Pre-extraction records for complete denture fabrication: A literature review

Majid Bissasu, DDS, PhD
School of Dentistry, Al Baath University, Homs, Syria

Dentists use arbitrary methods in determining the vertical dimension of occlusion, and arranging the maxillary anterior teeth. Some dentists have difficulty in making maxillomandibular records for completely edentulous patients. Therefore the use of pre-extraction records has been recommended. This article reviews the pre-extraction records proposed for determining the vertical dimension of occlusion, recording centric relation, and arranging the maxillary anterior teeth. A MEDLINE search, from 1966-2002, for the key words “pre-extraction records” was supplemented with a hand search to identify relevant peer-reviewed English articles published in dental journals. On the basis of the review, it appeared that pre-extraction records proposed for determining the original vertical dimension of occlusion and arranging the maxillary anterior teeth for a completely edentulous patient were useful and preferred to arbitrary methods, whereas pre-extraction records proposed for recording centric relation may not be necessary. (J Prosthet Dent 2004;91:55-8.)

The complete denture (CD) replaces the entire dentition and associated structures of the maxilla or the mandible. Establishing the vertical dimension of occlusion (VDO), recording centric relation, and arranging the maxillary anterior teeth in their proper position are important for the success of CDs. Dentists may use arbitrary methods in determining VDO and arranging the maxillary anterior teeth, and some dentists have difficulty in recording centric relation. To overcome these problems authors have recommended the use of pre-extraction records (PERs). The most common PERs include pre-extraction diagnostic casts (PEDCs), instruments (the Dakometer, profile template, Willis gauge, Sorenson profile scale, and orofacial device), measurements (between tattoo points, of the closest speaking space, and of the physiological rest position), photographs, and radiographs.

Several authors have stressed the use of PERs in recording VDO and arranging the maxillary anterior teeth. Turrell reviewed many methods used in determining the VDO. Smith stated that PERs should be used and using them should be emphasized in the prosthodontic curriculum. Silverman also stated that the greater the number of PERs available to the dentist, the greater the chance of success. The purpose of this article is to review PERs that have been proposed and used in determining VDO, in recording centric relation, and in arranging the maxillary anterior teeth for a completely edentulous patient. A MEDLINE search from 1966-2002 for the key words “pre-extraction records” was supplemented with a hand search to identify relevant peer-reviewed English articles published in dental journals.

**PRE-EXTRACTION RECORDS IN DETERMINING VDO**

Many authors have proposed the use of PEDCs for determining the VDO of the edentulous patient. Heintz and Peters used PEDCs to record the position of the maxillary and mandibular teeth and the maxillomandibular relationship, as existed before the teeth were removed, by incorporating a stone replica of the natural teeth in their original relationship in occlusion rims of the edentulous stone casts. Impressions for maxillary and mandibular PEDCs were made in an irreversible hydrocolloid material. A layer of aluminum foil was adapted to the edentulous maxillary and mandibular definitive stone cast. Dental stone was vibrated into the impressions of teeth in the irreversible hydrocolloid impressions. The edentulous definitive stone casts were placed into the irreversible hydrocolloid impressions. After the stone was set, the stone teeth were removed from the irreversible hydrocolloid impressions and attached, using sticky wax, to their original position on the edentulous definitive stone cast. The maxillary and mandibular definitive stone casts were mounted in an articulator with stone teeth in maximal intercuspation, and artificial teeth arranged similar to an immediate complete denture arrangement. The method necessitated additional procedures and was time consuming.

Quinn et al made maxillary and mandibular record bases and wax occlusion rims, recorded patient’s maxillomandibular relationship, and made wax flanges for the dentate areas of the PEDCs. The maxillary and mandibular record bases, wax flanges, and the stone teeth were duplicated in a duplicating flask using reversible or irreversible hydrocolloid impression material. The replica wax bases were used for making the definitive impression, the resultant stone casts and the replica wax bases and the wax teeth were mounted in an articulator in maximal intercuspation, and the artificial teeth were ar-
ranged with the impression material in place. This method also required additional procedures and was time consuming. Bissasu\textsuperscript{1,3} proposed determining the original VDO of the edentulous patient by measuring the distance between the center of the incisive papilla and the incisal edges of the maxillary central incisors and between the anterior attachment of the lingual frenum and the incisal edges of the mandibular central incisors, on PEDCs, and then adjusting the maxillary and mandibular wax occlusion rims, anteriorly, to correspond with these measurements. The method was simple and did not require additional armamentarium.

