CHAPTER III

MATERIALS AND METHODS

3.1 Materials

3.1.1 Samples

Twenty three patients with a complete unilateral cleft lip and palate were included in the study (Table 4). Twelve patients underwent one-stage surgical treatment as Group 1 (7 male and 5 female patients). Eleven patients underwent two-stage surgical treatment as Group 2 (6 male and 5 female patients). In one-stage group, the mean age of lip and palatal closure was 14.92 ± 4.81 months. In two-stage group, the mean age of lip closure was 4.45 ± 2.46 months, and the mean age of palatal closure was 13.73 ± 3.00 months (Table 5). Impressions were made of all subjects between 6 and 10 years of age.

Table 4 Numbers of subjects in one-stage and two-stage groups, and mean ages at time of impression-taking

	Number of subjects	Mean age (years)
Group 1: One-stage	12 (7 males, 5 females)	8.92 ± 1.44
Group 1: Two-stage	11 (6 males, 5 females)	9.18 ± 1.47

Individuals who fulfilled the selection criteria were indentified.

The inclusion criteria for subjects were as follows:

- Non-syndromic cleft
- Northern Thai people
- Complete unilateral cleft lip and palate
- Mixed dentition stage (age 6 to 10 years) and no orthodontic treatment undertaken.

The exclusion criteria for subjects were as follows:

- Poor quality models
- Bilateral cleft lip and palate, incomplete unilateral cleft lip and palate
- Subjects who had previous orthodontic treatment
- Subjects with a known syndrome

The treatment timing of both groups is shown in Table 5. In one-stage group the lip, hard and soft palate, and floor of nose were completely closed in a single procedure at age 15 months on average. In two-stage group the lip was initially closed at 5 months, and the hard and soft palate were closed at 16 months.

Table 5 Timing of lip and palate closure (age in months, means ± standard deviations)

	Lip closure	Palate closure
Group 1: One-stage	14.92 ± 4.81	
Group 1: Two-stage	4.45 ± 2.46	13.73 ± 3.00

The surgical protocols were operated by two skilled plastic surgeons using the same concepts and techniques. In one-stage group, the palate was closed with a Veau-Wardill-Kilner palatoplasty or V-Y pushback technique; however, the procedure was not identified for one patient. In two-stage group, Veau-Wardill-Kilner palatoplasty was performed in most of 8 patients but the procedure was not recorded for 3 patients (Table 6).

Table 6 Surgical techniques for palate closure

Surgical technique	Group 1 (One-stage closure)	Group 2 (Two-stage closure)
Veau-Wardill-Kilner palatoplasty or V-Y pushback	11	8
Not recorded	1	3

The surgical techniques for lip closure were not much different from each other (Table 7). The Onizuka cheiloplasty technique was performed in most patients in both groups.

Table 7 Surgical techniques for lip closure

	Group 1 (One-stage closure)	Group 2 (Two-stage closure)
Onizuka	11	6
Tennison	-	1
Not recorded	1	4

Surgical technique of lip closure

The triangular flap (Tennison) repair, uses a triangular flap from the lateral lip, inserted into a notch in the medial side of the cleft, just above the vermilion border, crossing the philtral column as it meets Cupid's peak. This 'triangle' adds length to the shorter cleft side of the lip. While this techniques provides excellent lip length, it comes at the expense of a less natural appearing scar across the columnella (Figure 5).

Surgical technique of palate closure

Veau-Wardill-Kilner repair, or V-Y pushback (Figure 6) was used in this study. The flap design involves relaxing incisions along the lateral edge of the hard palate, starting anteriorly near the palatomaxillary suture line, running posteriorly just medial to the alveolar ridge, and ending lateral to the hamulus, approximately 1 cm posterior to the greater tuberosity of the alveolus. The superior pedicle is divided, leaving a flap on either side of the cleft based solely on the greater palatine pedicle posteriorly. The mucoperiosteal flaps can then be approximated either directly or in a V-Y closure at the free anterior end to actively lengthen the soft palate.

A B

Figure 5 Triangular flap (Tennison) unilateral cleft lip surgery, A is cutting design for the unilateral cleft lip surgery and B is final flap positioning after cutting for the unilateral cleft lip surgery.

