

## Case Report

# Profile Teleradiography: A Diagnostic Means and a Prosthetic Construction Aid for the Removable Prosthesis

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### ABSTRACT

The profile teleradiography finds its indication in removable denture each time that the complexity of the case requires it. It is used as a working tool with a clinical value for refining our diagnosis. The aim of this work is to establish, through a clinical case, the importance of this radiography in the diagnosis and prosthetic decision-making.

#### Keywords

Profile teleradiography; Radiological occlusal plane; Occlusion sagittal curve; Cephalometric method.

### INTRODUCTION

The restoration by the removable denture must optimally reproduce the functions and the aesthetics lost following the edentulism.

To meet these goals, several parameters should be considered to ensure the prosthetic balance and the restoration of the aesthetics of the patient: one of these parameters is the correct orientation of the occlusal surface.

This essential criterion to restore requires the use of several references such as the profile teleradiography that is a simple and effective way.

### EDENTULISM AND DISTURBANCE OF THE OCCLUSAL CURVES

The restoration of partial edentulism and total unimaxillary edentulism is often complex, due to the loss more or less ancient of the teeth, the absence of prosthetic restorations, or the inadequate design of prostheses.

Therefore, we often find regressions, important abra-

sions, rotations and various misalignments that lead to disruptions of functional curves, which prevent the good prosthetic integration within the manducatory system.

So, before starting the prosthetic realization, it is imperative that the practitioner corrects all these problems, cited above, according to a reliable reference which is the occlusal plane and subsequently he does make prostheses with a mounting of prosthetic teeth which respects this same plane guarantor of an optimal occlusal balance.

This reference occlusal plane is not a clinical reality; it is a theoretical plane defines by the curves of compensation.

Several authors have tried to give an exact orientation of the occlusal plane:

For Dawson<sup>1</sup>: “It is a virtual surface, theoretically determined by the edge of the incisors and cuspal point of the molars and premolars”.

Lejoyeux<sup>2</sup> defines it as “a conventional plane passing by the incisal edges of the two maxillary central incisors and by the

Summit of the distolingual cusp of each upper molar.  
In fact, the occlusal plane is the ideal plane according to which the two arches must meet to ensure simultaneously:

- Respect of the integrity of the support surfaces;
- The recovery of the mastication by movements of propulsion and laterality without interference or occlusal prematurity. For this purpose, a good orientation of the occlusion curves is essential: Indeed, if the sagittal curve is too marked there will be posterior interferences during the propulsion and if the frontal curve is accentuated there will be interferences of the non-working side in laterality;
- The recovery of the aesthetics and phonation by a good level of the anterior occlusal plane.

**THEN THE QUESTION IS: HOW CAN WE ORIENT OCCLUSAL PLAN RELIABLY?**

**Contribution of Profile Radiography in the Orientation of the Occlusal Plane**

Classically the clinicians<sup>3</sup> ensure the adjustment of the maxillary occlusion rim using the Occlusal Plane Plate (Figure 1) by seeking the parallelism with:

- The bipupillary plane concerning the antero-superior occlusion rim (Figure 2a);
- The Camper plane concerning the postero-superior occlusion rim (Figure 2b) (At the level of the skin Camper plane passes by

two points: tragus and under nasal).

However, many comparative studies have demonstrated that this plane remains variable and quite different from the real occlusal plane, according to the craniofacial typologies.<sup>4,7</sup>

