

## **FUNCTIONAL CHANGES IN TMJ DOCUMENTED BY INTRAORAL GRAPHIC REGISTRATION**

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### **Summary**

The functional changes in temporo-mandibular joint (TMJ) could create difficulties in one of the main clinical appointments-that for determination of the central relation of the lower jaw. Previous old complete denture treatment with not precisely registered parameters of jaws interrelations could also lead to over posed adaptive changes in the jaws elements, which after all can create preconditions for errors in establishing the central relation of lower jaw.

To minimize the conditions for mistakes in determination of the central position of lower jaw by complete denture patients with arthropathies the authors' aim was to make intraoral graphic registration (IOGR) of the lower jaw central position followed by an analysis of the Gothic arch.

Twenty six patients (twenty women and six men) aged between 59 and 80 years who showed an diversion more than 1.5 mm in the sagital and the frontal plane when registering the central position of the lower jaw by reflective and combined methods were subjected to IOGR.

The shape of the Gothic arch allows drawing conclusions for the functions of the lower jaw joints: unilateral limitation of the movements in laterotrusion (left or right), changes during the laterotrusion or protrusion, suspected disorders in retrusion.

Determination of the central position of the lower jaw using IOGR by patients with functional pathology is of great meaning for the success of the treatment with complete dentures. Otherwise the errors in registration of the central position lead to serious adjusting of the occlusion of the already processed dentures, which destroy the normal relief of the tubercles, the established vertical dimension and lead to reflective changes of the neuromuscular elements of the joints.

**Key words:** IOGR, full dentures, Gothic arch

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## **Introduction**

At the beginning of the last century the methods of graphic registration were used to present the movements in the TMJ and most of all to adjust the articulators according to the individual values of the patients. Since the early seventies Gerber documented that the form of the Gothic arch tracing allows conclusions for the function of the TMJ. That leads to a discussion if the different graphic tracings could be observed as signs of pathology of the jaw movements as well as additional diagnostic marks for estimation of joint function (1,2, 3).

According to Sheldon Winkler and L. Rush Bailey (4) the central relation is a guided, retruded posterior border position which by healthy patients can be considered as constant for clinical purposes. It is repeatable, recordable and is the point of reference for establishing central occlusion by edentulous patients. That's why by patients with changed or lost vertical interocclusal dimensions (VID), needing a new prosthetic treatment, the estimation and recording of the central relation is of primary importance before the new occlusal and articulating relations were established.

By patients with unacceptable and inadequate in occlusal-articulating aspect old dentures we found more often uncertainties by chewing, expectation of pain, decrease of extend of the movements. The clinical observation by such patients usually showed problems with the occlusion and lessening of the degree of jaw movements. In cases when those discrepancies are minimal the occlusal adjusting by trimming the tubercles of primary contacts is a widely acquired procedure. But only if those inaccuracies are little the clinician could act in those way. In cases when the mistakes are considerable, the patients too long accommodate with that situation and caused pain and additive adverse movements and adaptive reflexes and processes. All that leads to great difficulties when a new treatment lies ahead, especially at the procedure of determination of the interocclusal jaws relationship.

Because the interrelation between the mandible and the maxilla are seen very well during the intraoral graphic registration that procedure was chosen by the authors to record the central position of the mandible and to diagnose the TMJ disorders – to visualize and analyze the volume of the movements in the joints represented by the Gothic arch tracing at the horizontal plane.

To achieve minimal discrepancies at the appointment of determination of the central relation of patients with TMJ disorders and forthcoming complete denture treatment the authors aim was an intraoral graphic registration followed by an analysis of the Gothic arch tracing.

## **Materials and Methods**

Forty two patients (26 women and 16 men) aged from 45 to 81 years seeking a prosthetic treatment during the student education in clinics of Prosthodontics were subjected to IOGR. All of them complained of discomfort, uncertainty, unilateral or bilateral pain during mastication but not connected with prosthesis` hurts. 25 patients informed that they prefer chewing at one side only; 3 of them complained of crepitating and crackle in the joints during eating; two of them said that the noise of cracking was so strong that it was heard by the next standing people, and four of them complained of dislocation of the jaw when wide opened.

The clinical observation included the following procedures:

1. Observation and palpation of denture bearing tissues. Special attention was placed upon painful areas and spots-exostoses, decubitus, aphthae, which could be a cause for pain.
2. Checking of old dentures for impair occlusion (spatula test).

3. Checking of the occlusal contacts with articulating paper.
4. Checking of the vertical dimensions and the central relation of the old dentures.

