2.[14] A score from 1 to 9 indicates a good dental relationship. All study models were scored by the same investigator who would remeasure the study casts 2 weeks later. The mean of 2 PAR score from 9 or less was included in this study.

The second step was the determination of the skeletal pattern and the dental inclination on posttreatment cephalometric radiographs of the subjects from the first step. Cephalometric radiograph was used to measure upper incisor and lower incisor inclination. (Figure 1)

(1) Maxillary incisors (U1):[15]
- U1 - SN (degrees) (Thai norm range: 107.01±6.13)
- U1 - NA (degrees) (Thai norm range: 21.58 ± 4.99)

(2) Mandibular incisors (L1):[15]
- L1 - MP (degrees) (Thai norm range: 97.26 ± 5.97)
- L1 - FH (FMIA) (degrees) (Thai norm range: 59.9 ± 5.86)
- L1 - NB (degrees) (Thai norm range: 30.22 ± 5.55)

(3) Maxillary and mandibular incisors[15]
- Interincisal angle (Thai norm range: 124.36±7.56)

All cephalometric radiographs were remeasured 2 weeks later by the same investigator. The models with normal upper incisors and lower incisors inclination were included in this study.

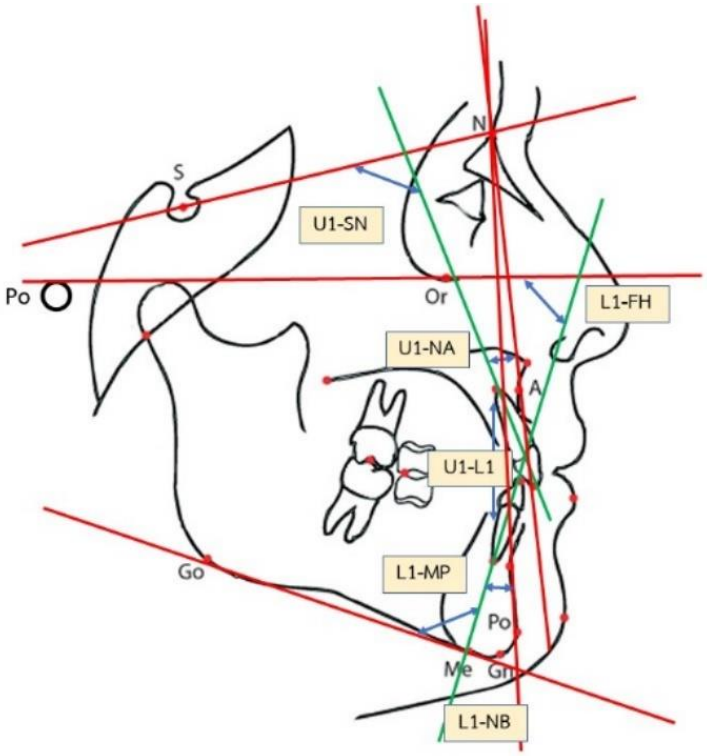

Figure 1 Cephalometric measurements

The chosen post-treatment models were scanned and digitalized with 3shape E2 scanner (3Shape, Copenhagen, Denmark) in the third step. (Figure 2) The surface data was then imported into the virtual model software (3Shape Ortho System, 3Shape A/S, Copenhagen). The largest width of each teeth of digital models were measured from the most occlusal and the most outer point at the mesial and distal aspect of teeth was paralleled to the occlusal plane. (Figure3) Then, the total arch length was calculated from the sum of the width of the first molar from one side to another side. The measurements were performed similarly in all cases. An analysis of the measurement error was undertaken, the same investigator remeasured the digital model twice 2 weeks apart. Moreover, before starting the measuring process, calibration was done with another orthodontist to assess the reliability.

The mean width for each tooth from the 2 measurements as well as Bolton's ratio were calculated for each subject.

Overall “10” ratio =

$$\frac{\text{Sum mandibular teeth 36-46}}{\text{Sum maxillary teeth 16-26}} \times 100$$

Anterior “6” ratio =

$$\frac{\text{Sum mandibular teeth 33-43}}{\text{Sum maxillary teeth 13-23}} \times 100$$

Means, minimum-maximum values, standard deviations, standard errors of the mean, and variances were calculated for the overall “10” ratio and the anterior “6” ratio.

