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A Path way to the Centric – Gothic Arch

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ABSTRACT

Clinical skill is the key for the correct establishment of the accurate and verifiable maxillomandibular records. With this skill comes the ability to create an occlusion that is harmonious, functional, and comfortable to the edentulous patient in need of prosthetic treatment. The article thereby reviews the most reliable method of recording the maxillomandibular relationship of the mandible in its posterior most position in the glenoid fossa. Keeping in mind the merits and demerits, the perfect Gothic arch tracing, is an art which combines the skill of the prosthodontist and patient cooperation along with it. Hence a good centric is a reflection of the tracing obtained from the patient.

Keywords: Gothic arch, maxillomandibular, prosthodontist

INTRODUCTION

The human mandible can be related to the maxilla in several positions in the horizontal plane. Among these centric relation is a significant position, because of its usefulness in relating the dentulous and edentulous mandible to maxilla, where the teeth, muscles and temporo mandibular joint function in harmony. It is a position of occluso-articular harmony. The importance of centric relation in complete denture prosthodontics has been well known for many years. Some dentists claim that a correct centric relation is the most important single

measurement made in the construction of complete dentures¹ According to GPT- 7 it can be defined as The maxilla mandibular relationship in which the condyles articulate with the thinnest avascular position of their respective discs with the complex in the anterior-superior position against the slopes of the articular eminences. This position is independent of tooth contact. This position is clinically discernible when the mandible is directed superior and anteriorly. It is restricted to a purely rotary movement about the transverse horizontal axis”²Boucher³ said it is The most posterior relation of the lower to the upper jaw from which lateral movements can be

made at a given vertical dimension. As classified by various authors, the different methods of registering the centric relation. The most commonly recommended method of determining centric relation is the Gothic arch (needle point) tracing proposed by Gysi in 1910⁴. The apex of the Gothic arch tracing recorded by a pin attached to one jaw which writes on a plate attached to the other is considered a starting point from which protrusive and lateral jaw movements are made by patients. The reference point designated centric relation has been defined as the most retruded unstrained relation of the mandible to the maxillae at a given degree of jaw separation.⁵

GOTHIC ARCH TRACING

The Gothic Arch Tracing has been accepted by many as a means of locating the centric maxillomandibular relation. It is also invaluable for reproducing the working and balancing lateral paths⁶. In the original Gysi⁷ technique the occlusal plane is determined by locating the correct height of the upper occlusion rim. Then the lower occlusion rim is adapted to the upper rim at the correct vertical dimension of occlusion. The Gothic arch tracer is fixed to the occlusion rims with the tracing table parallel to, or continuous with, the plane of occlusion. The central bearing point is not used. No mention is made of the inclination of the tracing point. No cusp height is introduced when the Gothic arch tracing is registered. This means that even contact of the occlusion rims is lost when the patient makes forward or lateral excursions of the mandible because of the forward and downward movement of the condyles. A Gothic arch tracing with a sharp apex can only be obtained by a pivoting of the mandible on first one condyle and then the other as right and left lateral movements are made. If the condyles do not pivot or do not have centers from which lateral movements are made, a faulty tracing or one with a rounded apex will be obtained. Most of the proponents of the needle point tracing method assume that a correct tracing with a sharp apex is indicative of condyles properly situated in their glenoid fossae¹. An investigation into the duplicability of the apex of arrow-point ~S needlepoint j tracings was initiated because of conflicting opinions regarding the proper position at which to occlude teeth in dentures and in reconstructed dentitions⁸. Meyers⁹ said that the apex of the Gothic arch tracing recorded by a pin attached

to one jaw which writes on a plate attached to the other is considered a starting point from which protrusive and lateral jaw movements are made by patients. The reference point designated centric relation has been defined as the most retruded unstrained relation of the mandible to the maxillae at a given degree of jaw separation. The Gothic arch (needle point) tracing can be used to record maxillomandibular relationships during the diagnosis and treatment of restorative problems. The apex of the tracing indicates centric relation, which is also known as the ligamentous position or the posterior border position.¹⁰

GRAPHIC METHODS

- Intraoral tracing and devices
- Extraoral tracing and devices

INTRAORAL TRACING AND DEVICES

- a. Coble tracer
- b. Swiss dent ball bearing bite tracer'
- c. Micro tracer

EXTRAORAL TRACING AND DEVICES

Used for recording horizontal relationship in one plane using ARROW-POINT Tracing.

