Maxillary arch width in unoperated adult of the unilateral cleft lip and alveolus patients

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Abstract

Background The transversal measurement on the dento-alveolar fragments of the maxilla, in the unoperated adult patients with unilateral cleft lip and alveolus are rare and have not been well documented and archived in the scientific journals . The effect of the congenital malformation is obvious in the Unilateral Cleft Lip and Alveolus (UCLA) patients and is well documented.

Objectives The aim of this study is to investigate whether there are any influences of the final transversal development of the maxilla based on the location and extent of the defect in patients with UCLA.

Methods 168 adult unoperated UCLA patients (study group) and 24 non cleft patients (control group) participated in this study. Plaster of Paris (POP) casts were made of the maxillary dentition and measurement were taken using coordinate measuring machine (CCM) (Zeiss Numere, Carl Zeiss, Stuttgart, Germany).

Result The mean values of maxillary transverse measurement of first premolar through the second molar of the UCLA and control group patients showed no statistically significant difference. The inter-canine distance was significantly smaller in the UCLA patients than non-cleft patients

Conclusions The maxillary inter-canine distance in untreated UCLA patients were significantly different from that of non cleft patients. There is narrow and constricted maxillary growth in UCLA patients causing maxillary morphological changes and cosmetic facial changes.

Keywords Cleft palate · Orthodontics growth

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Introduction

A patient with cleft lip and alveolus repair in early childhood show major or minor alternation of the morphology of the alveolar bone and position of the teeth after maturity, like undergrowth of mid-face and distortion of the dento-alveolar structures. In 1969 Dr. Ross stated that an important feature of these growth aberrations is the progressive or accumulated nature of the defect [1]. Following the initial operative treatment there is always a tremendous improvement, esthetically as well as functionally. From an esthetical point of view, the closure of the lip almost leads to a normalization of the appearance of the patient. The normalcy deteriorates gradually upto the maturity if the alveolus

is not corrected using orthodontic treatment for UCLA patients. The possible disturbances of the normal growth and the final development of the dento-alveolar component are rather limited and only around the area of the alveolar cleft [6,7].

In UCLA patients the surgical treatment is limited to the closure of the lip and alveolar part of the maxilla only; there is no elevation of palatal flaps, nor scar formation on the palate as in the CLP group and therefore no major influence of the operation on the final development of the palate may be expected. Extensive lateral compression of the maxilla may not be expected in UCLA group. Therefore transversal measurement and research studies of the early operated cleft lip and alveolus patients are few in the literature.

The publications on this topic are principally studies on babies and young children roughly upto seven years of age [8,9,10,11]. There are fewer publication of transversal measurement of the maxilla of the unoperated adult unilateral cleft lip and alveolus (UCLA) [12,13,14,15]. In 1962 Innis conducted a study consisting of 6 adults (20–35 years) UCLA patients and compared them with a thousand adults belonging to the same tribes. He found that medial collapse of the alveolar arch is most evident in the region of premolar and canine teeth in the cleft side. In the study of Bishara et al in 1985, that nine patients in the age group of 3–8 years with UCLA were included. The authors recorded that the effect of the cleft of lip and alveolus seems to be limited to that part of the dento-facial

complex that surround the cleft area, and there was a tendency that the canines are edge-to-edge and sometimes in cross-bite. The cleft segment had a tendency to rotate medially.

The aim of this study is to investigate whether there are any influences of the Unilateral Cleft Lip and Alveolus (UCLA) on the final transversal development of the maxilla based on the location and extent of the defect.

Methods

168 unoperated UCLA patients participated in this study and were compared to 24 unoperated patients who formed the control group, who were selected at random from surrounding population. Impressions of the upper and lower jaw were made with alginate impression material; dental impression was poured with plaster of paris. The measurements were done using an industrial device (Numerex) coordinating machine, with accuracy upto 0.00001. The data of the measurements are statistically assessed using SPSS. A t-test was done to find if the arch width differed significantly from the control group ($p < 0.05$).

