



**Basic design
of maxilla
dentures**

Minor connector

The designation minor connector comes from American usage. Originally designated as clasp tail, it acts as a connecting element between the clasp and the base. It performs its primary task, transmission of forces and shear distribution, only if given an appropriate solid design. This frequently leads to a situation in which the patient feels the minor connector to be annoying. There is often insufficient space available for the dentures. Ideally minor connectors, such as that of a G clasp, run directly from the saddle to the clasp shoulder. The basal contact area is given a convex design for hygienic reasons. As a result, there is no broad contact of the minor connector to the natural tooth. An exception is the structurally desired function as a guide surface or embracement for insertion and removal of the denture. Normally the contact area of the minor connector to the clasp tooth corresponds to the approximal contact point between natural teeth.

In the case of free-end and tooth-bounded situations, a disto-oral positioning at the premolars provides significant advantages:

- The active clasp arm becomes longer - improved retention, less visible due to lower contact
- In the case of support away from the saddle (e.g. G clasp), the distance from the clasp shoulder to the rest is shortened and the rest gains stability
- There is more space available for the denture

Major connector

Only when model surveying has been entirely completed and support points (rests, rest seats) and types of clasp have been defined, is the base designed as a further step. The international designation commonly used nowadays for maxillary or mandibular metal bases, major connector, also comes from American usage. The number, distribution and value of the abutment teeth provided with rests as well as the length of the row of replacement teeth extensively determine its dimensions and individual design.

The material thickness as well as the alloy considered must be taken into account in preparing the major connector, particularly with regard to its dimensions and design.

If the dental support (e.g. rest seats) of the denture is not adequate, the gingival support must be improved through a more extensive base. The demands and expectations of the patient, especially regarding aesthetic aspects, have to be taken into consideration here.

Definition of dental/gingival support

Dental support (tooth borne): Via clasp teeth (rests, occlusal clasp parts – to a limited extent clasp shoulders) Gingival support (mucosa borne): Via the mucous membrane (base, saddles)

Extensive bases or broad-based transversal bars relieve the abutment teeth. Special importance is given to the relieving effect through extensive saddle zones in this connection.

The planning of partial dentures should take into account extension or repair options, especially in the case of abutment teeth. Elongated and tilted teeth standing alone as well as teeth with large fillings are particularly at risk. Consideration must be given to their possible loss. The dimension for the expansion and material thickness of the partial denture frame also results from the demand for an extensively rigid, torsion-free connection. By distributing the force applied to a large area, this connection contributes significantly to a reduction in bone resorption. Only a denture with a stable design can meet the requirements of force distribution and transmission. Under extreme masticatory force stress, e.g. with a fully toothed opposing jaw, there should never be any ductile deformation. The necessary stiffness of the frame must be provided for, especially in the transition zone of the minor connectors and/or remain within a tolerable range. If a full denture is integrated into the opposing jaw, the expected masticatory pressure is less.

The data on the masticatory force diverge greatly, both in terms of the opinion of the teaching staff at universities and in dental literature. The values are probably between 200 and 500 N. In the case of patients with partial dentures, they may certainly be significantly lower. Many parameters determine the maximum masticatory force: age of the patient, type of dentition, root shape etc. The load capacity of the mucous membranes is relatively low with values up to 60 N.

Different types of base design

A distinction is made between transversal connections (transversal bar, horseshoe plate), skeleton framework bases and full plates. The definition „rationed base“ does not stand for a special type of denture. It only says that denture bases are shortened, for example from posterior to the dental arch. Such designations as „band“ plate, „collar“ plate and „hole“ plate (double palatal bar= anterior and posterior palatal bar) should no longer be used today. The term „band“ plate, for example, comes from the time when metal bases were produced through the stamping method. The lingual plates („collar“ plates) that cover the marginal gingiva are no longer indicated since they prevent any self-cleaning. The same applies to „hole“ plates in which the small recess at the palate resulted in more disadvantages than advantages. A maxillary base must not be extremely reduced even with ideal dental support. Accordingly, transversal connections with a width of less than 10 mm (mesial-distal) are critical. It is always difficult to meet the requirement of stability and a high support value, and to avoid substantial restriction of important functions due to an extensive base extension. The tongue requires the anterior palate region as an orientation (articulation, swallowing). Major functions are performed without impairment if this zone remains uncovered and can carry out its sensorial tasks. The feeling for temperature and consistency of food as well as the sense of taste depend on direct contact between the tongue and the anterior palate. During food intake, the palatal folds enlarge the frictional area - the chyme is also used in this area. For the above reasons extension of the major connector must be avoided in the anterior palatal area as far as possible. The more horizontal posterior area of the palate with its bony substructure and its high atrophy resistance is better suited as a support for the denture base.