- a) Hight tracer
- b) Sears tracer
- c) Phillips extraoral tracer

DESCRIPTION OF THE ARROW POINT TRACING

- Measured across a single plane
- Central bearing device is used.
- Defined as" a device that provides a central point of bearing or support between the maxillary and mandibular dental arches. It consists of a contacting point attached to one 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 the tracing of the mandibular movement recorded. It may be used to distribute the occlusal forces evenly during jaw relation and/or the correction of disharmonious occlusal contacts.-GPT²

CENTRAL BEARING DEVICE CONSISTS OF

- Central bearing point

- Central bearing plate

CLASSIFICATION OF ARROW POINT TRACING

Gerber described six different types of Gothic arch tracings. These are the "classical pointed form, classical flat form, weak tracing, asymmetrical form, miniature form and tracing with vertical line beyond arrow point". In general the following types of gothic arches are noticed with intra oral tracing in dentulous and edentulous conditions.

- **1. Typical:** Seen as a well-defined apex with a symmetrical left and right lateral component. The mean Gothic arch angle is about 120 degrees. It reflects a healthy TMJ without interferences in condylar path and balanced muscle guidance. The symmetrical form indicates an undistributed movement of the condyle in fossa and distal slope of eminence with symmetrical balanced muscle guidance.
- **2. Flat Form:** It is similar to typical arrow point except that it has more obtuse left and right lateral tracings. This type of arrow point signifies a marked lateral movement of condyle in the fossa. The Gothic arch angle is more than 120°.
- **3. Asymmetrical Form:** (i) The left and right lateral tracings meet in an arrow point; however their inclination to the protrusive path is not symmetrical. (ii) One of the lateral tracing is shorter. This form of tracing indicates an inhibition of the forward movement; either in the left or right joint.
- **4. Apex Absent / Round Form:** Instead of a sharp arrow point the tracing should be repeated till a definite arrow point is obtained. Patient training is necessary.
- **5. Miniature Arrow Point:** Similar to the typical arrow point, however the extension of tracing is very limited. This can be due to restricted mandibular movements improper seating of record bases, and painfully fitting record bases during registration. It is also an indication of a long period of edentulousness with an inhibition in condylar movements.
- **6. Double Arrow Point:** It is a record of habitual and retruded centric relation. Allow patient training and repeat till a single gothic arch is

obtained. It is also seen when vertical dimension is altered during registration.

- **7. Dorsally Extended Arrow Point:** The protrusive path extends beyond the apex of the Gothic arch. This signifies a forced strained retrusive movement of the lower jaw either by the patient or by the operator. It is also sometimes an artifact caused by the forward displacement of upper occlusal rim or backward dislodgement of lower occlusal rim while removing them from the mouth. It can also occur when the head of the patient is tilted too far posteriorly. The registration should be repeated after correct positioning. Gerber felt that occasionally the distal extension is correction, but the tracing was obtained with the mandible is protruded position.
- **8. Interrupted Gothic Arch:** Break or loss of continuity of lateral incisal path of Gothic arch. This happens due to posterior interference at the heels of occlusal rims during lateral movements. Check for posterior clearance before recording.
- **9. Atypical Form:** Protrusive component does not meet at apex but on one of the lateral path. This may happen in dentulous because of a faulty Muscular pattern due to par functional habits like bruxism. It is also seen in very old edentulous patients, who are using complete denture with incorrect centric relation.

TECHNIQUE FOR GRAPHIC METHOD¹¹

The technique for an extraoral arrow point tracing using a "Hight Tracing" device follows:

1. Make accurate, stable maxillary and mandibular record bases.
2. Attach occlusion rims of hard base plate wax.
3. Contour the wax occlusion rims.
4. Establish the vertical dimension of jaw separation with the mandible at physiologic rest.
5. Reduce the mandibular occlusion rim to provide excessive interocclusal distance.
6. Make a face-bow transfer and mount the maxillary cast.
7. With soft wax make a tentative centric relation at a predetermined vertical dimension of occlusion.
8. Adjust the articulator with the condylar elements secured against the centric stops
9. Relate the maxillary occlusion rims of the soft wax record and attach the mandibular, cast to the articulator with plaster.

10. Mount a central bearing device. Exercise care, to center the central. Bearing point in relation to the plate, both anteroposteriorly and laterally.

11. Mount the tracing device. Be sure to attach the devices securely to the occlusion rims. The stylus is, attached to the maxillary rim and, the recording plate to the mandibular rim. This arrangement develops an arrow point tracing with the apex.

