THE USE OF GOTHIC ARCH TRACER IN AN EDENTULOUS PATIENT WITH BILATERAL CONDYLAR APLASIA. A CASE REPORT

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Abstract

Complete aplasia of mandibular condyle is a rare condition, and its prosthodontic management, especially in edentulous patients, is a clinical challenge. The present clinical report describes the successful prosthodontic management of an edentulous patient with condylar aplasia utilizing gothic arch tracer for centric relation record.

Keywords: *complete denture, gothic arch, central bearing, condylar aplasia.*

1. INTRODUCTION

The centric relation is defined as "a maxillomandibular relationship, independent on tooth contact, in which the condyles articulate in the anterior-superior position against the posterior slopes of the articular eminences; in this position, the mandible is restricted to a purely rotary movement; from this un- strained, physiologic, maxillomandibular relationship, the patient can make vertical, lateral or protrusive movements; it is a clinically useful, repeatable reference position" [1].

The ability to establish an accurate, verifiable, and reproducible occlusal vertical dimension (OVD) and a centric relation (CR) is a clinical skill, with which comes the ability to create a harmonious, functional occlusion, comfortable to the edentulous patient in need of prosthetic treatment [2]. There are many techniques to record CR in edentulous subjects, from the wax closure, the most commonly applied to functional chew-in technique, the graphic method, or anterior deprogrammers [3]. The graphic method or Gothic Arch Tracing is Needle-point Tracing as "the pattern obtained on the horizontal plate used with a central bearing tracing device", which provides a central point of bearing or support between the maxillary and mandibular dental arches. It consists of a contacting point attached to a dental arch and a plate attached to the opposing dental arch. The plate provides the surface on which the bearing point rests or moves and on which tracing of the mandibular movement is recorded. All movements in the horizontal plane initiate from the apex of the Gothic arch. The apex of tracing is a reproducible reference point, which represents the centric relation [1]. Gothic arch tracing ensures that the centric record is made with minimal closing force equally distributed over the supporting tissues [1,4]. The central bearing device can be fabricated either conventionally or digitally [5].

Mandibular condyle deformities are rare, especially when both condyles are affected. They can be acquired, developmental or congenital in origin and classified as aplasia, hypoplasia, hyperplasia, or bifidity [6]. Congenital conditions and syndromes leading to unilateral or bilateral underdevelopment of the mandibular condyle can be associated with other various craniofacial abnormalities, including the ear, eye and zygomatic arch [7-9]. The congenital conditions known to cause such disturbances include: Hemifacial microsomia, Mandibulofacial Dysostosis (such as Treacher Collins syndrome), Goldenhar syndrome, Hurler syndrome, Proteus syndrome, and Morquio syndrome [10]. In addition, the condylar articular cartilage is a growth center for the mandible, and any insult, such as therapeutic radiation exposure, traum a or

infection can lead to developmental/ acquired growth disturbances [9]. The extent of involvement depends on the timing of insult and may include the condyle, ramus, body of the mandible and alveolar processes [8].

Application of the Gothic arch tracer (a central bearing device) in edentulous patients with condylar aplasia is a demonstrable method for determining the centric relation.

2.CASE DESCRIPTION

A 70 year-old Saudi female patient presented to the dental clinic in King Abdulaziz Medical City with a chief complaint of unsatisfactory mandibular denture retention. Clinical examination showed a severely atrophic mandibular ridge. Extra oral examination revealed retruded chin, while both condyles could not be detected on palpation. A panoramic radiograph revealed bilateral missing mandibular condyles (Fig. 1).

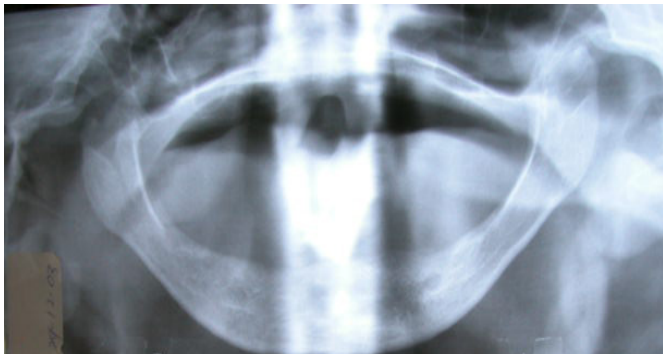
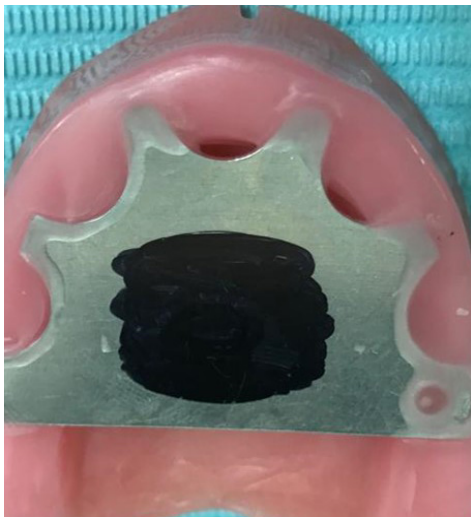


