Mandibular Condylar Aplasia Treated with a Functional Appliance: A Five years Follow Up

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This report presents a follow up of a clinical case published five years ago by the same authors. In the previous report, the authors showed a young girl treated with a myofunctional appliance due to a mandibular condylar agenesia. After a traditional graft had failed, the patient successfully responded to the functional treatment by forming a mandibular condyle. In this new report, the authors are showing how the mandibular condyle has continued developing within normal limits and, the mandibular ramus has continued positively remodeling. The bone biology embedded in the biological process reported here is discussed by the authors.

Key words: condylar aplasia, functional appliance, condylar growth

INTRODUCTION

The authors reported in 2013 a clinical case of mandibular condylar aplasia successfully treated with a modified functional appliance [1]. In that report, the authors showed a female child born with agenesis of the left mandibular condyle, which did not produce any response to the surgical treatment, a costal bone graft. After the treatment with a modified Klamt appliance, the mandibular condyle grew and developed forming a biological stable temporomandibular joint. Thus, the function of the oral system was re-established and the clinical case was reported at that time with a fully formed mandibular condyle sitting in the mandibular fossae.

When that report was issued [1], a protuberance was clinically observed on the left side of the patient´s face, which corresponded to the unsuccessfully costal bone graft placed previously to the functional treatment. That was confirmed with the 3D-image took by means of Cone-Beam Computerized Tomography.

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Case Follow up Report

After five years of completing the functional treatment, the authors are able to report that the patient´s facial appearance and the craniofacial growth and development has continued within normal limits maintaining a symmetric growing at the craniofacial complex (Figure 1); the dental occlusion has been maintained symmetrical on both sides maintaining the vertical dimension obtained after the treatment (Figure 2); after five years the bone graft has started a resorptive process, particularly at the edges of the costal bone graft where the screws are holding it attached to the mandible (Figure 3); which, has produced a significant change in the patient´s facial appearance, as the noticeable protuberance at the end of the functional treatment (Figure 4A), is not noticeable anymore at her last follow ups (Figures 4B & 4C).

Besides reporting the clinical and radiographic observations occurring over the following five years after the functional treatment was completed and described above, the authors also discuss below the biological concepts on bone biology that can explain the phenomenon occurring in this clinical case over the last years.

DISCUSSION

Bone modeling and remodelling occurs by the interaction of the osteoclasts and the osteoblasts, with the former cells resorbing that bone which is not viable or not biologically stable; and, the osteoblasts depositing a collagen matrix which is later mineralized. That process is known as the Bone Remodelling Unit (BRU) [2-3].

In humans, the BRU last for about seventeen weeks [3]. In that context every seventeen weeks the human body is able to replace approximately 200 μm of damaged or unviable bone (remodelling) or, to apposition 200 μm of new bone in those bones composing the human skeleton (modelling) [3].

Figure 1. Frontal photographs of the patient at 6 years old, before the functional treatment (A); at seven years of age, at the end of the first year of the functional treatment (B); at 8 years old, when the functional treatment was completed (C); and, at 13 years old, five years after completing the functional treatment (D). Notice that the initial deviation of the mandible towards the left side before the functional treatment (A) was corrected and maintained during, at the end and, five years after treatment (B, C & D).

Figure 2. Intraoral photographs of the patient at 6 years old, before the functional treatment (A); at seven years of age, at the end of the first year of the functional treatment (B); and, at 13 years old, five years after completing the functional treatment (C). Notice that the improvement of the vertical dimension and that in the mandibular midline has been maintained five years after the functional treatment was completed without further treatment (B, C & D).

Figure 3. Three-Dimensional tomograms obtained from the patient at 9 years old (A & C); and, at 13 years old (B & D). Notice the diffused area of the costal bone graft at the bottom (red arrows) when comparing it at 9 years old (A) with that one at 13 years old (B). Also, notice how the costal bone graft extended over the external border of the zygomatic bone (red line) at 9 years old (C) and, how it goes back to the external border of the zygomatic bone at 13 years old (D).

