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Maxillary Arch Width Dimension and Cleft Width in Unilateral Cleft Patients - A Retrospective Study

Soumya S. V.[1*], Kingsly Paul M.[2] and Mahasampath Gowri S.[1]

[1]Department of Dental Orthodontics and Dentofacial Orthopeadics, Christian Medical College & Hospital (CMC), Vellore – 632001, Tamil Nadu, India; dr.soumya.mds@gmail.com
[2]Department of Plastic surgery, Christian Medical College & Hospital (CMC), Vellore – 632001, Tamil Nadu, India; kingslypaul@gmail.com

Abstract

Objectives: 1. To formulate a normative data/Research data of maxillary arch dimension and cleft width in UCLP patients. 2. To formulate a Posterior cleft width prediction equation using anterior cleft width, which will help in organising the future treatment plan in the required sequence. **Materials and Methods:** A Sample of 20 unilateral CLP patients were selected from a patient pool who had reported to CMCH, for treatment. This study was approved by ethical committee at CMCH, Vellore. Inclusion criteria: 1. Models of patients with unilateral CLP were selected. 2. Models were taken before any Presurgical manipulation of hard or soft tissues was done. 3. Age of the patient was 3 to 4 months without any treatment began. **Methods:** The landmarks anterior, mid, posterior arch width was marked on the Study Model measurements were made using the digital Vernier caliper Figure and documented on excel worksheets. Data were summarized using mean and standard deviation. We used a linear regression model to identify the prediction equation of posterior having posterior as an outcome and anterior as predictor. The scatterplot with the linear fit was used to visualize the prediction. All the data were analyzed using STATA IC/16.0. **Results:** 1. Normative data was tabulated. 2. Prediction equation of posterior from anterior width Posterior= 39.25-0.21*(anterior). The equation explains that when anterior increase posterior decrease and this can quantify as for one-unit increase in anterior there will be 0.21 decrease in posterior width, but this change is not statistically significant (p=0.447). **Conclusion:** 1. A normative data of maxillary arch dimension and cleft width in UCLP patients was developed and tabulated which will be also be useful as Research data. 2. The Posterior cleft width prediction equation using anterior cleft width, will help in formulating the future treatment plan in required sequence and ease the method of impression making in unilateral Cleft lip and palate patients.

Keywords: Normative Data, Retrospective Study, Unilateral Cleft Lip and Palate

1. Introduction

Cleft lip and/or palate are the most common congenital craniofacial birth defects. Orofacial clefts arise in about one in 700 live births, the size of the cleft in infancy is determined by the tissue deficiency and also by the degree of separation of the maxillary segments. The severity of the deformity at birth varies remarkably, cleft severity and maxillary morphology can also influence facial growth. Large clefts and small maxillae are generally associated with worse maxillary growth (Suzuki et al., 1993; Liao et al., 2010; Chiu et al., 2011) the width of the cleft in infancy influence the difficulty of surgical repair and indirectly the treatment outcome. Parwas et al., 2009 studied cleft width with dental models in UCLP and CP patients before palatoplasty and evaluated the fistula formation. The width of the cleft affected the occurrence of postoperative palatal fistula formation. A width of 15mm or more had a significant risk of fistula formation. The strongest association was found for the ratio of the cleft width to the sum of the palatal shelf width, if the ratio was 0.48 or more, the risk of fistula formation was statistically significant. Despite substantial work in this field many questions are still unanswered because methodology, cleft types and outcome measures vary greatly in these studies. This study is an attempt to formulate a normative data/ Research data of maxillary arch dimension and cleft width in UCLP patients and to find the ratio between cleft width

*Author for correspondence

and maxillary arch dimensions in UCLP patients before NAM or Palatoplasty procedures, which would serve as an important documentation data for future use.

2. Materials and Methods

A Sample of 20 unilateral CLP patients were selected from a patient pool who had reported to CMCH, for treatment. This study was approved by ethical committee at CMCH, Vellore.

Inclusion criteria:

1. Models of patients with unilateral CLP were selected.
2. Models were taken before any Presurgical manipulation of hard or soft tissues was done.
3. Age of the patient was 3 to 4 months without any treatment began.

3. Methods

The landmarks anterior, mid, posterior arch width were marked on the Study Model (Figure 1), measurements were made using the digital Vernier caliper (Figure 2) and documented on excel worksheets.

The measurements as described[1] were as follows:

- Anterior cleft width: is the alveolar cleft along the crest of the ridge (Figure 3).
- Middle cleft width: is the intersection of the inter canine point line (Figure 4).



Figure 1. The landmarks Anterior, Middle, Posterior arch width marked on Study Model.

- Posterior cleft width: is at the intersection of the inter tuberosity line (Figure 5).

4. Statistical Analysis

Data were summarized (Table 1) using mean and standard deviation. We used a linear regression model to identify the prediction equation of posterior having posterior as an outcome and anterior as predictor. The scatterplot with the linear fit was used to visualize the prediction. All the data were analyzed using STATA IC/16.0.