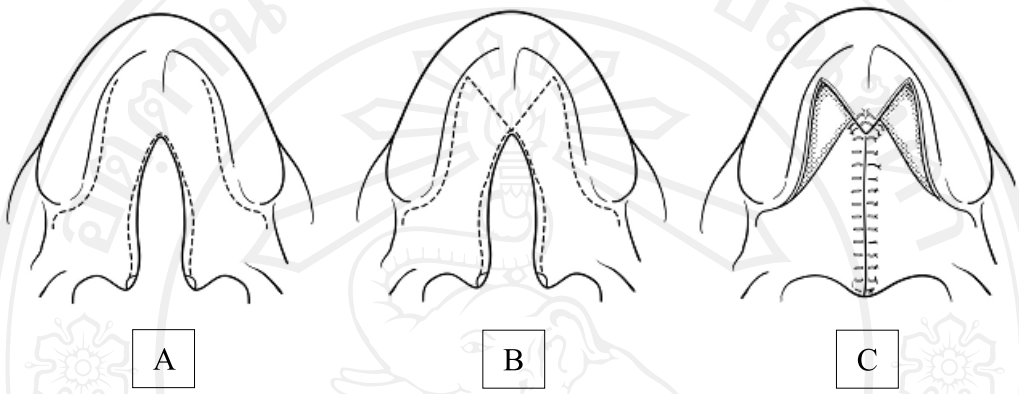

Figure 6 Flap design (A) of Veau-Wardill-Kilner repair used lateral releasing incisions to allow medial movement of the palatalmucosa; the technique preserved the greater palatine vessels and the anterior incisive pedicle (B). TheVeau-Wardill-Kilner palate repair, referred to as the pushback technique, is similar in initial markings to the von Langenbeck technique (C). However, the technique then divides the oral mucosa anteriorly, basing the mucoperiosteal flaps on the greater palatine pedicle

3.2 Methods

3.2.1 Dental model analysis

3.2.1.1 Anterior and posterior arch widths

The transverse development of the upper jaw was analyzed, regarding anterior and posterior arch widths, using the following definitions (Figure 7).

- The anterior arch width is the distance between the middle points of the transverse fissure of the first premolar teeth on each side, or the most posterior points of the deciduous first molar teeth in millimeters.
- The posterior arch width is the distance between the points of intersection of the transverse fissure with the buccal fissure of the permanent first molar teeth on each side in millimeters.
- The midpalatal raphe (MPR) is the line defined between selected anterior and posterior anatomical landmarks. The anterior point is the intersection of the second palatine ruga with the palatine raphe. The posterior point is the midpoint between the fovea palatini.

The reference points and lines were marked on the subjects' dental casts.

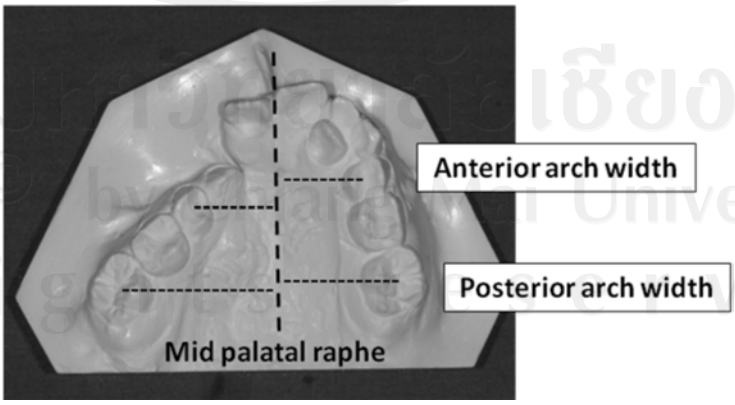

Figure 7 Analysis of the anterior and posterior arch widths[49]

3.2.1.2 Anterior overjet[50]

To analyze the sagittal relationship of the maxilla and the mandible, anterior overjet was determined by the distance from the most proclined central incisors and the labial surface of the lower central incisors in millimeters (Figure 8).

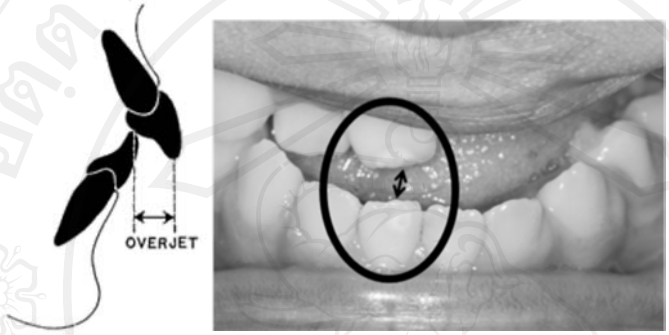

Figure 8 Overjet measurement

3.2.1.3 Anterior overbite[50]

Anterior overbite, representing the vertical relationship between upper and lower jaws, was determined by the amount of vertical overlap of the upper and lower central incisors in millimeters (Figure 9).

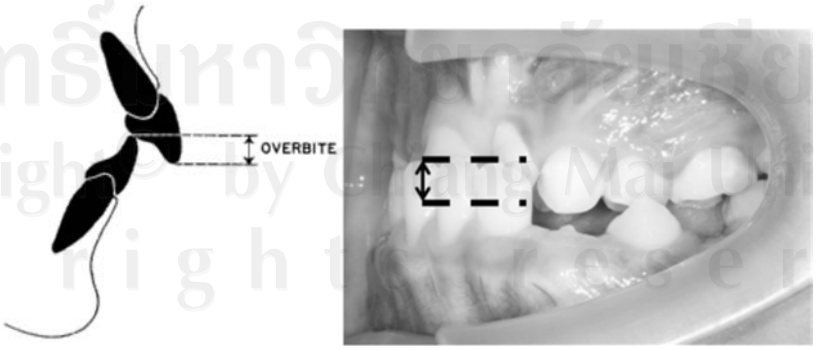

Figure 9 Overbite measurement

The registration of anterior and posterior arch widths, anterior overjet and anterior overbite were made to the nearest 0.01 mm using a digital caliper (Coral®, Japan) (Figure 10).