Fig. 1. Panoramic radiograph showing bilateral missing mandibular condyle

In the absence of any other relevant findings, congenital causes were ruled out, most likely to be acquired in nature. The patient was provided with two osseointegrated implants inserted in the interforaminal area as abutments of mandibular overdenture (Fig. 2). However, since the CR is the physiological relationship of the condyles and the articular eminences are absent in this case, the Gothic arch tracer was utilized for recording the centric relation. This technique enables a consistent, repeatable and accurate centric relation [2].

Fig. 2. Two implants were placed in the interforaminal area as an abutment of mandibular overdenture

The setup of the arch tracer consists of 3 parts: a striking plate, a contact plate, and a threaded pin. After determining the vertical dimension of occlusion, a threaded pin was mounted in the mandibular recording base. Then, a flat striking plate was attached to the upper recording base, covered with a marker. The bases were inserted into patient's mouth, who was advised to move the mandible to the most retruded, then to the most protrusive position. These retrusion and protrusion movements were performed several times to establish an accurate copy on the upper tracing plate. The patient was also advised to move the mandible into the most lateral movements,these paths of movement being also recorded on the upper striking plate (Fig. 3). The maxillary cast was mounted using a facebow record, while the mandibular cast was mounted to the maxillary cast, using arch tracings.



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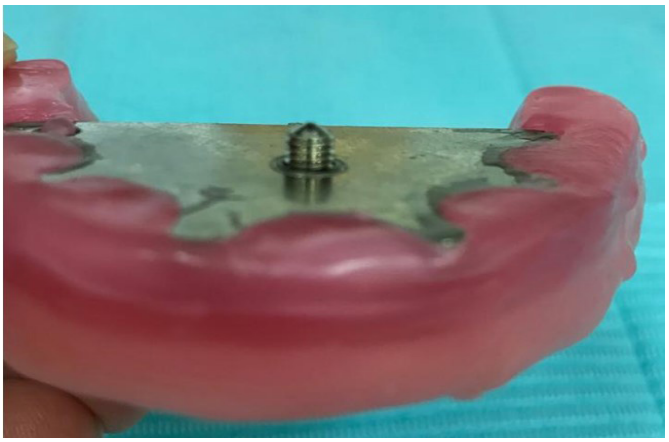

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Fig 3. a. Mounted striking plate on upper denture. b. Central pin attached to the mandibular denture. c. Bases were inserted into patient mouth. d. Recorded paths of movements on the upper striking plate. e. Social smile expression at post treatment.

3. DISCUSSION

Even if dentures are an established pillar of dentistry, a great number of inexperienced dental professionals may avoid this treatment option, fearing the possibility of unsatisfactory denture fit, marginal aesthetics, and a number of postoperative adjustments requiring an extra clinical time [11]. However, dentures help improve many of the emotional consequence and the quality of life caused by edentulism, inducing changes in the lower facial third, that will give the aspect of premature aging, caused by bone resorption due to premature tooth loss to decreased lip support and facial height [12]. Patient satisfaction plays an important role in the success of the treatment plan. Gothic arch tracers remain a largely underutilized tool because the early versions were considered technically sensitive and difficult to assemble, although they have demonstrated the advantage of recording the precise relationship of the anterior teeth in centric relation [2].

In patients with severe atrophic mandibular ridge, dental rehabilitation with conventional removable or fixed prostheses anchored to implants is not always possible, due to

anatomic, functional or economic factors, however, a 2 implant retained overdenture considered the standard of care for mandibular edentulism [13]. Moreover, studies have shown greater patient satisfaction with implant over their relative satisfaction with conventional complete denture [14-16].