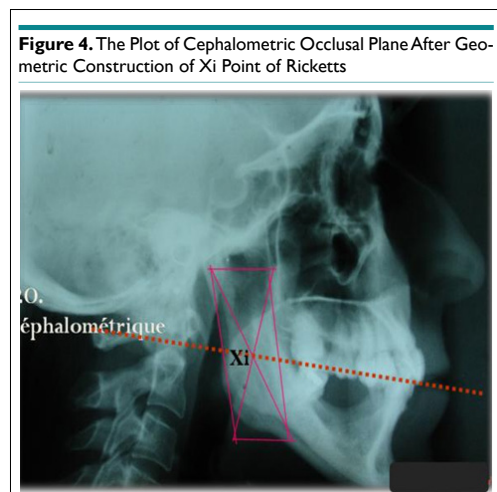
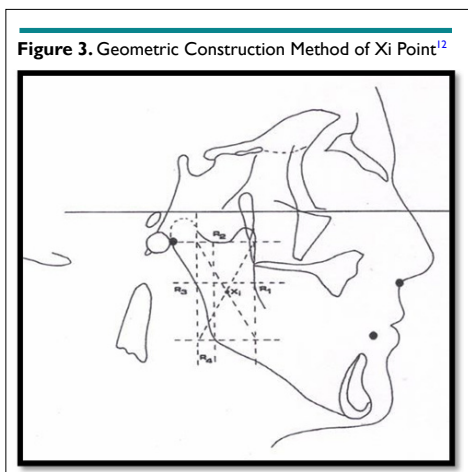
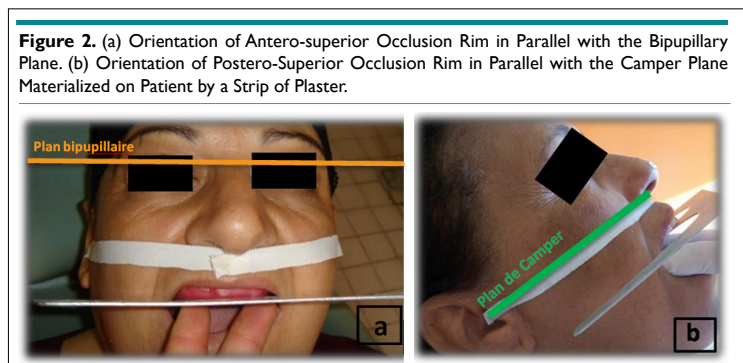
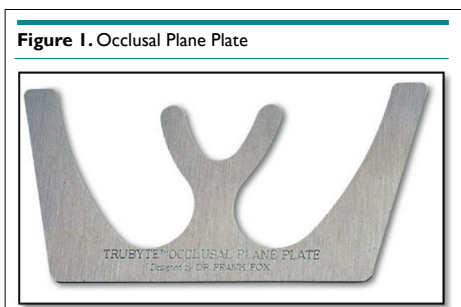
We need then a more valid method and it is indeed the profile telerradiography, which can define the sagittal orientation of the occlusal plane, and allows the determination of the individual radius of curvature.<sup>8</sup>

It is very useful, especially in the case of large occlusal disorders.<sup>9</sup>

Monniot and Migozzi<sup>10</sup> concluded, after a statistical study of more than 100 profile telerradiography of toothed patients in angle class I, that:

- In 50% of cases there is an exact superposition of the plane determined by Xi with the subject's occlusion plane;
- In 30% of cases this superposition is almost exact;
- In 20% of the cases, the occlusal plane of the subjects moves away from 1% of the plan determined by Xi.

Ricketts<sup>11</sup> has very explicit the technique: he has defined two points, the first is anterior passing through the middle of incisal recovery and the second is posterior named Xi; this point is created by geometric construction and will be located at the level of the center of the mandibular ramus (Figure 3 and 4).



This geometric construction is done as follows: First, it is necessary to locate the points R1, R2, R3 and R4.

- R1: Is the most slope point of the anterior part of the mandibular ramus;
- R2: is the most slope point of the mandibular notch;
- R3: is the point situated at the intersection of the posterior part of the mandibular ramus and a parallel to Francfort passing through R1;
- R4: is the point situated at the intersection of the lower edge of the mandible and the perpendicular to Francfort passing through R2.

Then we draw the mandibular rectangle by tracing:

- The perpendiculars to Francfort passing through R1 and R3;
- The parallels to Francfort passing through R2 and R4;
- The Xi point is situated at the intersection of the diagonals of the triangle thus formed.