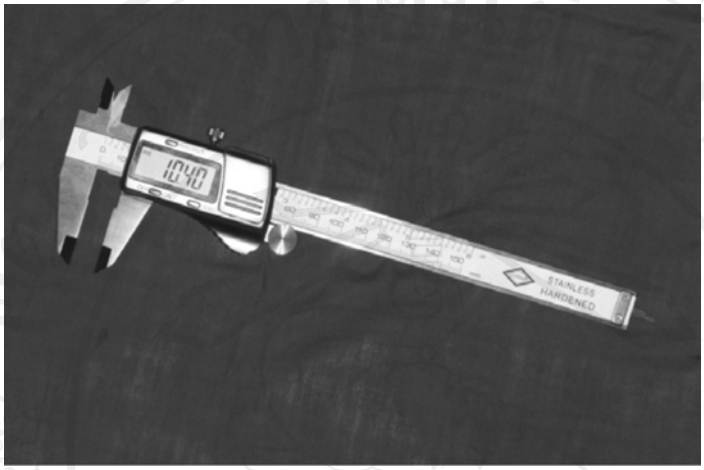

Figure 10 Digital caliper

3.2.1.4 Anterior and posterior crossbites

To describe anterior and posterior crossbites, the principles used by Hellquist *et al.*[51] and a modification of the scoring system developed by Huddart and Bodenham[52] were used.

- The maxillary tooth was given a score depending on its relationship to its opponent in the mandibular arch (Figure 11).

Score evaluation, no crossbite = 0; edge to edge = -1; crossbite = -2.

- All maxillary teeth except the lateral incisors and the second and third molars were included in the analysis.

- The sum of the total scores was calculated (total score = 20).

- The scores for the different segments of the maxillary arch, i.e., anterior segment (central incisor = 2 teeth) and posterior segments (canine to first molars = 8 teeth), were calculated. If a tooth was missing it was given a score corresponding to the mean value of the neighboring teeth within the segment. The sums of the segment scores were rounded up to the nearest negative integer.

- Posterior crossbite was considered when the patients had a score less than or equal to -4 and anterior crossbite when the score was less than or equal to -3.

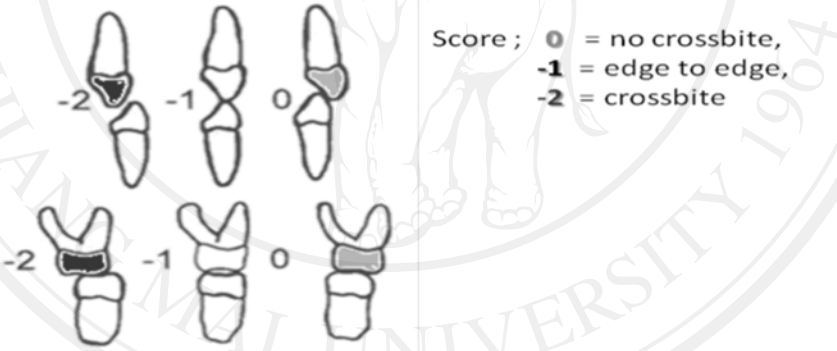

Figure 11 Method for the evaluation of the occurrence of crossbite according to Huddart and Bodenham. Scores were calculated for different segments of the maxillary dental arch as well as for the whole arch. The lateral incisors were excluded because of they were missing on the cleft side.

3.2.2 Statistical methods

1. Descriptive statistics, including means and standard deviations, were calculated for the measurements

2. Intergroup mean differences for each measurement were assessed, using the independent *t*-test to assess the differences in anterior and posterior arch widths, anterior overjet, anterior overbite, and anterior and posterior crossbites between one-stage and two-stage treatments. *P*-values of less than 0.05 were accepted as significant.

3. The chi-square test was used to assess intergroup mean differences between one-stage and two-stage treatments in anterior and posterior crossbites.

3.2.3 Errors of assessment

3.2.3.1 Errors of measurement

The dental casts were re-measured by the same examiner on different days, one week apart. The repeated measurements were test with *t*-test to assess the error of the measurement.

3.2.3.2 Errors of method

The linear variables of the measurement were calculated according to the formula, $\boldsymbol{S}_e = \sqrt{\sum d^2/2n}$ (Dahlberg, 1940): with D representing the different between corresponding first and second measurements on 23(N) models made one week apart.