12. Seat the patient with head upright, in a comfortable position in the dental chair.

13. Place the record bases in the patient's mouth with the attached recording devices. Inspect the record bases and recording devices for stability. Make sure that there is no interference between the occlusion rims, when the mandible is moved in any direction. Lower the stylus to the recording plate and determine that the stylus maintains contact with the recording plate during mandibular movements.

14. Retract the stylus and conduct training exercise with the patient. Place, the tips of the index fingers under the mandibular in the bicuspid areas. Place the tip of the thumb under the mandible near the chin. Calmly and quietly instruct the patient to move the jaw forward, backward, and to the right and left while gently applying guiding pressure with the thumb. It is possible to dislodge the mandibular record base by improperly placing the thumbs or by exerting excessive pressure. The "nay excursion guide" is an aid in training the patients.

15. When the patient is proficient in executing the mandibular movements, prepare the tracing plate to record the tracing. A thin coating of precipitated chalk in denatured alcohol applied evenly with a brush provides a medium that offers no resistance to the; movement of the stylus and produces a clearly visible tracing.

16. Develop an acceptable tracing by dropping the stylus to the record plate.

17. When a definite arrow point tracing with a sharp apex is made, have the patient retrude the mandible to centric relation. The point of the stylus should be at the point of the apex of the arrow point tracing. Injet quick setting dental plaster between the occlusion rims and allow the plaster to harden.

18. Remove the assembly and mount the mandibular cast with the new record.

This record is a tentative record and will be checked with an interocclusal check record when the teeth are arranged and the wax is contoured.

DISCUSSION

Centric relation attaches importance to the structure of the mandibular joint, whereas muscular position relies on habitual opening and closing movement. Clinicians who use muscle position use unguided closure, voluntary repeated mandibular closure (voluntary tapping) in the upright position¹². Todic J et al (2011) in his case report described the functional analysis of the orofacial system and the instrumental analysis of the mandibular movement (Gothic Arch Method) can be recommended as accurate and simple methods in craniomandibular disorder diagnosis¹³. Mohammed EL Armany¹⁴ deciphered

1. Needle point tracings were obtained from ten subjects at five different degrees of jaw separation.
2. All subjects showed anteroposterior change of the centric relation position as a factor of increases in the vertical dimension between the jaws. The mandibular centric relation position moved posteriorly when the vertical dimension between the jaws was increased.
3. Two subjects showed only negligible lateral deviations at any degree of opening while one subject showed consistent deviations from the midline when the vertical dimension between the jaws was increased.
4. The needle point tracings at a given vertical dimension of jaw separation under the same controlled conditions, on the same individual, at the same sitting, were not significantly different. On the basis of this study, the needle point tracing procedure is reliable. Villa et al concluded that When the Gothic arch tracing is correctly obtained, the occlusion on the working side will be the same in the mouth as it is on the articulator. However, when the Gothic arch tracing is not correctly obtained, the centric relation will be correct, but the occlusion on the working side as seen on the articulator will not be the same when the dentures are placed in the patient's mouth⁶. Hanau¹⁵ recommended use of the Gothic arch tracing but warned that it was a means of checking mandibular position and should be neither overrated nor underrated. Brill¹⁶ claims that the retruded position of the mandible (stylus at the apex of the tracing) does not coincide with the maximum intercuspation in all persons. Trapozzanoia¹⁷ insists that the retruded unstrained relation is the only proper position and that this position is constant throughout

life. Criticism of Gothic arch tracings stated that equalization of pressures did not occur, prognathic or retrognathic patients could not be used, and flabby tissues or large tongues could cause shifting of bases. Payne stated that the tracing was difficult to see and too much, patient cooperation was needed. Trapozzano believed that "check bites" were far more accurate than the central bearing point could possibly be, due to the unequal pressure produced. Block made the point that any sore spot under the base plate could cause an eccentric tracing. Granger stated that the Gothic arch produced was generally rounded and was, not precise enough.

CONCLUSION

The accurate determination, recording and transfer of jaw relation records from the edentulous patient to the articulator are essential for restoration of

function, facial appearance, and the maintenance of the patient's health. Unsatisfactory maxilla-mandibular relationships will eventually lead to the failure of complete dentures and necessitate time consuming and costly remarks. There is probably no best method for recording centric relation. A method proven to be good for one dentist may fail for the other. Both accurate and incorrect records of centric relation have been made by this method. This means that irrespective of the method used, subsequent clinical checking and rechecking must be done throughout the denture construction phases. Surprisingly, the earlier definition of retruding theory nor the current definition of an anterior bracing of the condyles has neither significantly changed the objective nor the procedure of recording centric relation in complete denture construction.

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