Role of Cephalometrics in Prosthodontic Diagnosis

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Article history:
Received: 24 January, 2014
Accepted: 26 January, 2015
Available online: 08 March, 2016

Keywords:
Cephalometrics, complete denture, partially edentulous

Abstract
Factors such as increasing the occlusal vertical dimension, degree of posterior extension of an upper denture, the anatomy and angulations of the soft palate, function of the tongue or length and actions of the lips and degeneration of the temporomandibular joint; these illustrate the need for a more basic concept and rational approach to the management of prosthetic and reconstruction cases. This article proposes to demonstrate the use of a tool or weapon in the available armamentarium of the Prosthodontist - namely the use of Cephalometrics roentgenography.

Citation:

1. Introduction

The success or failure of increasing the occlusal vertical dimension may be closely related to the shape of the mandible. The degree of posterior extension of an upper denture may depend upon the form of the base of the skull which is thought to influence the angulations of the soft palate. The stability of the lower denture is frequently dependent upon the size and function of the tongue or length and actions of the lips. Degeneration of the temporomandibular joint can be caused by the loss of posterior teeth and by arch irregularity.

Factors such as these illustrate the need for a more basic concept and rational approach to the management of prosthetic and reconstruction cases. This article proposes to demonstrate the use of a tool or weapon in the available armamentarium of the Prosthodontist - namely the use of cephalometrics roentgenography.

Certain planes or points of the facial and skull have been used for orientation of the denture. The eye-ear plane, or Frankfort plane, and the ear-nose plane, or Camper's plane, has been employed for reference.

Greater understanding of the problems and more agreement on treatment may result from better means of visualization. From cephalometrics, information has been derived to classify the anatomic relationships and to determine the physiologic conditions of the structures of the head and neck. More important however, cephalometrics has revealed the changes induced by treatment and served as a record to evaluate the ultimate success or failure of treatment objectives years later. (Ricketts R.M, 1956)

2. Physiological Considerations of the Head

The environment of the denture is created by the arrangement of musculature on the bony framework of the face and base of the skull or brain case.
The first system, that is displayed in almost a horizontal manner, is the superior constrictor, buccinator lip complex. This muscle system constricts and is the limiting factor in the molding of the arch of teeth. It can be seen to extend from the lips to the posterior throat wall and to the base of the occipital bone.

The second system of musculature is that of the soft palate and the lateral throat walls. This system can be visualized as functioning in almost a vertical manner. The elevator of the soft palate, being attached near its middle, hooks the soft palate in an upward and backward direction as the end of the soft palate is elevated and, in swallowing, the soft palate serves as a plunger for driving food into the pharynx.

The third system of musculature can be thought of as links in a chain. This chain starts from in back of the head, in the postcervical muscles which support the head in the upright position, and circles the head, coming into the temporalis, the masseter, and the superior and inferior hyoid muscles. In this arrangement the face is supported in a cantilever fashion with the mandible, the tongue, and the pharynx operating in an elastic chain. As on muscle is stretched, the remaining muscles take up the slack to maintain stability of the system. An appreciation of this chainlike function can be gained by observing the acts of chewing, swallowing, and speaking in cinemfluoroscopy. The role of the tongue should not be overlooked in this arrangement, for it, too, serves as a plunger; opposing the lips and cheeks on the outside, it serves as the molding influence for the dental arch from within.

When the mandible is viewed in this manner, it is seen to occupy its place in the muscle system. It therefore, must be remembered that the purpose of the mandible is not merely for the support of teeth. Factors other than those concerned with the teeth must be considered when dealing with mandibular relationships. (Profitt W, Fields H et al., 2002)

3. Findings on Facial Variations

As stated before, the muscle systems of the head and neck are arrangement and draped on a skeletal framework. Variations in that framework, therefore, influence to a large degree the direction and effect of the muscles involved.

It will be noted that retrognathic-type faces are characterized by a small mandible or by a mandible that is located posteriorly in the cranial base. This yields high convexity to the profile. Large mandibles combined with small maxillae produced serve concavity to the facial outline. These conditions represent a disharmonious relation of the basal bones. However, the alveolar process and teeth can also contribute to disharmony at the mouth.

In each of these instances, extreme variation can be seen in the tongue, the lips, and the soft palate. In addition, differences in the physiology of the muscles of mastication are suspected on the basis of form and relation of the facial bones. (Hajighadimi M, Garakani F et al., 1981)

Therefore, it seems apparent and important that functional variation is implicit with certain variations in the form of the face and the relationship of the skeletal parts.

3.1. The Rest Position Concept

By studying serial cephalometric head roentgenograms of growing children, and by studying a series of patients receiving artificial dentures, Thompson concluded that the physiologic rest position of the mandible was constant. He postulated that the mandible was suspended in the chainlike arrangement of musculature described above, and was therefore positioned by muscle tonus.

Following these significant findings, the analysis of occlusion came to be made from the resting position of the mandible. (Engel G., 1981)

3.2 Laminagraphy

Application of the same cephalometric techniques to laminagraphy provided a true lateral image of the condyle and fossa, capable of being measured, and included the denture and the joint simultaneously. Laminography was, therefore, the method of choice for a controlled investigation of the temporomandibular articulation.

4. Discussion

When used in the proper manner, cephalometrics can be a useful tool to the prosthodontist. Each face has its own characteristics and these can be classified by the application of cephalometric procedures. A clear definition of the basic structures of the jaws and the base of the skull is available in the head film. The teeth can be related to the bony framework of the face in all dimensions. The relationship of the lips, the tongue, the soft palate, the throat walls, and the hyoid bone can all be evaluated and correlated to the various occlusal problems. In addition, many functions of the mandible can be measured. The interocclusal dimension or the free-way space can be determined and the rest position of the mandible has been postulated to be of clinical significance. The clinical use of cephalometrics should lead to
better treatment prescription and prognosis for the individual.

The need for dental prosthesis arises most frequently in the middle or later years of life following the gradual loss of teeth and improper chewing patterns. These have often been progressive, and sometimes irreversible situations are present as a result. In treatment, therefore, it may be asking too much of the patient to adhere to a fixed conception of the ideal. Therefore, the philosophy of a continuous vigilance toward the ideal is sound. Under such an orthopedic philosophy, it may take many attempts to reach the ideal if that is ever possible.

It is, therefore, important that a cephalometric record be obtained so that treatment procedures can be evaluated, and that the changes that occur after treatment and through the dimension of time can be recorded. The success or failure of treatment procedure after years of wear can thus be evaluated. (Bishara S.E., 1990, Behbehani F, Hicks E.P., et al, 2012, Handan A.M., Rock W.P, 2001, Reitz Philip, Aoki Hides et al., 1973, Hughes George A, 1951)

Clinical significance

It is clearly evident that the interest of the dentist should not be limited to the teeth and mastication alone. The functions of speech, respiration, posture, and psychosomatics are equally important considerations. A better interpretation of all of these functions can be obtained through cephalometric procedures.

Summary

A biologic and physiologic approach to prosthodontics diagnosis has been outlined. Also Correlations with these findings to laminographic studies of the temporomandibular joint were made. And it is clearly evident that when observations from research in cephalometrics is directed or applied to prosthodontics has been found to give better interpretations of all the functions of speech, respiration, posture and psychosomatics.

References