We should note that in the case of anterior tooth loss, where we cannot determine the anterior point, we are going to proceed to an initial orientation of the occlusal plane during the adjustment of the maxillary occlusal registration rim in the mouth according to the classical technique. Then ball of lead will be arranged at the level of the inter-incisive point (Figure 5) to be visible on the teleradiography. This technique has been used by Lejoyeux.<sup>2,13</sup>

## CASE REPORT

A 58-year-old female patient was referred to the removable partial denture department for restorative treatment. On examination, the patient had a class I Kennedy Applegate mandibular edentulism and class V division 1 at the maxilla. The edentulism was old so that the occlusal context was very disturbed. Thus, the occlusal plane had to be correctly oriented in order to judge dental and osseomucosal corrections imposed to restore the functional curves.

**Figure 5.** Positioning of the Radio-opaque Balls at the Level of the Maxillary Occlusion Registration Rim



Therefore, a profile radiography was used to determine the radiological occlusion plan (Figure 6).

## Now after Determining this Plan how we can Transmitted it on Articulator to be able to make the Necessary Corrections?

In reality, what we must transfer on the articulator is not a plane of occlusion but a sagittal curve of the occlusal plane. Wadsworth<sup>14</sup> accepts the theory of the sphere but individualizes the radius of curvature by choosing the distance inter incisal point-condyle. From this distance as the radius of the individual occlusal sphere, it is easy to materialize an individual occlusal curve.

For Orthlieb<sup>15</sup> also the creation of a plane occlusion is a solution of facility, which does not resist to the analysis if we take into consideration the periodontal imperatives.

According to this author, to transfer the radiological occlusion plane to the articulator we must determine the individual radius of the Spee curve by applying this equation:

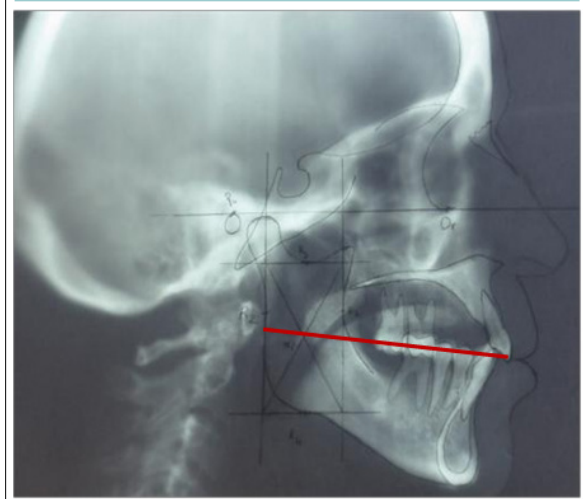
$$R=134.43 \text{ mm}-(DPO \times 1.42)$$

1, 5-diphenyl-2, 4-pentadien-1-one (DPO) being the distance separating perpendicularly the axio-orbital plane of the occlusal plane passing through inter incisive point and Xi point (Figure 7).<sup>16</sup>

To draw the sagittal curve, we can continue by using flag technique:

- The flag is placed on the upper frame of the articulator on the sagittal plane or on the same vertical plane as the hemi-arcade at rehabilitate;
- Then the branches of the compass are displaced according to the value of the individual radius and a first arc is drawn on the flag from center's condyle. A second arc is drawn from the maxillary or mandibular canine point;

**Figure 6.** Construction of Radiological Occlusion Plan



- The intersection of two arcs is located at the center of the sphere from which the curve of Spee is plotted on the casts (Figure 8).

This preprosthetic analysis shows that the mandibular and maxillary teeth must be reduced at different levels to be able to ensure the restoration of the ideal level of occlusal plane.

Depending on the quantity of tissue to be removed, either coronoplasty or fixed prosthesis is indicated. Then the materialization of the prosthetic project being ensured by the wax up and director mounting (Figure 9).<sup>17</sup>

The director mounting will be polymerized and will serve, on the one hand, as a guide for the practitioner in the achievement of the dental preparations in the mouth and on the other hand, as a temporary removable denture the time to achieve our final prosthesis.