Following distances were calculated:

- 171–271 distance between distal cusps of the right and left second molar
- 172–272 distance between mesial cusps of the right and left second molar
- 161–261 distance between distals cusps of the right and left first molar
- 162–262 distance between mesial cusps of the right and left first molar
- 151–251 distance between buccal cusps of the right and left second premolar
- 141–241 distance between buccal cusps of the right and left first premolar
- 131–231 distance between cusps of the right and left canine

Results

The results of the transversal measurements of the dento-alveolar segment of the maxilla of the unoperated adult UCLA patients are summarized in Table 1.

From the table it becomes clear that the mean of value of the UCLA and the control group are in comparable. There was no

Fig. 1 Measurement in UCLA, 2 point in buccal cusp in second molar, 2 point in buccal cusp in the first molar, 1 point in buccal cusp of first premolar, second premolar and canine.

Fig. 2 Box whisker plot of the maxillary arch width (in mm) in unoperated adult UCLA subject compared to the control group

statistically significant difference from the second molar upto the first premolar between the two groups. There was statistically significant difference between the inter-canine distances. The inter-canine distance is significantly smaller in the UCLA group.

Discussion and Conclusions

The present study deals with the analysis of the transversal arch dimensions of the maxilla of the unoperated adult UCLA patients. The sample size being substantial some conclusions can be drawn from this study. As there are no publications dealing with the transversal measurements of the dento-alveolar part of the maxilla on the

early operated in adult UCLA patients as this would help investigate whether there are any influences of surgery on the final development of adult UCLA patients. In our sample, second molar to the first premolar the transversal dimensions of the maxilla of the UCLA group are not significantly different from the transversal dimensions of the non-cleft population. This is in accordance with the finding of Bishara et al. [13] but is in contradiction with the findings of Innis [12], who has found a compression in the premolar area of the maxilla. The samples in both studies were too small and the analysis especially in Innis is insufficient to allow reliable conclusions. Therefore our sample may be used as a basis for the study of the possible developmental disturbances following

operative treatment of the UCLA in the early childhood. Further research on UCLA in operated and unoperated individuals is recommended. The only significant difference was found in the canine area. The maxillary inter-canine width is significantly smaller in the UCLA group. The cause of this reduction on the inter-canine width is not clearly understood. The cleft of the alveolar process alone may be the cause of local collapse of the alveolar process resulting in a reduction of the inter-canine distances. A local medial collapse of the canine of the cleft due to the absence of the reduction in size of lateral incisor on the cleft side might also be a local factors responsible for this phenomenon. The result of the present study supports the observation of Bishara et al. [13] that the effect of the UCLA is limited to the part of the dento-alveolar fragment in the vicinity of the cleft.

In conclusion the UCLA as congenital malformation has an influence on the final development of the dento-alveolar part of the maxilla in the canine region. The compression of the maxilla remains limited to the dento-alveolar part of in the direct vicinity of the cleft.

Table1 Maxillary arch width of the unoperated adult in UCLA patients compared with control group

Variable	N	Mean	S.D.	SE of mean	Maxi	Mini	p-value
B171-271							
UCLA	143	59.73	3.378	0.282	68.50	48.52	ns
Control	22	58.76	2.671	0.570	63.76	53.63	
B172-271							
UCLA	154	59.37	3.434	0.277	68.65	46.47	ns
Control	24	58.88	2.795	0.571	63.73	53.27	
B161-261							
UCLA	151	56.59	3.064	0.249	64.42	45.88	ns
Control	24	56.32	2.570	0.525	60.38	50.93	
B162-262							
UCLA	151	55.24	3.105	0.253	62.48	44.55	ns
Control	24	54.93	2.574	0.526	58.49	49.40	
B151-251							
UCLA	157	49.25	2.923	0.233	56.30	37.89	ns
Control	24	48.70	2.282	0.466	52.40	44.37	
B141-241							
UCLA	168	43.78	2.773	0.217	50.08	37.07	ns
Control	24	43.96	2.134	0.436	47.50	39.50	
B131-231							
UCLA	162	34.26	3.939	0.309	43.54	21.77	*sign
Control	24	36.11	1.920	0.392	39.37	32.57	

*sign-significant different; ns-no significant different

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