Using the mean and SD you can present the normative data which is highlighted.

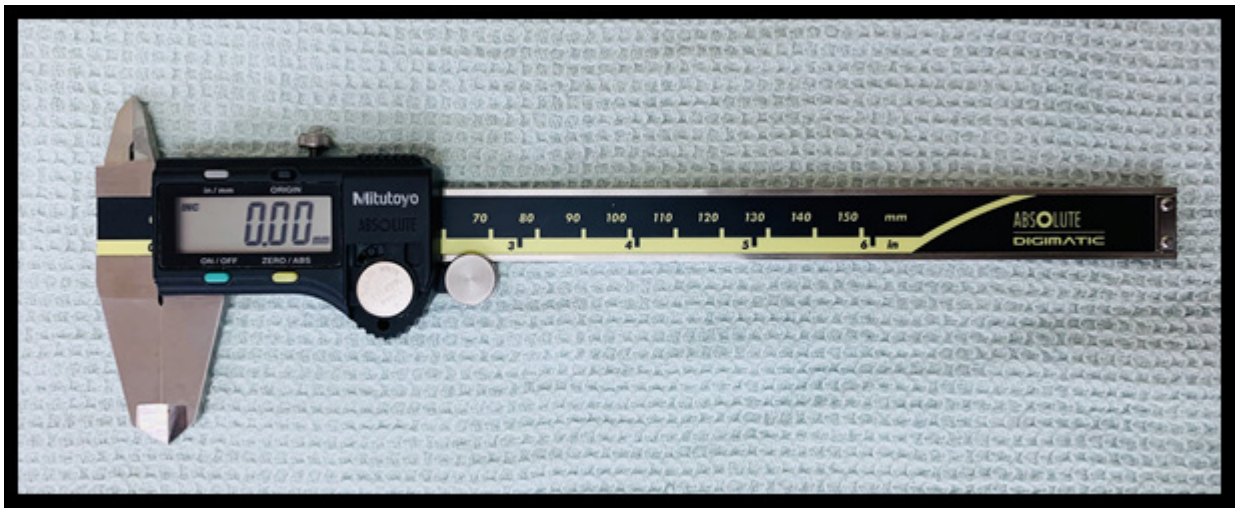


Figure 2. Digital Vernier Calliper.

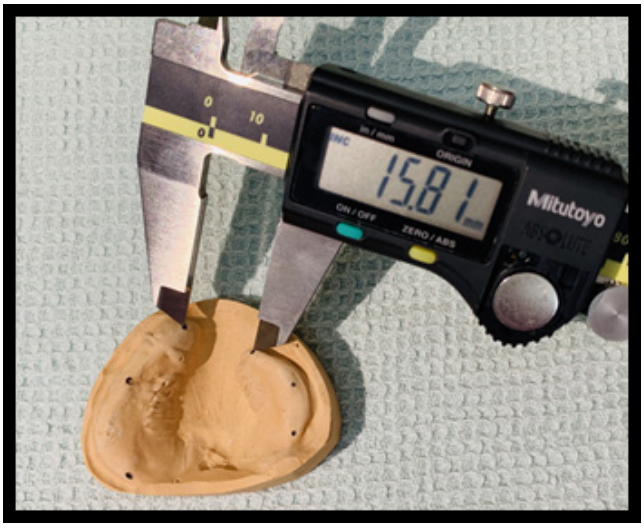


Figure 3. Anterior Cleft Width.



Figure 4. Mid Cleft width.

The following output predicts the posterior using anterior.
regress Posterior Anterior

Source | SS df MS
Number of obs = 16
------------+--
F(1, 14) = 0.61
Model | 2.51536915 1 2.51536915 Prob > F = 0.4468
Residual | 57.4690058 14 4.10492899
R-squared = 0.0419
------------+--
Adj R-squared = -0.0265
Total | 59.984375 153.99895833
Root MSE = 2.0261

Posterior | Coef. Std. Err. t
P>|t| [95% Conf. Interval]
---------+--
Anterior | -.2169591 .2771595 -0.78
0.447 -.8114071 .3774889
_cons | 39.25088 3.827286 10.26
0.000 31.04217 47.45959

Prediction equation of posterior from anterior
Posterior= 39.25-0.21*(anterior)

The equation explains that when anterior increase posterior decrease and this can quantify as for one-unit increase in anterior there will be 0.21 decrease in posterior width, but this change is not statistically significant (p=0.447).



Figure 5. Posterior Cleft width.

The results were expressed as scatterplot Figure (6) graphically.

5. Results

1. Normative data was tabulated.
2. Prediction equation of posterior from anterior width Posterior= 39.25-0.21*(anterior).