## DISCUSSION

The failure or success of the removable prosthesis depends essentially on correct occlusal plane determination. Several techniques have been described in the literature.

The statistical studies that were done to see which of these techniques was the most reliable attributed a great deal of reproducibility and validity to the radiological determination of occlusal plane from a profile radiopathology.<sup>10</sup>

But, there is no doubt that in clinical practice the technique of parallelization of the anterior occlusal plane with the bipupillary plane and posterior occlusion plane with Camper plane remains the most used by practitioners. However, this is only possible for simple cases.

Indeed for difficult cases requiring great precision in general prosthetic rehabilitation and more particularly at the occlusal level, the radiological determination of occlusal plane is fully indicated but still insufficient.

In fact, our objective is not to reproduce a plane surface, but a sagittal occlusion curve. This is why we must enchain by the geometrical construction of the latter after having deduced the radius of curvature by analyzing of profile radiography.

However, it is necessary to note that this technique requires the use of steps of transfers, which complicates and sometimes extends prosthetic time. The practitioner must be also accustomed to work on a semi-adaptable articulator: a bad manipulation can be a source of error that can distort the result.

It is also important to remember that besides precious information regarding the occlusal plan the teleradiography intervenes also when an ortho-surgical treatment should be laid down in preprosthetics steps or when increasing or decreasing of vertical dimension is discussed.<sup>18,19</sup>

## CONFLICTS OF INTEREST

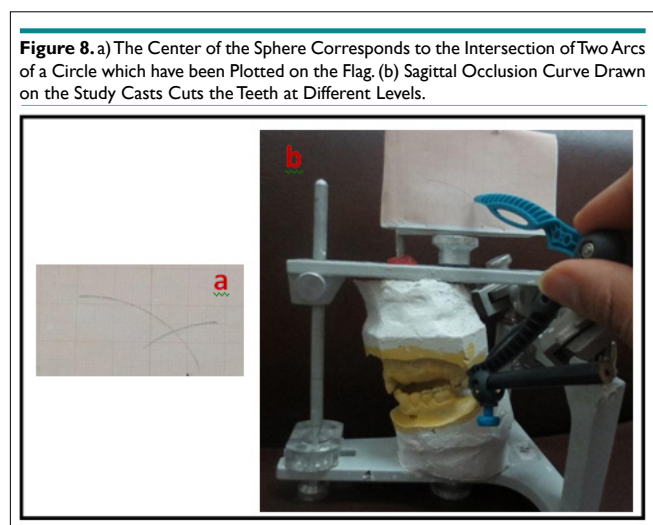
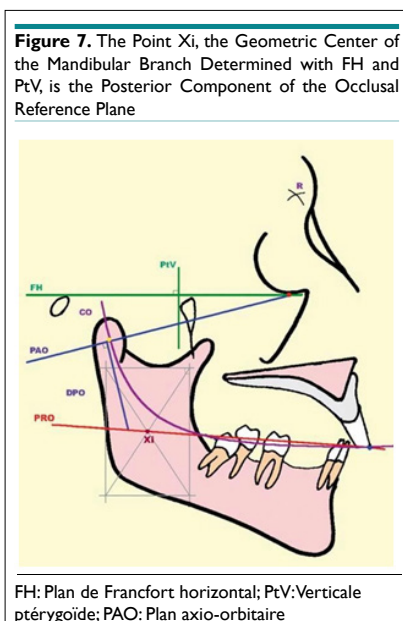
The authors declare that they have no conflicts of interest

## CONSENT

The authors have received verbal informed consent from the patient.

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**Figure 9.** a) The Center of the Sphere Corresponds to the Intersection of Two Arcs of a Circle which have been Plotted on the Flag. (b) Sagittal Occlusion Curve Drawn on the Study Casts Cuts the Teeth at Different Levels



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