Figure 2 3shape E2 scanner (3Shape, Copenhagen, Denmark)

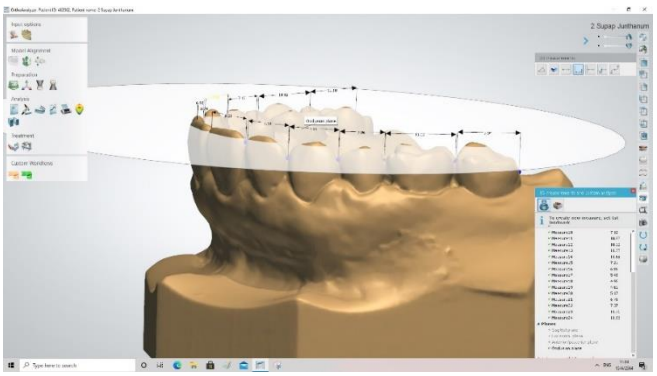

Figure 3 Tooth size measurement parallel to the occlusal plane (3Shape Ortho System, 3Shape A/S, Copenhagen).

Ethical consideration

This study was approved by the Khon Kaen University Ethics Committee for Human Research No. HE632075. Subjects' data such as name, family name, hospital number, address, and telephone number are securely protected. In addition, the case record forms are listed in numbers rather than names.

Statistical analysis

Data was analyzed using SPSS software version 22.

1. Mean, minimum and maximum value, standard deviations, standard errors of the mean and variances were calculated for each variable for each subject.
2. One sample T-test was used to compare the mean value of cephalometric angles of this study with that of Dechkunakorn's study.
3. One sample T-test was used to compare interarch tooth size ratio of this study with Bolton's study and Kayalioglu's study.
4. One sample T-test was used to compare the mean of each tooth size of this study and Dechkunakorn's study.

Results

Ultimately, the study was conducted on 38 subjects (32 females and 6 males). The subjects were categorized based on the ANB angle. (Table1)

Skeletal Class I patients have an ANB angle ranging from 1-5 degrees. If the angle is great than 5 degrees, they are categorized as Skeletal Class II. While ANB angle smaller than 1 degree are categorized as Skeletal Class III. The samples included 33 skeletal Class I, 3 skeletal Class II, and 2 skeletal Class III subjects.

Determination of descriptive statistics for each PAR components are shown below. (Table2) The highest mean is LBO component (1.10±1.31) followed by the RBO component (1.02±1.07).

We compared our mean value of every angles to the study by Dechkhunakorn et al.[15] Our mean of U1-SN angle, L1-FH angle, L1-NB angle and interincisal angle were significantly different from the study by Dechkunakorn et al. (Table 3)

Table 1 Demographics data of the categorical variable (Skeletal relationship)

Skeletal relationship	Frequency (Percent)	ANB	Minimum-maximum
Class I	33(86.8%)	2.92±1.23	1-5
Class II	3 (7.9%)	6.16±0.28	6-6.5
Class III	2 (5.3%)	0±0.70	-0.5-0.5
Total	38 (100%)		

Table 2 Mean, SD, and minimum-maximum values of each PAR components of selected posttreatment samples (n = 38) after the third step.

PAR components	Mean±SD	Minimum-maximum
UAS	0	0
RBO	1.02±1.07	0-4
LBO	1.10±1.31	0-4
OJ	0.47±1.10	0-3
OB	0.59±1.13	0-3
MID	0.02±0.16	0-1
PAR Score	3.22±2.32	0-8

Table 3 Comparison of mean cephalometric angles between Dechkhunakorn's study and this study (One sample T test).

Measurements	Mean±SD	Thai norm range (Dechkhunakorn's study)	t	P-value
U1-SN(°)	104.63±4.94	107.01±6.13	-2.96	0.00*
U1-NA(°)	21.09±3.67	21.58±4.99	-0.81	0.41
L1-MP(°)	96.31±4.62	97.26±5.97	-1.25	0.21
L1-FH(°)	57.85±5.27	59.9±5.86	-2.38	0.02*
L1-NB(°)	28.75±3.56	30.22±5.55	-2.54	0.01*
Interincisal angle	126.71±5.29	124.36±7.56	2.73	0.01*
* P<0.05				

