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Evaluation of lip force in patients with unilateral and bilateral cleft lip

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Abstract

Our aim was to investigate the differences in the dynamics of lip force between a group of participants with repaired cleft lips and a group of patients the same age but without clefts.

We evaluated 101 children between the ages of 10 to 15 years (unilateral clefts n = 35, bilateral clefts n = 15, class I malocclusion n = 25, and class III malocclusion n = 26). Maximum and minimum forces required to close the lips were evaluated with the Lip De Cum® device (Cosmos Instruments Co Ltd, Tokyo, Japan) for the all groups. We found no significant differences between the maximum and minimum values between boys and girls within the groups, whereas the mean maximum and minimum lip force of the boys was higher than those of the girls in all the groups. This study showed that maximum and minimum lip closing force values were statistically similar in all groups. We conclude, therefore, that patients with bilateral cleft lip have reduced maximum and minimum lip force.

Keywords: cleft lip; lip force

Introduction

Closing the lips is a complex function that can be achieved by various types and numbers of movements. These are well-organised functions of the orbicularis oris muscle, with additional facial muscles that have muscle fibres that go in various directions around the perioral region.[1] The positions of the teeth are governed by the force and balance of the lips and cheeks, and the equilibrium among the forces of the lips, cheeks, and tongue is important, particularly for orthodontists in planning the correct treatment. The technical skills and protocol that orthodontists use to assess these forces may define the ultimate success of orthodontic treatment.[2]

The lack of contact or changes between the lips affects various functions, such as breathing, chewing, and speaking, and impairs the balance between the muscles and maxillofacial bones. The development of the maxillofacial tissues is therefore affected by these impairments. In particular, patients with unilateral or bilateral cleft lip have appreciable changes in the muscular tone as result of the cleft itself and operations to close it.[3] Treating cleft lip involves complicated procedures, which are initiated during the first months of life and then continued until adulthood. Because of its complexity, treating cleft lip requires knowledge about the alterations of the patients' perioral systems for complete rehabilitation.[4]

The present study was designed to investigate the differences in lip-force dynamics between a group of patients with

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Table 1
Comparability of the groups.

Group	Mean (SD) age (years)	Male	Female	Total
Cleft:				
Unilateral	12 (??-??)	21	14	35
Bilateral	13 (??-??)	7	8	15
No cleft:				
Class I malocclusion	12 (??-??)	9	16	25
Class III malocclusion	13 (??-??)	15	11	26

repaired cleft lip and a group who had not had clefts (patients with Class I and Class III malocclusions) from the same age group.

Patients and Methods

The sample size for the groups was calculated using G*Power software (G*Power Version 3.0.1. Franz Faul, University of Kiel, Germany).[5] Fifteen subjects were required in each group to detect a clinically relevant difference with a power of 94% at the 5% significance level.

A total of 101 children between the ages of 10 and 15 were evaluated in this prospective study conducted between 2015 and 2016, and they were divided into four groups: unilateral cleft lip, bilateral cleft lip, and Class I malocclusion and Class III malocclusion (no clefts) (Table 1). The study design and ethical considerations were approved by the Ethics Committee of Süleyman Demirel University, Faculty of Medicine, Turkey, and signed informed consent was given by all the patients' parents. The study was supported and funded by the TUBITAK 3001 Project, project number 115S017.

The inclusion criteria were: no full jacket crown on the incisors, no history of orthognathic surgery or previous orthodontic treatment, no congenital craniofacial anomalies, and no noticeable canting in the occlusal plane or asymmetrical skeletal patterns on clinical examination or cephalometric analysis. Patients had no cleft palate and all patients had purely isolated cleft lips. No revision operations were done in any of the groups. All the operations were done by the same three surgeons. Two orthodontists evaluated the lip forces.

Measurement of lip-closing force

We evaluated maximum and minimum lip-closing forces for all the groups with the Lip De Cum® device (Cosmos Instruments Co Ltd, Tokyo, Japan) (Fig. 1).[6] All measurements were made three times for each patient during three different periods and measurements were made at the same time between 09.00 and 10.00. The device has two parts: a sensor with a lip adaptor, and a digital display. The indicator of lip-closure strength (force) (Lip De Cum®) was set up with a lip-holder mounted to the sensor, and the subjects were instructed to bite the holder between their upper and lower lips. The patients were located parallel to the floor plane according to their Frankfurt plane. They then closed their upper and lower lips with as much strength as they could without allowing their upper and lower teeth to touch (Fig. 2).

Fig. 1. Lip De Cum® device (Cosmos instruments Co. Ltd, Tokyo, Japan) has two parts including a sensor with a lip adaptor and digital display.

Fig. 2. Patients closed the upper and lower lips as firmly as they could without allowing the upper and lower teeth to touch.

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