The lack of anterior (teeth) and posterior guidance (condyle) in edentulous patient with condylar aplasia is particularly challenging for prosthodontic management. Therefore, the centric relation was recorded using a Gothic arch tracer. However, the use of a central bearing device in temporomandibular disorders helps neuromuscular deprogramming and allows the condyle to be placed in physiological retruded position, which leads to high occlusal stability [4]. Nevertheless, scarce data is offered in literature on the specific protocol or previous clinical reports of prosthetic rehabilitation of such patients. To the best of our knowledge, this is the first case that reports prosthodontic management for completely edentulous patient with condylar aplasia.

4. CONCLUSIONS

In an edentulous patient with a rare case of bilateral condylar aplasia, a Gothic Arch Tracer was utilized for CR registration, where maxillary complete denture and mandibular implant supported overdenture have been constructed. Gothic arch tracer processes can save valuable chair and clinician time. Additionally, they help avoid patient discomfort and dissatisfaction by outlining the ideal denture occlusion for the laboratory prior to fabrication, thus creating accurate and well-fitting dentures.

References

1. The Glossary of Prosthodontic Terms: Ninth Edition. J Prosthet Dent. 2017;117(5S):e1-105.
2. Wojdyla SM, Wiederhold DM. Using intraoral Gothic arch tracing to balance full dentures and determine centric relation and occlusal vertical dimension. Dent Today. 2005;24(12):74-7.
3. Keshvad A, Winstanley RB. Comparison of the replicability of routinely used centric relation registration techniques. J Prosthodont. 2003;12(2):90-101.
4. Millet C. Management of an edentulous patient with temporomandibular disorders by using CAD-CAM prostheses: A clinical report. J Prosthet Dent. 2018;120(5):635-41.
5. Qu F, Du X, Liu WC. 3D-printed custom trays with a Gothic arch for centric relation recording and definitive impression making for complete dentures: A dental technique. J Prosthet Dent. 2019;121(1):32-6.
6. Ahmad M, Schiffman EL. Temporomandibular Joint Disorders and Orofacial Pain. Dent Clin North Am. 2016;60(1):105-24.
7. Galea CJ, Dashow JE, Woerner JE. Congenital Abnormalities of the Temporomandibular Joint. Oral Maxillofac Surg Clin North Am. 2018;30(1):71-82.
8. Krogstad O. Aplasia of the mandibular condyle. Eur J Orthod. 1997;19(5):483-9.
9. Shibata S, Suda N, Fukada K, Ohyama K, Yamashita Y, Hammond VE. Mandibular coronoid process in parathyroid hormone-related protein-deficient mice shows ectopic cartilage formation accompanied by abnormal bone modeling. Anat Embryol (Berl). 2003;207(1):35-44.
10. Priolo M, Lerone M, Rosaia L, Calcagno EP, Sadeghi AK, Ghezzi F, et al. Question mark ears, temporo-mandibular joint malformation and hypotonia: auriculo-condylar syndrome or a distinct entity? Clin Dysmorphol. 2000;9(4):277-80.
11. Kimoto S, Kimoto K, Kitamura A, Saita M, Iijima M, Kawai Y. Effect of dentist's clinical experience on treatment satisfaction of a complete denture. J Oral Rehabil. 2013;40(12):940-7.
12. Tallgren A, Lang BR, Miller RL. Longitudinal study of soft-tissue profile changes in patients receiving immediate complete dentures. Int J Prosthodont. 1991;4(1):9-16.
13. Feine JS, Carlsson GE, Awad MA, Chehade A, Duncan WJ, Gizani S, et al. The McGill consensus statement on overdentures. Mandibular two-implant overdentures as first choice standard of care for edentulous patients. Gerodontology. 2002;19(1):3-4.
14. Preciado A, Del Rio J, Lynch CD, Castillo-Oyague R. A new, short, specific questionnaire (QoLIP-10) for evaluating the oral health-related quality of life of implant-retained overdenture and hybrid prosthesis wearers. J Dent. 2013;41(9):753-63.
15. Thomason JM, Lund JP, Chehade A, Feine JS. Patient satisfaction with mandibular implant overdentures and conventional dentures 6 months after delivery. Int J Prosthodont. 2003;16(5):467-73.
16. Awad MA, Lund JP, Dufresne E, Feine JS. Comparing the efficacy of mandibular implant-retained overdentures and conventional dentures among middle-aged edentulous patients: satisfaction and functional assessment. Int J Prosthodont. 2003;16(2):117-22.