We compared the mean tooth size to the study by Dechkunakorn et al.[10] Our mean of upper central incisor, upper lateral incisor, upper second premolar, upper first molar, lower second premolar and lower first molar were significantly different from the study by Dechkunakorn et al. (Table 4)

The mean overall "10" ratio for the posttreatment models was 90.31±1.86. The values ranged from 86.24 to 94.10, and the median was 90.43. The standard error of the mean was 0.30, and the variance was 3.47. The mean anterior "6" ratio calculated was 77.47±2.66. The values ranged from 71.76 to 84.55, and the median was 77.79. The standard error of the mean was 0.43. The variance was 7.11. (Table 5)

We also compared our mean anterior "6" ratio to ratios reported in Bolton et al., Kayalioglu et al., Dechkunakorn et al. and Manopatanakul et al. Our anterior "6" ratio was not significantly different from any of the studies mentioned, except Dechkunakorn et al. (Table 6)

Our overall "10" ratio was significantly different from the previous studies. (Table7)

Table 4 Comparison of Mean tooth size between Dechkhunakorn's study and this study (One sample T test).

Tooth		Present study (N=38)	Dechkhunakorn's study (N=100)	t	P-value
Maxillary	Central incisor	8.74±0.47	8.57±0.48	2.31	0.02*
	Lateral incisor	7.37±0.52	7.01±0.50	4.28	0.00*
	Canine	7.89±0.40	8.01±0.42	-1.69	0.09
	Second premolar	7.25±0.37	6.88±0.39	6.07	0.00*
	First molar	10.69±0.50	10.27±0.43	5.17	0.00*
Mandible	Central incisor	5.50±0.34	5.46±0.33	0.85	0.39
	Lateral incisor	6.11±0.35	6.08±0.32	0.66	0.51
	Canine	6.97±0.37	6.97±0.40	0.12	0.89
	Second premolar	7.68±0.47	7.16±0.39	6.88	0.00*
	First molar	11.60±0.53	11.36±0.52	2.86	0.00*
* P<0.05					

Table 5 Mean tooth ratio of selected posttreatment models

Variables	n	Mean	Min-max	Median	SD	SEM	V
Overall "10" ratio	38	90.31	86.24-94.10	90.43	1.86	0.30	3.47
Anterior "6" ratio	38	77.47	71.76-84.55	77.79	2.66	0.43	7.11

Table 6 Comparison of Mean and SD values of Anterior ratio between previous studies and this study (One sample T test).

Variables	Studies	N	Mean	SD	t	P-value
Anterior ratio (Mand 3-3) (Max 3-3)	Bolton (1958)	55	77.20	1.65	0.64	0.52
	Kayalioglu (2004)	53	77.68	1.12	-0.46	0.64
	Dechkunakorn (1995)	100	78.53	2.34	-2.43	0.02*
	Manopatanakul (2011)	37	77.09	2.18	0.89	0.37
	Present study	38	77.47	2.66		
* P<0.05						

Table 7 Comparison of Mean and SD values of Overall "10" ratio between previous studies and this study. (One sample T test)

Variables	Studies	N	Mean	SD	t	P-value
Overall "10" ratio (Mand 6-6) (Max 6-6)	Bolton (1958)		88	1	5.85	0.00*
	Kayalioglu (2004) (All first premolar extraction)	53	89.28	1.07	3.40	0.00*
	Present study (All premolar extraction)	38	90.31	1.86		
* P<0.05						

The measurement was done in all samples, and re-examinations were done 2 weeks after the first examination by the same examiner (A.D.). The Intraclass Correlation Coefficients (ICCs) (Table 8). Before starting to measuring tooth size process, we were required to calibrate our measurement with another orthodontist. The summary of Intraclass Correlation Coefficients (ICCs) (Table 9). The score presented excellent ICC values. These results indicated the reliability of the data.

