

*Research Article*

## Evaluation of Palatal Bone Regeneration after Cleft Palate Repair

Nasser Zaghloul\*, Ph.D, Ahmed Mahrous Mohamed\*\*, Ph.D, Sherif A. Bakri\*\*, MD, Sarah O. A. Muhammad\*\*, MSc

\* Department of General Surgrey, El-Minia Faculty of Medicine

\*\* Department of Maxillofacial and Plastic Surgery, El-Minia Faculty of Medicine

### Abstract

**Objectives:** The aim of this work was to study new bone formation in the bony cleft after surgical repair of cleft palate using Cone-Beam computed tomography (CBCT). **Patients and Methods:** 26 cleft palate patients were evaluated using cone-beam CT scans for the volume of newly-formed bone in the bone cleft. **Results:** all patients were found to have developed new bone along the antero-posterior diameters of the hard palate. The average “Regenerated bone volume ratio” measured for all cases was 58.2% with the highest volume of bone formation in the middle 1/3 of hard palate.

**Keywords:** cleft palate, bone regeneration, Cone-Beam computerized tomography (CBCT)

### Introduction

Despite developing many surgical techniques, Von-Langenbeck's procedure stands to be the most commonly used technique so far. Since mucoperiosteal closure can be simply achieved using one technique or another, bony healing of the cleft hasn't been granted much attention. However, it has been noticed that new bone was formed in the cleft site and connected the two palatal shelves in the center. (Yin et al., 2005).

To have a closer look at this newly-formed bone, we studied cone-beam CT scans of 26 cleft palate patients.

### Materials and Methods

We held a retrospective study on 26 patients who had their cleft palate repaired by Von-Langenbeck's technique.

Syndromic patients, and patients with incomplete cleft secondary palate, or residual palatal were excluded. Our study included 16 males (61.5%), and 10 females (38.5%). Twenty-four patients (92.3%) originally had complete cleft lip and palate (CLP), and two (7.7%) had isolated cleft secondary

palate (ICP). Their ages ranged from 5 to 15 years old, with an average of 10.6 years old. They had their cleft palate repaired before 2 years old, with an average of 1.3 years old.

### Evaluation of bone regeneration using UBCT scans

From the CBCT cuts, the newly-formed bone was thoroughly studied for its relative quantity, and quality, along with areas of maximum, and minimum bone formation.

- All CBCT imaging was performed using Plameca Promax 3D (Helsinki, Finland) imaging machine.
- CBCT were viewed, studied, examined for newly-regenerated bone using the (Planmeca Romexis viewer 4.4.2 (Helsinki, Finland).

### Results

Bone Regeneration, and “Regenerated bone volume ratio”

All cases showed new-bone formation with variable degree in different sites along the anteroposterior diameter of palate. The newly-formed bone was most commonly observed in the middle one third of the hard

palate, all patients had good density of newly-formed bone.

“Newly-formed bone”, and time that has elapsed since primary palatal surgery. By correlating the relative quantities of the “Newly-formed bone”, and the number of years that have elapsed since primary palatal surgery, both variables had a strong positive correlation with each other.

### Discussion

Many authors have already studied the phenomenon of new bone formation at site of the cleft palate. Rintala and Ranta (1987) noted that, in 44 patients with cleft palate only, the relative size of the palatal cleft decreased by an average of 7% between the ages of 3 and 17 months, before and palatal repair surgery. (Rintala and Ranta, 1987).

Lo et al., reported that there was a decline in the width of the hard-palatal cleft in patients with unilateral complete cleft lip and palate during the 18-month period, before surgical repair of the cleft (Lo et al., 1999).

Some others reported that regenerated bone was formed in bony cleft defects after cleft palatal surgery (Choi et al., 2012). Though CT imaging Choi et al., (2012) observed that regenerated bone was formed in most of the palatal bony clefts after repair surgery. (Choi et al., 2012).

In the present study, we are studying this new bone formation in 26 cleft patients, 16 males (61.5%), and 10 females (38.5%), their ages ranging from 5 to 15 years, with an average age 10.5.

Twenty-four patients (92.3%) originally had complete cleft lip and palate (CLP), and two (7.7%) had isolated cleft secondary palate (ICP). Similarly, Choi et al., (2012) evaluated this newly-regenerated bone using CT imaging in 30 unilateral complete cleft lip and palate patients, with 22 males (73.3%), and 8 females (26.6%), with their ages ranging from 6 to 15 years old, and an average age of 9.8 years old.

In this study, newly-regenerated bone has been found in CBCTs in all patients.

Patients had surgical repair of the cleft palate at an average age of 1.3 years old.

Similarly, Choi et al., (2012) observed regenerated bone in all 30 patients of his study (100% of patients), who had their lip repair at an average age of 4.03 months (range 3 to 9 months), and their hard-palatal cleft closed at an average age of 14.32 months (range 11 to 25 months), and CT imaging performed at an average age of 9.8 years (range 6 to 15 years).

Yin et al., (2005) noted that 52 patients with cleft lip and palate underwent von Langenbeck repair, and in 37 of 52 patients, the regenerated bone was found in the hard palate on CT scans, most commonly at the premolar and the anterior part of the molar area.

Saijo et al., (2010) noted that 5 out of 29 patients (17%) with unilateral cleft lip and palate, who underwent push-back palatoplasty, had bony union on CT imaging.

### References

1. Choi, J., Kwon, G. Y., Kim, S. & Choi, T. H. (2012): The long term changes of hard palatal bony cleft defects after palatoplasty in unilateral complete cleft lip and palate. *Journal of Plastic, Reconstructive & Anesthetic Surgery*, 65, 1461-1467.
2. Lo, L.J., Huang, C.S., Chen, Y. R., & Noordhoff, M.S. (1999): Palatoalveolar outcome at 18 months following simultaneous primary cleft lip repair and posterior palatoplasty. *Annals of plastic surgery*, 42, 581-588.
3. Rintala A.E. & Ranta R. (1987): Spontaneous narrowing of the palatal cleft during the first year of life: a quantitative study. *Scandinavian Journal of Plastic and Reconstructive Surgery*, 21, 35-38.
4. Saijo, H., Mori, Y., Fujihara, H., Kanno, Y., Chikazu, D., Ohkubo, K., Hikiji, H., Ino, M., Yonehara, Y., and Takato, T., (2010): Evaluation and analysis of formation of bone at the palate in patients with cleft lip and palate after palatoplasty based on

computed tomograms and three-dimensional data. *Journal of Plastic surgery and Hand surgery*, 44, 21-25.

5. Yin, N., MA, L., & Zhang, Z., (2005): Bone regeneration in the hard palate

after cleft palate surgery. *Plastic and reconstructive surgery*, 115, 1239-1244.