The equation explains that when anterior increase posterior decrease and this can quantify as for one-unit increase in anterior there will be 0.21 decrease in posterior

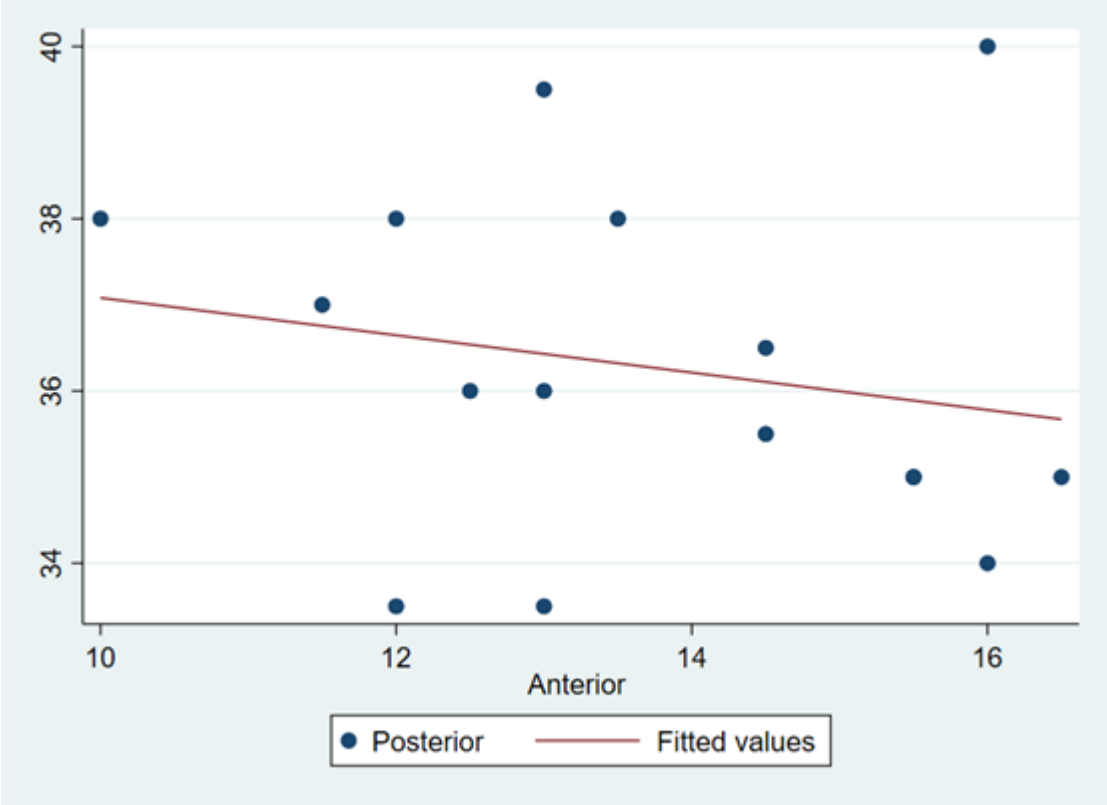


Figure 6. The results expressed as scatterplot graphically.

Table 1. Normative data

Variable	n	Mean	SD	Minimum	25th percentile	Median	75th percentile	Maximum
anterior	16	13.69	1.89	10.00	12.25	13.25	15.50	16.50
mid	16	33.63	1.35	31.50	32.50	33.75	34.75	36.00
posterior	16	36.28	2.00	33.50	35.00	36.00	40.00	38.00
ration	16	0.38	0.06	0.26	0.34	0.37	0.43	0.47

width, but this change is not statistically significant (p=0.447).

6. Discussion

Age of the CLP Patients reporting to hospital varied, as it is dependent on the awareness, social economic status, interest of patient's caregiver/guardian/parent. In our study patient pool consisted of UCLP Patient from 3-4 months, who had not undergone any manipulation of hard or soft tissues with active or passive appliance impressions of these patients were recorded before lip surgery. The measurements used has been described[1–6].

As recommended the measurements were all made by one operator (1) Aim of our study is to formulate an equation for prediction of posterior width from anterior width, which would facilitate selection of prelim tray without un sterilizing many trays used in trial and error method, also this trial and error method would be a major discomfort for the babies. The anterior width can be easily measured with direct method using millimeter scale but posterior width assumption is difficult, hence our equation would be beneficial and ease the process of impression making on cleft babies. Also, sometimes no pre-surgical orthodontics have be attempted and UCLP patient report only at 6 months for lip surgery and if no

impressions are required then the equation would be beneficial to predict the posterior arch width by directly measuring the anterior width and the future treatment plan, growth and development of arches can be assessed without needing a diagnostic or study model which may not serve any clinical purpose but only would be an additional burden to the UCLP baby.

Though the results for the equation is statistically insignificant, further increasing the number of patient pool would help to substantiate the equation and would be a very useful tool in impression making technique decisions.

Normative Data is always useful for further research purpose hence that was also formulated and tabulated.

6. Conclusion

1. A normative data of maxillary arch dimension and cleft width in UCLP patients was developed and tabulated which will be also be useful as Research data.
2. The Posterior cleft width prediction equation using anterior cleft width, will help in formulating the future treatment plan in required sequence and ease the method of impression making in unilateral Cleft lip and palate patients.

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