CHAPTER V
DISCUSSION

5.1 Differences of PAR Index score means between orthodontic treatment alone group and orthodontic treatment combined with orthognathic surgery group

5.1.1 Pre-treatment PAR Index score

This study showed that the PAR Index score in OTA group was less than in COS group at pre-treatment phase (Table 5), which was to be expected. The PAR Index score reflected the severity of malocclusion in each group. One factor that would have contributed to this finding was the severity of skeletal relationship discrepancy. The skeletal discrepancy in COS group was more than in OTA group for both cleft lip and palate patients and non-cleft patients.[17] In cleft lip and palate patients, the skeletal problems could occur in all dimensions (sagittal, transverse and vertical planes).[3] The most common skeletal discrepancy in cleft lip and palate patients was a maxillary hypoplasia that presented a skeletal Class III relationship.[1] The skeletal problems could affect the dental malocclusion such as anterior overjet in sagittal plane, buccal overjet in transversal plane, open bite or deep bite in vertical plane, and severe crowding or embedded tooth in severe maxillary hypoplasia. The greater the severity of skeletal discrepancy in COS group was, the more severe would be the dental malocclusion.

5.1.2 Post-treatment PAR Index score

This study showed that the PAR Index scores in OTA group and COS group were not different post-treatment (Table 5). The PAR Index score reflected the final treatment outcomes of cleft lip and palate patients in both groups. The orthodontic treatment outcomes between OTA group and COS group were likely to be different because the objective of treatment was different in each procedure. For OTA, the objective of treatment tried to camouflage the skeletal relationship problems by orthodontic tooth movement without changing the skeletal problem. Mild skeletal Class III with anterior crossbite in cleft lip and palate patients could be treated by

proclination of upper anterior teeth and retroclination of lower anterior teeth to create positive overjet while skeletal problem was still remain. The facial profile of patients was not improved by orthodontic treatment alone. By contrast, the objective of COS was to try to correct skeletal problems by skeletal movement because the severity of skeletal problem was too great to correct by tooth movement alone. The anterior teeth for severe skeletal Class III cleft lip and palate patients were corrected to normal inclinations, while the skeletal discrepancy was corrected by surgical jaw movement. The combined effect of these two sets of procedures was expected to be significant improvement of the patient's profile.

The PAR Index evaluated 11 components of malocclusion except the inclination of anterior teeth. Furthermore, it evaluated only the dental occlusion relationship and not skeletal relationship or facial profile. For that reason, the treatment outcome evaluated by the PAR Index was not different comparing the OTA group with the COS group.

5.1.3 Improvement of PAR Index score

Improvement of PAR Index score or PAR Index score reduction assessed the quality or standard of orthodontic treatment of malocclusion. Richmond and Andrews suggested that the mean PAR Index score reduction should be greater than 70 percent in high-standard orthodontic treatment[54] and that specialist orthodontic treatment should reduce the malocclusion, on average, 78 percent using before- and after-treatment PAR scores.[55] From this study, improvement of PAR Index scores (Table 5) were greater than 90 percent in both OTA group (91.72 %) and COS group (93.90 %). The results indicated that the cleft lip and palate patients at the Khon Kaen University Cleft Lip and Palate Center received high-standard orthodontic treatment thus bettering the minimal outcome quality of treatment that Richmond et al. suggested.[54,55] In addition, the results of this study reflected that the cleft treatment protocol for correction of malocclusion problems developed by Khon Kaen University Cleft Lip and Palate Center was of a high-standard quality. Actually, the improvement of PAR Index score in the COS group should be greater than in the OTA group because the COS group presented more severe malocclusions, such as the quantity of reverse overjet, and severe crowding in maxillary hypoplasia. However, the statistical analysis showed that the improvement of PAR Index score was not different for the

two groups. A reason for the equality of improvement for both groups was that the PAR Index evaluated only the alignment and occlusion of patient and not the effects of any dental camouflage that might have been employed among OTA subjects. Such camouflage would adversely affect inclination of the teeth in the OTA group whereas tooth inclinations as well as alignments were improved by pre-surgical orthodontics for the COS group. Therefore, the improvement of facial esthetics and facial profile might be better in the COS group. The PAR Index did not evaluate facial esthetic improvement but only looked at malocclusion reduction. For that reasons, the improvement of malocclusion between OTA group and COS group was not significantly different.

5.2 PAR Index score improvement categories

The PAR Index score improvement was categorized following Richmond et al. in 1992.[53] It represented the degree of improvement and reflected the quality of orthodontic treatment outcome. From Table 6, in OTA group, it found that 2 samples performed 100% or total improvement that means of 2 cleft lip and palate patients were received excellent orthodontic treatment. Others cleft lip and palate patients in the OTA group were classified in the greatly improved category, so the treatment plan and technique to treat cleft lip and palate patients in this group were of high quality. In addition, all of subjects in the COS group were categorized as greatly improved, the same as for the OTA group. Thus, there was good orthodontic and surgical treatment planning for cleft lip and palate patients who had severe skeletal malrelationship and malocclusion. No samples in either group were found in the lower quality categories of "improved", "worse-no difference" category. From these results, the degree of improvement represented high standard and quality of dento-skeletal treatment outcomes at the Khon Kaen University Cleft Lip and Palate Center.