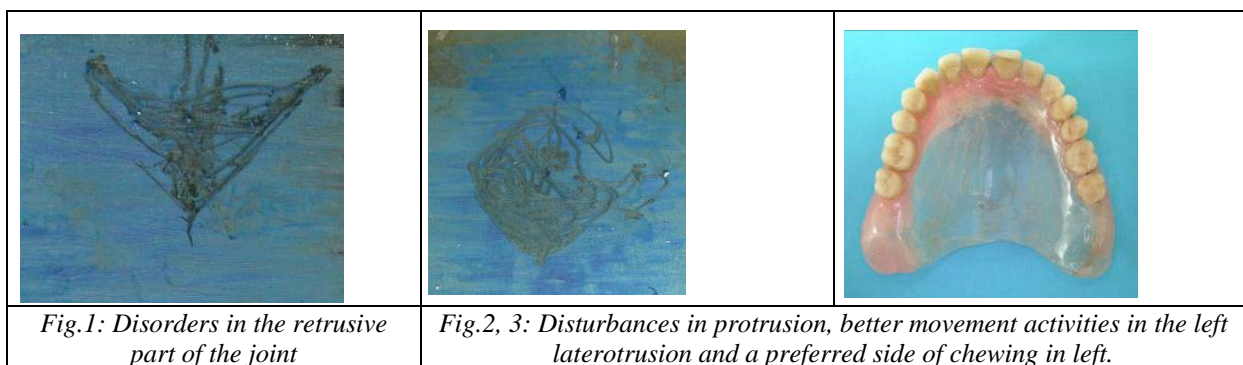
5. The mandibular range of movements for each patient was documented by means of intraoral Gothic arch tracing, which was recorded by an appliance that consisted of a maxillary and mandibular device. The maxillary part covered the palate of the upper recording base and included an adjustable pin that was attached in the center of the palatal plate, which coincide with the imaginary line connecting both maxillary first molars. With the mouth closed, the tip of the pin was in contact with the mandibular plate of the Gothic arch assembly simultaneously with the occlusal rims of the previously determined vertical interocclusal relationship, with wax rims not disturbing the movements. Each subject was seated upright against the back of the dental chair with the head rest in place. The patient's head was positioned so that the plane of occlusion was horizontal. The surface of the mandibular part of the assembly was covered by dye pencil. The patients were instructed to close the mandible until the pin touched the lingual plate. Subjects were instructed to produce their maximal protrusive, retrusive and lateral mandibular excursions according a previously trained protocol and without losing contact between the pin and the lingual plate.

### Results

The observation of the old dentures showed that all patients had old dentures aged from 2 to 8 years of use. We established that all of the old dentures had very abraded occlusal tubercles and by 25 of those in one side more expressive abrasion up to elimination of the whole relief, as well as cases with uneven and asymmetric abrasion with missing (destroyed or fractured) artificial teeth.




By 31 patients we established unbalanced and unstable occlusion when closing in central occlusion, accompanied by sliding forward or forward and aside more than 1.5mm. By all of them were found diversions over 1.5 mm in the sagittal and in the frontal plane when comparing the reflective and combined methods for estimation of the central position of the lower jaw.

On fig.1 is shown the vertical path, protruded beyond the arrow point of the tracing is a sign of retrusive movements in the jaw. The unclear shape of the apex indicates for disorders in the retrusive part of the joint.



Disturbances in protrusion - the tracing visualize the clinical findings are shown on fig.2: the patient very uncertainly makes the retrusive movements when pushing back the mandible from protrusion (PT) to central position, as well as the movements from laterotrusion (LT) to central point. Coming into central relation (CR) is accompanied with chaotic and guessing circular movements. The Gothic arch is more clearly drawn in the right segment-the right tracing is more distinct, which show better movement activities in the left laterotrusion (LLT) (going to maximum left and back to the centre). The observation of the old dentures showed more defined abrasion in the teeth in the left side of the prostheses, which indicates for a preferred side of chewing in left (fig.3). In the interview the patient mentioned that he “feel the left side more sure”.



Asymmetric Gothic arch with sharper angle between the left arm and the vertical line than in the right part of the picture (fig.4). It demonstrates for slight movements in the backward components.

		
<i>Fig.4: Asymmetric Gothic arch</i>	<i>Fig.5: Retrusive disorders in TMJ</i>	<i>Fig.6: Chaotic and uncertain movements</i>


On fig.5 is represented a vertical path, protruded beyond the arrow point of the tracing. It is possible when the picture is achieved with protruded mandible, but here shows for retrusive disorders in TMJ.

Chaotic and uncertain movements when going back from PT to CR are shown on fig.6. In the right part the movements are more coordinated, while in LLT they are difficult and coming back to CR are insecure, accompanied with arbitrary lateroprotrusive movements. The old dentures' observation of those patients showed more expressive artificial teeth's abrasion in right, which was the preferred side of chewing, or the side with last existing teeth.

Asymmetric form of the gothic arch is demonstrated on fig.7 with one side limited lateral movements. The tracing indicates a distinct inhibition of the forward movement in the left joint. The observation of the dentures showed more advanced teeth's abrasion in the left side of the dentures and even with fractured teeth (fig.8, 9).

	
<i>Fig.7: Asymmetric form with one side limited lateral movements.</i>	<i>Fig.8, 9: More advanced teeth's abrasion in the left side of the dentures and fractured teeth.</i>

Disturbances in the path of PT but distinct and symmetrical lateral movements of the condyles in the fossae at laterotrusion both left and right are represented on fig.10.


<i>Fig.10: Disturbances in PT and symmetrical lateral movements.</i>

### **Discussion and Conclusions**

By 80% of patients diversions in the form of the Gothic arch tracing were observed such as: asymmetry of the two lateral arms, differences in length and reproducibility of the movements in LT and PR and others. The form of the tracing allows coming to joint function conclusions. So the protrusive drawings register the influence of the condyle path on the movements of the lower jaw. The laterotrusive parts of the picture -left or right – can visualize changes in the lateral movements in one side or in both sides limitation in the laterotrusion left or right as well as along the laterotrusive motion. Suggestions for disorders in retrusive area are established by 60% of patients.

The intraoral graphic registration except for precise determination of the central position of the lower jaw has a diagnostic and prognostic meaning. That gives us a ground to be the preferred method used for patients with established mistakes in the previous complete denture treatment. The discrepancies in the established central position lead to a substantial tubercle grinding of the processed dentures and destruction of the relief of the artificial teeth and the established already vertical jaw interrelation too and as a result of it cause to reflective changes in the jaws and in the nerve and muscle tissues.

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