The most common instrument advocated for use in determining VDO was the Dakometer.\textsuperscript{14-17} This instrument recorded both the VDO and the position of the maxillary anterior teeth. The instrument was placed on the patient’s face while the patient closed into maximal intercuspation. With the instrument in position, the edge of the instrument moved to engage the incisal edges of maxillary central incisors. The measurements were recorded and used after the patient had the remaining teeth extracted. Some authors\textsuperscript{18-20} suggested the use of a profile template and described several methods to fabricate it. The profile template recorded facial contour in the mid-saggital plane before the extraction of the natural teeth and served as a guide for determining the VDO and arranging the maxillary anterior teeth. The template was placed against the edentulous patient’s face to determine if the proper facial contour had been reestablished. When the template was placed on the face, the skin was displaced; therefore, errors may have been introduced.\textsuperscript{17} Willis\textsuperscript{21} recommended the use of the Willis gauge for measuring the vertical height from the undersurface of the chin to the base of the nose. This method introduced inaccuracies because it depended on the operator applying the exact same degree of pressure when the instrument made contact with the skin of the face. Smith\textsuperscript{22} recommended the use of the Sorenson scale. The nasion locator of this instrument was placed in the mid-saggital plane before the extraction of the natural teeth and recording the measurements. The method was simple and could be helpful, but Rivera-Morales and Mohl\textsuperscript{20} did not support using the closest speaking space in determining the VDO. On the other hand, many authors\textsuperscript{31-33} reported instability of the physiological rest position.

Wright\textsuperscript{27} compared measurements of anatomic landmarks on photographs with measurements using the same anatomic landmarks on the face for many edentulous patients. Wright\textsuperscript{27} stated it was advantageous to relate, through the arithmetical process of proportion, certain measurements made from previous patient photographs to measurements on the patient’s face, such as the interpupillary distance and the distance from the top of the eyebrows to the base of the chin. The method was simple but, unfortunately, the skin covering the chin was movable.

Profile radiographs have been suggested as PERs for establishing the VDO.\textsuperscript{29} The image should have approximately a 1:1 ratio to the patient’s head. The exposure of a full lateral skull film was made with the teeth in occlusion, and after extraction, another skull film was made with occlusion rims in contact. The 2 films were compared and necessary adjustment was made.\textsuperscript{29} Conventional radiographic equipment used to provide profile radiographs was not available in most dental offices. Furthermore, the method required additional time and would result in additional patient exposure to radiation.

Although most PERs may not be completely accurate, some authors\textsuperscript{17,22,25} agreed that PERs were more useful than the conventional methods for determining physiological rest position, closest speaking space, and the VDO for edentulous patients. Turrell\textsuperscript{17} evaluated many methods of recording VDO in edentulous patients and stated that in spite of the problems with most pre-extraction recording instruments, some of them were more accurate in the assessment of the VDO than numerous postextraction aids. Smith\textsuperscript{22} also investigated the reliability of 5 methods for making PERs of the VDO and 3 methods for making PERs of the maxillary incisal points. He found that all of the methods used in determining VDO were clinically useful, and the potential for variation of the methods he evaluated was less than the potential variation for the physiological rest.
position in common use. Silverman\textsuperscript{25} also stated that when CDs are made without PERs of the closest speaking space, the clinician must use arbitrary methods to establish the proper VDO.

