

CONVENTIONAL FULL DENTURE PROSTHODONTICS

Antonín Zicha

UČEBNÍ TEXTY
UNIVERZITY KARLOVY

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Conventional Full Denture Prosthodontics

Antonín Zicha

Reviewed by:

doc. MUDr. Pavel Poleník, CSc., Faculty of Medicine in Pilsen, Charles University

MDDr. Adam Pěnkava, Faculty of Medicine in Pilsen, Charles University

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1. INTRODUCTION

Dentures are removable oral appliances that replace missing teeth. There are many different types of dentures. This textbook provides essential information about the principles and procedures involved in the fundamentals of conventional prosthetic rehabilitation.

One of the most complicated aspects of dental prosthetics is the procedure associated with the manufacture of complete dentures (full denture). A full denture is a type of denture that replaces all the natural teeth and gums in the upper or lower jaw. Older patients are most commonly affected. Patients who no longer have favorable conditions, complicate the management. Sometimes a special oral operation is needed to resolve the problem before the prosthetic treatment (e.g., large tuberosity, sharp bone, flabby ridge). The influence of local factors should be considered, such as mucosal resiliency, residual ridge quality and quantity, salivary parameters, skeletal ridge relationships and general factors such as patient age, gender, systemic health, parafunctional activities and psychological factors.

Successful management of a complete denture depends on 3 main factors:

- 1) Perfect clinical work
- 2) Perfect laboratory procedures
- 3) Adequate psychological behaviour towards the patient

The patient has to feel that the delivered dentures are the best possible under the given conditions. Dentures that are not only well “fitting” but also “good looking”. The dentist must explain the options, expectations, goals, and targets that are associated with the new denture, in order to convince the patient. The patient should always be involved in the aesthetic arrangement of the teeth. (I.e., selection of the colour or the size of the teeth.) The patient must be prepared for certain functional limitations, especially in the adaptation phase. The basis of the so-called psychological incorporation of the denture should correspond to the patient’s expectations concerning the function and appearance of the dentures in association with the actual outcome. According to this, we can see that the psychological factor plays an important role. It explains why some patients are dissatisfied with a functionally and aesthetically perfect denture, whereas others are very satisfied with a less aesthetic appearance.

2. PRINCIPLES OF RETENTION OF COMPLETE DENTURES

Retention, in prosthetic dentistry, is a force that resists displacement of a denture in an occlusal direction.

The retention of the denture is primarily derived from various physical principles. Many secondary factors influence the retention (i.e., the significance and effectiveness of the retention).

Keeping the laws of physics in mind, retention depends mostly on:

- a) Surface adhesion
- b) Pressure difference
- c) Mechanical retention
- d) Gravity

These principles are secondarily determined or influenced by:

- e) Muscle activity
- f) The quality of the external and internal peripheral seal
- g) The quality of the palatal seal
- h) The amount and quality of saliva
- i) Surface dimensions and modelling of the denture base
- j) Laboratory technology and clinical procedures
- k) Basal seat morphology
- l) The static constellation of the teeth

Each principle has its own variable significance in different individuals as well as during different phases of the masticatory process. The significance of a principle depends on the conditions present at that particular point in time.

For example: if the denture base is localised on the basal seat, or if the denture is destabilized by muscle activity, or if the denture is well balanced in a statically stable position.

During the denture function, the principles work together in such a way that each one replaces, substitutes, or fulfils the previous and following one.

Ad a) Surface adhesion

Adhesion is the elementary and basic principle of retention for complete dentures. Adhesion generally occurs between two surfaces when there is mutual and direct contact at the molecular level. Such close contact is not clinically present between the denture and basal-seat-mucosa. A layer of saliva fills the slit-like-space between the denture and mucosa, exactly copying both surfaces and ensuring this contact. In order for the saliva to reach this space, the slit has to be minimal and the surfaces must be moist.

Under these conditions, the next physical principle can play its role, which is the so-called: Capillary elevation (the behaviour of a liquid in a capillary).

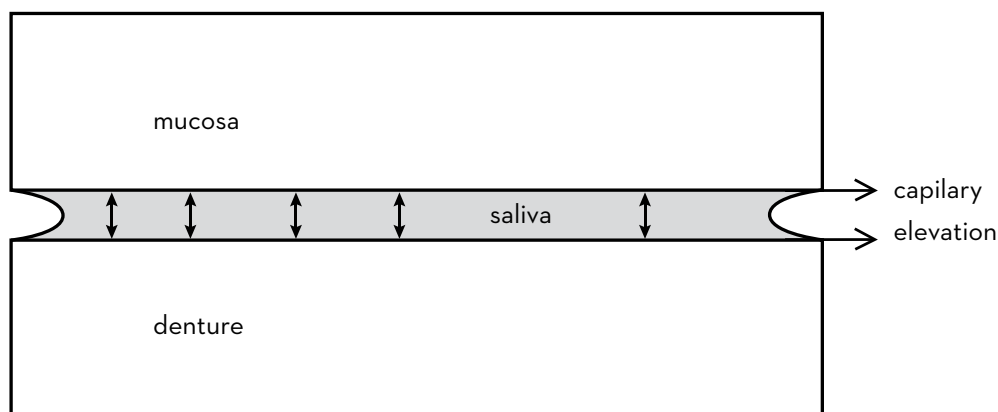


Fig. 1: Saliva is considered a major factor in the physical forces (adhesion, cohesion, capillarity) that contribute to denture retention.