Table 8 Summary of Intra-examiner reliability by using Intraclass Correlation Coefficients

Measurement	Intraclass Correlation Coefficients (95% CI)
PAR index	
Single Measures	0.843 (0.699-0.922)
Average Measures	0.915 (0.823-0.959)
Cephalometric analysis	
U1-SN angle	
Single Measures	0.973 (0.766-0.997)
Average Measures	0.986 (0.868-0.999)
U1-NA angle	
Single Measures	0.942 (0.550-0.994)
Average Measures	0.970 (0.710-0.997)
L1FH angle	
Single Measures	0.969 (0.762-0.997)
Average Measures	0.984 (0.865-0.998)
L1MP angle	
Single Measures	0.911 (0.464-0.990)
Average Measures	0.953 (0.634-0.995)
L1-NB angle	
Single Measures	0.88 (0.17-0.987)
Average Measures	0.936 (0.291-0.993)
U1L1 angle	
Single Measures	0.864 (0.233-0.985)
Average Measures	0.927 (0.378-0.992)
Tooth width	
Single Measures	0.999 (0.998-0.999)
Average Measures	0.999 (0.999-1.00)

Table 9 Summary of Inter-examiner reliability by using Intraclass Correlation Coefficients

Tooth width measurement	Intraclass Correlation Coefficients (95% CI)
Single Measures	0.996 (0.994-0.997)
Average Measures	0.998 (0.997-0.998)

Discussion

In this study, we reported the mathematical interarch tooth size ratio and the size of each tooth in normal occlusion patients whom first four premolars were already extracted. First premolars are frequently extracted in orthodontic treatment. Thus, understanding how pre-treatment planned extraction impact the final outcome is essential to achieve the 'perfect'occlusion. H. Travess et al. found that the first premolar had the highest percentage of extraction, followed by the second premolar, first molar, second molar, canine, lateral incisor and central incisor.[16] Saatci et al. presented a statistical significance of Bolton value between pretreatment and posttreatment after first four premolars extraction. Removing the first four premolars creates the most serious tooth-size discrepancy.[12] Tooth size discrepancy is often observed after four premolar extractions after treatment. Consequently, this can make it difficult to achieve the good occlusion after treatment.

Interestingly, tooth size difference among men and women have been reported. Men have generally larger teeth than women.[17,18] Bishara et al. studied subjects of normal Class I occlusion and found that males were prone to have larger teeth than females.[19] Dechkunakorn et al. studied tooth size and tooth size ratio in 100 dental models. There were 50 Thai males and 50 Thai females. They found that males teeth were significantly larger than females teeth in upper first molars, upper canines, upper lateral incisors, upper central incisors, lower canines, lower first premolar and lower first molars. Nevertheless, they stated that there were no differences in anterior teeth ratio, posterior teeth ratio and the overall ratio between gender.[10] Multiple studies have also compared the anterior Bolton ratio between sexes. Lavelle compared interarch tooth size discrepancy of 120 casts with excellent occlusions between males and females which showed that the total and anterior ratios were both slightly higher in males than in females.[2] On the contrary, Jóias and Scanavini investigated 35 subjects with natural normal occlusion. They stated that there are no differences in Bolton's anterior ratio within sexes.[20] Besides, many studies

have found that the differences between tooth size discrepancies and sexes are not strongly significant. These imply the variation in the result of the studies in tooth size discrepancy and sexes.[21-23] Most of our subjects were female. Thus, we could not compare tooth size discrepancy appeared between men and women.

ANB angle was used to distinguish skeletal discrepancy. The sample included 33 skeletal Class I, 3 skeletal Class II, and 2 skeletal Class III subjects. Johe et al. studied 306 subjects with different sexes, ethnicities, and skeletal malocclusion categories. They found no significant difference in anterior ratio or overall ratio in each groups.[24] Also, Asad et al. found that the anterior Bolton ratio in Skeletal Class I, II & III patients was statistically insignificant different. Their sample comprised of 60 patients of different malocclusion groups.[25] Nevertheless, a study by Batool et al. and Araujo, & Souki showed an inconsistent result that the mean anterior tooth ratios were significantly higher for skeletal Class II patients.[21,26] According to Table 1, samples in Class II and Class III showed an ANB angle that deviated no more than 2 standard deviation of the Class I samples (3±2). Thus, the ANB angles presented less severe skeletal relationship resulting in samples that showed normal incisal inclination angle.