5.3 Comparing present study with previous report

So far, only one study had been found that assessed orthodontic outcomes for unilateral cleft lip and palate patients who received OTA was by Deacon et al. in the UK[61], but only for an orthodontic treatment alone group. This present study was the first to report comparison of OTA and COS for cleft lip and palate patients.

The pre-and post-treatment PAR scores for the Deacon et al. study were both higher than those for the present study (Table 7). However, the percentages for improvement of PAR were reversed, those of the former study being worse than for the present study. No great significance could be attached to this difference because of the small number of subjects (six) in Deacon et al.'s study compared with 27 subjects in the present Khon Kaen University Cleft Lip and Palate Center study's OTA group. There was the added possible confounding variable of ethnic differences for the two studies that made comparison unuseful.

Table 7 Report included in comparison study in pre-treatment, post-treatment and improvement PAR Index score

PAR Index score	Orthodontic treatment alone	Combined orthognathic surgery	Population
Pre-treatment			
Deacon et al.[61] (2007)	41.0	-	UK
Present study	32.26	39.86	Thailand
Post-treatment			
Deacon et al.[61] (2007)	12.0	-	UK
Present study	2.67	2.43	Thailand
Improvement			
Deacon et al.[61] (2007)	69.0 (%)	-	UK
Present study	91.72 (%)	93.90 (%)	Thailand

5.4 The advantages and disadvantages of PAR Index score

The PAR Index could assess the severity of malocclusion in cleft lip and palate patients as well as in non-cleft patient. The pre- and post-treatment PAR Index scores were measured easily from dental models. The orthodontic treatment outcomes could be evaluated by the post-treatment PAR Index score while the success of orthodontic treatment could be interpreted by PAR score improvement. For the Khon Kaen University Cleft Lip and Palate Center, the PAR Index was useful for orthodontic treatment outcome evaluation of its cleft lip and palate patients and had never been done before. The outcomes could reflect the effectiveness of Khon Kaen

University Cleft Lip and Palate Center treatment protocol, including the timing of each procedure, treatment plan, and orthodontic technique and surgical technique for the cleft lip and palate patients who had severe skeletal discrepancy. If the improvement PAR score indicated negligible or poor treatment outcomes, then search must be made for improvements to the protocol for better treatment outcome achievement.

Apart from the report of Richmond et al.[53], the PAR index presented excellent reliability and validity. From the result of reliability testing of PAR in this study, the excellent agreement both intra- and inter-reliability was performed. It indicated that PAR index was easy to use to evaluate treatment outcome in cleft lip and palate patients as well as in non-cleft patient.

Although the PAR Index had many advantages for assessing treatment outcomes or treatment need evaluation, it had limitations. It assessed only the dento-occlusal change from dental models. For treatment outcomes evaluation, it was necessary to evaluate not only occlusion but also soft tissue change, cephalometric measurement and functional factors.[24] Because the PAR Index measured from dental models, it did not identify aspects of dental disease that might influence the development of malocclusion, and root resorption and function of temporomandibular joint dysfunction that might result from orthodontic treatment.[62,63]

5.5 Limitations of the study

The PAR Index could evaluate only patient's occlusal outcome while the soft tissue treatment outcome was neglected. For treatment outcome evaluation, it was necessary to evaluate both occlusion and soft tissue change that affected the facial attractiveness in cleft lip and palate patients on social perception. Moreover, the treatment outcome satisfaction of patient was important factor to evaluate the successful of treatment. In future study, it should include the facial esthetic evaluation together with occlusal evaluation to assess the overall treatment outcomes in cleft lip and palate patients.

Furthermore, the PAR Index had limitations in occlusion evaluation. It could not interpret the angulation and inclination of the anterior teeth that affected to the facial esthetic. For camouflage treatment (OTA group), the objective of treatment was

compensation of malocclusion to camouflage the skeletal malrelationship, so the facial esthetic outcomes might be less satisfactory than in orthodontic treatment combined with orthognathic surgery group that had dental decompensation along with jaw surgery.

Sample size in this study was found to be insufficient for comprehensive statistical analysis. From sample size calculation, 35 subjects were needed in each group for statistic comparison. The present study located 27 subjects in the orthodontic treatment alone group and 7 subjects in the orthodontic treatment combined with orthognathic surgery group. The number of subjects was limited because data recording (pre- and post-treatment dental models) during treatment was incomplete. Larger sample size of each group would provide more precise statistical results.