That's why the denture has to be manufactured with sufficient accuracy, or at least in such a way that capillary elevation is present. The saliva must also have a certain physical quality. If all these conditions are fulfilled, the saliva will penetrate by capillary elevation into the slit-like-space until it is filled completely (or only partially). In order for capillary elevation to occur, the surfaces of the mucosa and denture must be moist. A layer of saliva is formed, ensuring capillary elevation and giving rise to adhesive molecular bonding. This bonding depends mostly on the size of the slit-like-space, which determines the occurrence of capillary elevation. However, capillary elevation does not occur under the denture surface areas where the accuracy is less. Such spaces are filled with air. Apart from the size of the space, the physical properties of saliva (i.e., its surface tension) also influence capillary elevation. This means that if the denture isn't manufactured with sufficient accuracy or if there isn't enough saliva of normal quality present, the principle of adhesion can't function completely. On the other hand, a sufficient quantity and quality of saliva can ensure capillary elevation even in situations where the denture doesn't fit perfectly (refer to adhesive materials).

If the denture is lifted off its basal seat during its function, the principle of adhesion is not preserved. (It is substituted by other principles, which are not dependent on the close connection to the mucosal surface, such as negative pressure).

The two surface adhesive layers are:

- "Saliva-denture" and
- "Saliva-mucosa"

They are connected together by cohesion (= cohesive intermolecular bonding, the force that holds together). According to physical laws, saliva is incompressible. This means it doesn't change its volume during compression or decompression.

Ad b) Pressure difference

The pressure difference between the outer atmospheric pressure (= the positive pressure) and the inner pressure underneath the denture (= negative pressure) is the second most significant physical principle of retention for complete dentures. The advantage of this principle is that it does not need to fulfil the criteria of intimate bonding of surfaces (unlike in the case of adhesion). This condition is determined by a hermetic seal (= air-tight steady state) of the space underneath the denture. The denture can be pressed into the basal seat by atmospheric pressure only when there is a pressure difference between the space underneath the denture and the space around it. If the space underneath the denture is hermetically separated from the surrounding area, then negative pressure occurs under the denture. This is due to the atmospheric pressure under standard conditions. The denture is pushed into the basal seat by the relative positive atmospheric pressure. Negative pressure underneath the denture occurs when the air is removed from this space (e.g., due to pressing or sucking) and during the attempt to remove the denture from the basal seat. If the hermetic seal underneath the denture is continuously ensured, the greater the destabilising forces in removing the denture, the greater the negative pressure and the more intensively the denture is pushed into the basal seat.

The hermetic seal is mostly ensured by the quality of

- 1) The inner peripheral seal
- 2) The outer peripheral seal
- 3) The palatal seal
- 1) The inner peripheral seal definition: it is the seal between the inner circumferential surface area of the denture and the outer alveolar surface. This seal is broken once the denture is displaced even slightly, as the contact between the inner denture surface and the alveolar process is lost.
- 2) The outer peripheral seal definition: it is the seal between the inner buccal and labial surfaces and the outer surface of the circumferential area of the denture. The peripheral seal has a functionally bigger range of movement. I.e. it functions even in the case of relatively significant distancing of the denture from the basal seat.
- 3) The palatal seal is performed in the post-dam-area of the upper denture (refer to Chapter 10.3).

Penetration of the atmospheric pressure and the production of saliva (by minor palatal salivary glands) can disturb the relative negative pressure underneath the denture. Therefore, it is necessary to occasionally push the denture into place or to remove the accumulated saliva or air. It is essential to have perfectly stable dentures that do not lift off the basal seat during occlusal contact. On the contrary, they must lie evenly on the entire base.

During mastication, the pressure conditions (relative to atmospheric pressure) repeatedly change from negative to positive pressure in the space underneath the denture. During a statically accurate load on the denture, a relative positive pressure occurs. Conversely, the greater the load lifting the denture off the basal seat, the less negative the pressure. These intermittent pressure changes enhance the microcirculatory blood supply to the tissues of the basal seat. However, continuous pressure and negative pressure result in a decreased blood supply in the vicinity (refer to consequences of