PAR index was used to evaluate the severity of dental malocclusion and the success of orthodontic treatment. PAR index gives good reliability and validity to assess both severity of malocclusion as well as estimated treatment difficulty.[27] However, Heusdens et al. found that PAR index could not present the severity of tooth size discrepancy.[28] PAR index does not include the incisal inclination. Therefore, in this study, cephalometric analysis measurements were used to evaluate the incisal inclination. Dechkunakorn et al. reported Thai norm value of cephalometric analysis. They studied in 26 Thai males and 29 Thai females. Inclusion criterias were Angle Class I occlusion, normal overjet and overbite, good alignment of tooth, crowding or spacing less than 1 mm and good facial profile.[15] Norm of the incisal inclination angles in Thai people from Dechkunakorn's study was used to select the appropriate samples. We found that our findings for U1-SN angle, L1-FH angle, L1-NB angle and interincisal angle are statistically different from findings of Dechkunakorn et al. This may be due to the skeletal relationship of our samples. While we included all skeletal relation in our study, Dechkunakorn et al. included Angle Class I occlusion. Consequently, both PAR index and cephalometric measurement were taken into account to select a perfect occlusion in this study, the same way as the Kayalioglu's study. Also, this study calculated the tooth size ratio from actual cases with premolar extraction, not hypothetical tooth extractions, therefore our data is reliable.

In our study, the chosen post-treatment models are scanned with 3shape E2 scanner (3Shape, Copenhagen, Denmark). We digitalized our models with the virtual model software (3Shape Ortho System, 3Shape A/S, Copenhagen). This allowed us to measure the mesiodistal tooth width parallel to the occlusal plane. Thus, this method was accurate and reproducible. An intraoral scanner has been rapidly developed in orthodontics. It has many advantages. The scanner does not require the fabrication of plaster models and reduces error as there are fewer steps compared to the conventional impression techniques. Lee and Park's study compared in vivo full arch scan from intraoral scanner and digital model from a laboratory desktop scanner. They showed that intraoral scans created local deviations in the lower arch posterior regions. They reported 0.10 mm of overall deviation between both methods.[29] Nonetheless, conventional alginate impression may be less precise compared to the intraoral scanners because alginate have internal tearing during the removal of the trays.[30] Recently, digital orthodontic system accommodating in diagnosis is growing rapidly. Thus, in the future, it could be used more widely than the conventional techniques. It would be beneficial for future studies to use the intraoral scanner to further investigate topics that are related to this study.

According to Table 4, our mean tooth size of upper central incisor, upper lateral incisor, upper second premolar, upper first molar, lower second premolar and lower first molar was significantly different from Dechkunakorn's study. This may be due to the fact that our study reported the

tooth size of posttreatment model with normal occlusion while patients with full dentition were observed in Dechkunakorn et al. Many studies reported tooth size discrepancy after orthodontic treatment with first four premolars extraction. Therefore, our subjects teeth might be modified to achieve normal occlusion which result in changes of the tooth size. Thus, our study differs from Dechkunakorn et al. which can be explained by inclusion criteria.

Some studies have shown a reduction of Bolton's overall ratio in cases with premolar extraction.[31,32] In 1962, Bolton presented that the overall ratio should not be used to estimate the occlusion after four premolars extraction. In 2005, Kayalioglu and a team studied posttreatment dental models of 53 Turkish patients, with four extracted first premolars. They used the PAR index and cephalometric measurement to select a perfect occlusion. Accurate to 0.01mm, a digital caliper was used to measure tooth size. They found that the overall ratio without the first four premolar was 89.28±1.07%. They suggested this overall ratio to be the norm for four first premolar extractions.[33] In our study, the mean overall "10" ratio and the mean anterior "6" ratio were 90.31±1.86% and 77.47±2.66% and respectively. Our anterior "6" ratio was not significantly different from the previous studies except from study by Dechkunakorn et al. (Table 6). Dechkunakorn et al. investigated tooth size and interarch tooth size ratio in Thai people that had normal occlusion. They used an electronic digital caliper to measure tooth width in the dental model. The differences in results between our study and Dechkunakorn et al.'s study could be explained by different measuring method and inclusion criteria. Therefore, the result was different despite studying in Thai samples. Moreover, our overall "10" ratio was significantly different from Bolton's study and Kayalioglu's study which could be explained by ethnicities and measuring methods.

Our samples were dominantly females and skeletal Class I. Therefore, we could not compare the data on the basis of sexes and skeletal relationships. Future studies should also evaluate the relationship in larger samples.

Conclusion

Our study suggests that an overall ratio of 90.31 % is practical in diagnosis and treatment planning for the patients with four first premolars extraction.