**PRE-EXTRACTION RECORDS FOR RECORDING CENTRIC RELATION**

Several authors proposed recording the centric relation position for edentulous patients before the extraction of the natural teeth to be used in the fabrication of CDs.\textsuperscript{11,12,14,15} Heintz and Peters\textsuperscript{11} and Quinn et al\textsuperscript{12} proposed using diagnostic casts made before the extraction of the remaining natural teeth for recording centric relation. Murphy\textsuperscript{14} also recommended using PEDCs to record the centric relation position by means of wax occlusion rims, for patients who had edentulous areas in both maxilla and mandible, to be used after extraction of the remaining natural teeth to record the patient’s centric relation. Sproull and Broone\textsuperscript{15} mounted maxillary and mandibular casts in an articulator, removed the mandibular cast from the articulator, and replaced it with an index. Plaster indexes were made on the hard palate and the occlusal and incisal surfaces of the maxillary teeth, and using the plaster indexes, the maxillary edentulous definitive stone cast was mounted in the articulator and the maxillary teeth were arranged. Because this method was recommended for patients with maxillary CDs only, it was of limited value for the completely edentulous patient. Fortunately, if temporomandibular joint disorders are not present, the centric relation position is reproducible and stable with or without teeth present.\textsuperscript{34} Therefore, recording the edentulous patient’s posterior horizontal maxillomandibular relationship that existed before the extraction of the remaining natural teeth in CDs was not necessary.

**PRE-EXTRACTION RECORDS IN ARRANGING THE MAXILLARY ANTERIOR TEETH**

Most methods that had been proposed using PEDCs and instruments, mentioned above, for determining the edentulous patients’ VDO and centric relation, proposed recording the position of the maxillary anterior teeth as well.\textsuperscript{11,12,15,18-20} In addition, Bissasu\textsuperscript{16} reported making a transparent vacuum-formed template to the patient’s edentulous PERs that existed before the extraction of the remaining natural teeth. The method was reported to be simple and practical. Smith\textsuperscript{22} designed an instrument, the incisor point locator, which allowed transferring the location of the maxillary incisor point from a PEDC to the wax occlusion rims placed on the edentulous definitive stone cast. Irreversible hydrocolloid was placed without a tray into the palate of the maxillary PEDC and over the central incisors. The anterior portion of the irreversible hydrocolloid was cut at the midline and removed to expose a maxillary central incisor on one side only. The edentulous definitive stone cast was clamped into the locator and the irreversible hydrocolloid record positioned on the palate. A pointer was clamped so that the stylus was located at the maxillary incisor point. The irreversible hydrocolloid record was removed from the definitive stone cast and replaced by the patient’s wax occlusion rim. Then the labial surface and the height of the maxillary wax occlusion rim were trimmed and the midline was marked to correspond to the stylus of the clamped pointer. The procedure required special equipment and took additional time. Bliss\textsuperscript{28} emphasized the use of 3-dimensional photography as a valuable aid in evaluating tooth arrangement and fullness of the face. Photographs of the patient’s face were made by positioning the head in the V formed by 2 mirrors placed at right angles to each other.

**SUMMARY**

This article reviewed the PERs proposed for determining the VDO, recording centric relation, and arranging the maxillary anterior teeth for a completely edentulous patient. The review of the literature indicated that PERs provided a useful guide in determining the edentulous patient’s original VDO and arranging the maxillary anterior teeth. Therefore PERs are preferred to arbitrary methods in common use. However, PERs were not necessarily needed for recording centric relation position for edentulous patients.

**REFERENCES**

32. Silverman MM. Pre-extraction records to avoid premature aging of the denture patient. J Prosthet Dent 1955;5:465-76.

Reprint requests to:
Dr. Majid Bissasu
PO Box 768
Homs, Syria
Fax: 963-31-462-345
Email: bissasu76@gawab.com

Copyright © 2004 by The Editorial Council of The Journal of Prosthetic Dentistry.

doi:10.1016/j.prosdent.2003.10.004

New product news

The January and July issues of the Journal carry information regarding new products of interest to prosthodontists. Product information should be sent 1 month prior to ad closing date to: Dr. Carol A. Lefebvre, Editor, The Journal of Prosthetic Dentistry, School of Dentistry, AD-1112, Medical College of Georgia, Augusta, GA 30912-1255. Product information may be accepted in whole or in part at the discretion of the Editor and is subject to editing. A black-and-white glossy photo may be submitted to accompany product information.

Information and products reported are based on information provided by the manufacturer. No endorsement is intended or implied by the Editorial Council of The Journal of Prosthetic Dentistry, the editor, or the publisher.