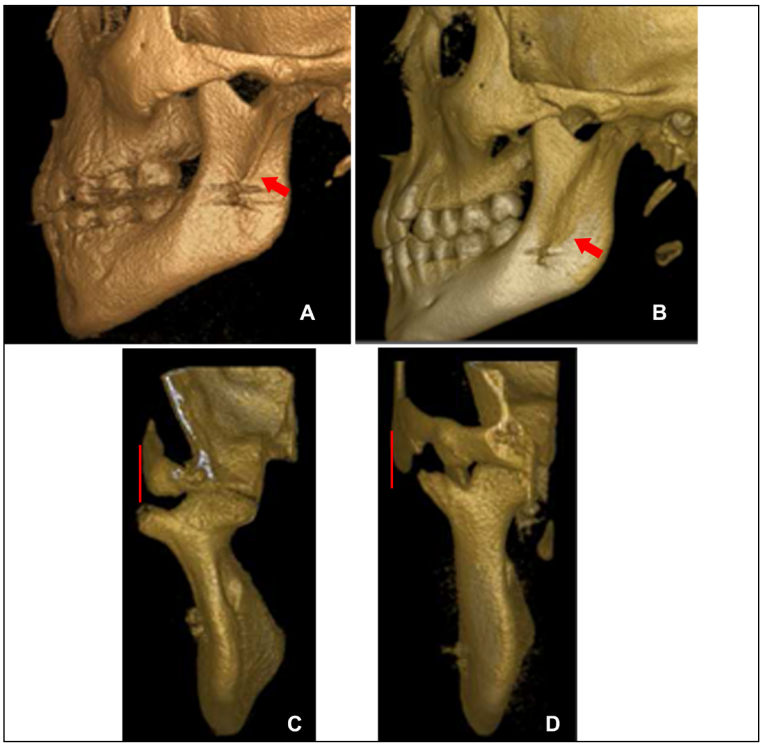
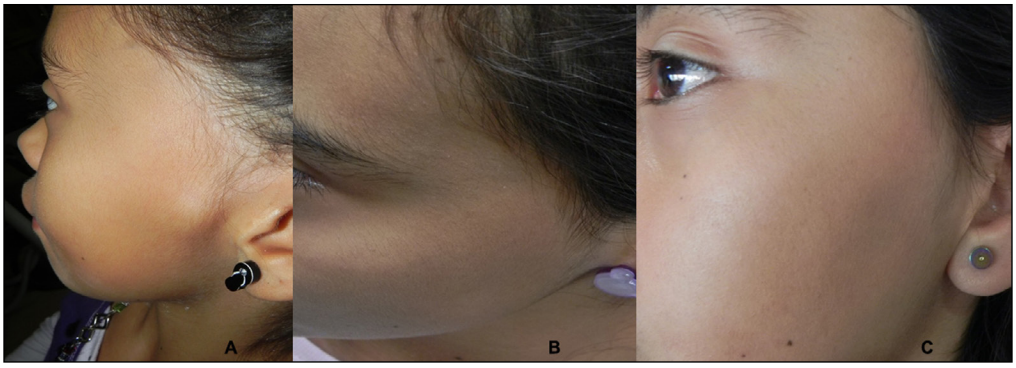


Figure 4. Photographs of the patient´s face left side showing a noticeable protuberance near to the ear at 8 years old (A), due to the unsuccessful costal bone graft placed intending to stimulate a condylar development; and, at 12 and 13 years old (B & C), where the spontaneous resorption of the costal bone graft occurring over the last five years has improved the patient´s facial appearance.



Therefore, we can argue that in a year period three BRUs may occur in human beings. So, a bone would be able to either replace or apposition approximately 600 µm of bone tissue in a one year period. Keeping in mind the small amount of bone tissue that can be either replaced or apposition in one or two years (between 600 to 1200 µm), observations on a significant morphological change in any bone of the human skeleton would require to follow the modelling and remodelling processes of a determined bone over several years. In other words, significant morphological changes in a human bone, observed either clinically or radiographically cannot be measured after at least five or more years, when a significant amount of bone tissue would be either resorbed or appositioned.

The case discussed here is a good example of that statement proposed above. A follow up of five years allowed us to observe a noticeable change in the appearance of the patient`s face. The presence of a protuberance referred to in the previous publication (Figure 4A), is not noticeable anymore in the photographs taken five years later (Figures 4 B & C). That is due to the modeling of the mandibular ramus, where the bone graft was considered a non-viable bone tissue by her body and, a modeling process (change in the shape of the bone) has been spontaneously initiated at her mandible, as observed in the most recent 3D-images (Figures 3 B & C).

CONCLUSION

The initial report of this clinical case showed that a functional approach can stimulate the growth and development of the mandibular condyle in a case of mandibular condyle agenesis. This new report showed that over the last five years the physiological function of the temporomandibular joint in the patient has been maintained and the craniofacial growth and development has been within normal limits, without additional treatment. Furthermore, these recent observations permit the authors to suggest that the responses at the mandible and the maxilla should be evaluated for five or more years when intending to determine skeletal changes produced by a functional appliance, in accordance to the biology of bone modelling and remodelling.

REFERENCES

1. Mejia-Gomez C, Ramirez-Yanez G. Mandibular condylar aplasia treated with a functional approach. J Clin Pediatr Dent.; 38: 179-184. 2013-
2. Parfitt, AM.. Bone histomorphometry: standardization of nomenclature, symbols, and units. J Bone Miner Res; 2: 595-610. 1987.
3. https://en.wikipedia.org/wiki/Bone_remodeling_period. Consulted on April 10, 2017.