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ค่าอัตราส่วนขนาดซี่ฟันในผู้ป่วยที่ได้รับการจัดฟันร่วมกับการถอนฟันกรามน้อยซี่ที่หนึ่งสี่ซี่

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บทคัดย่อ

การสบฟัน ระยะสบเหลื่อมแนวราบ ระยะสบเหลื่อมแนวดิ่งที่เหมาะสมระหว่างฟันบนและฟันล่างในผู้ป่วยที่ได้รับรักษาด้วยการจัดฟันร่วมกับการถอนฟันกรามน้อยซี่ที่หนึ่งสี่ซี่นั้น ขึ้นอยู่กับการมีอัตราส่วนร้อยละของขนาดซี่ฟันล่างต่อฟันบนที่เหมาะสม โดยจุดประสงค์ของการศึกษานี้คือ การรายงานค่าอัตราส่วนร้อยละของขนาดซี่ฟันล่างต่อฟันบน และขนาดซี่ฟันแต่ละซี่ในผู้ป่วยที่มีการสบฟันปกติภายหลังการรักษาทางทันตกรรมจัดฟันร่วมการถอนฟันกรามน้อยซี่ที่หนึ่งสี่ซี่ เราคัดเลือกแบบจำลองฟันอย่างเข้มงวดในผู้ป่วยที่ได้รับการรักษาทางทันตกรรมจัดฟันร่วมกับการถอนฟันกรามน้อยซี่ที่หนึ่งสี่ซี่และมีการสบฟันปกติ ดัชนีชี้วัดพาร์ (PAR index) ถูกนำมาใช้เพื่อคัดเลือกแบบจำลองฟันที่มีการสบฟันปกติ หลังจากนั้นนำตัวอย่างที่ผ่านการคัดเลือกจากดัชนีชี้วัดพาร์ทำการประเมินการเอียงตัวของฟันหน้าโดยใช้ภาพรังสีกะโหลกศีรษะด้านข้าง เราคัดเลือกแบบจำลองฟันที่มีการเอียงตัวของมุมฟันหน้าปกติ ได้ตัวอย่างทั้งหมด 38 ตัวอย่าง ตัวอย่างทั้งหมดได้รับการสแกนและวัดขนาดซี่ฟัน โดยใช้โปรแกรมแบบจำลองฟันเสมือนทรีเชพ ออโธ ซิสเต็ม (3Shape Ortho System, 3Shape A/S, Copenhagen) เราหาค่าเฉลี่ยของขนาดซี่ฟันแต่ละซี่และ ค่าเฉลี่ยอัตราส่วนร้อยละของขนาดซี่ฟันล่างต่อฟันบน เราพบว่า ค่าเฉลี่ยอัตราส่วนร้อยละของขนาดซี่ฟันล่างต่อฟันบน 10 ซี่ และค่าเฉลี่ยอัตราส่วนร้อยละของขนาดซี่ฟันหน้าล่างต่อฟันหน้าบน 6 ซี่ เท่ากับ 90.31±1.86% และ77.47±2.66% ตามลำดับ นอกจากนั้นยังพบว่าค่าเฉลี่ยขนาดซี่ฟันตัดซี่กลางบน ฟันตัดซี่ข้างบน ฟันกรามน้อยซี่ที่สองบน ฟันกรามซี่ที่หนึ่งบน ฟันกรามน้อยซี่ที่สองล่าง และฟันกรามซี่ที่หนึ่งล่าง มีความแตกต่างอย่างมีนัยสำคัญเมื่อเปรียบเทียบกับการศึกษาที่มีลักษณะคล้ายกัน อีกทั้งเรายังพบความแตกต่างอย่างมีนัยสำคัญของค่าเฉลี่ยอัตราส่วนร้อยละของขนาดซี่ฟันล่างต่อฟันบน 10 ซี่ ระหว่างการศึกษาของโบลตัน และการศึกษาของคายาลิโอกลู และการศึกษานี้ โดยสรุปการศึกษานี้แนะนำค่าเฉลี่ยอัตราส่วนร้อยละของขนาดซี่ฟันล่างต่อฟันบน 10 ซี่ เท่ากับ 90.31±1.86% เพื่อใช้ในการวินิจฉัยและวางแผนการรักษาในผู้ป่วยที่วางแผนจะจัดฟันร่วมกับการถอนฟันกรามน้อยซี่ที่หนึ่งสี่ซี่

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