Leaving the marginal periodontium uncovered is a demand already mentioned. The distance between the metal base and the marginal gingiva is at least 4 mm. In the marginal zone, at the transition to the saddle, the denture should only take up the space that would be available to the natural tooth. This requirement can be met ideally by designing the first replacement tooth as a bridge pontic. The contact to the gingiva is then only provided for intermittently. The acrylic saddle begins at a point offset by one tooth.

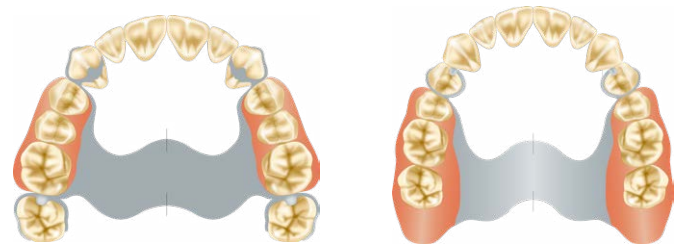
In contrast to the horseshoe shape, the transversal bar running through the posterior tooth area directly links the opposite saddles. The shorter connection is furthermore, the more stable, such as with a bilaterally shortened arch (Kennedy class 1). Here the mean width of the transversal connection corresponds to the length of the row of replacement teeth as long as this row is positioned in occlusion to the opposing jaw! The use of extra-hard alloys is recommended for extremely delicate and very narrow connections. The maximum masticatory pressure stress must not lead to acrylic deformation or excessive elastic bending-up of the denture. In the case of a tooth-bounded saddle situation, the mean width of the base corresponds to the length of the tooth-bounded saddle (Kennedy class III). It is advantageous to extend the base slightly into the rising anterior palatal region. This leads to a bracing of the profile (three-dimensional base form), resulting in more stability given unchanged material thickness. The masticatory force must be compensated for only moderately on the lateral surfaces of the palate vault rising towards the alveolar ridge. These areas form slanted planes. The dorsal, horizontal palate region absorbs the masticatory force most effectively. The maxillary base should ideally be supported here.

Provisional marks on the model simplify the drawing of the major connector. The center line is marked and the uniform, symmetrical design of the base is checked with dividers. The transversal bar should not run diagonally across the palate for functional and optical reasons. Its right-angle alignment to the sutura palatina mediana results in the desired symmetrical design. This is tolerated by patients better than base edges running diagonally across the palate. With Kennedy classes I and II, the denture is designed broader towards the acrylic saddle. Low alveolar ridges require extensive denture bases that counteract the transversal shear forces.

The topographic conditions of the palatal field (torus palatinus, structure of the mucus membrane) have to be taken into account. For example, the dentist identifies which areas are to be relieved. The anterior beading of the base should not cut the palatal folds, rather they are covered by the major connector or completely left open. The rear denture edge must not run too far - tip-like - in the dorsal direction at the level of the central palatal fold. A minimum spacing of 5 mm must be maintained to the hard/soft palate border line (Ah-line).

Advantages of a transversal connection

- Palatal fold area remains extensively free of denture elements
- Functions of the tongue are not restricted
- A direct and short connection from saddle to saddle as compared to the horseshoe shape
- Even vertical load applied to mucous membrane as masticatory force begins
- Only little risk of settling of dorsal denture beading (compared to horseshoe shape)
- No impaired sense of temperature and taste while eating
- Determination of food granularity and consistency provided for
- Initiation of swallowing reflex takes place without hindrance
- No impairment of phonation



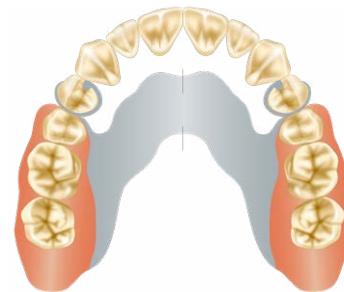
Transversal connection with tooth-borne situation

Transversal connection with free-end situation

A rationed, horseshoe-shaped base is justified if teeth are to be replaced in the anterior area. Horseshoe-shaped bases display significant disadvantages in comparison to the transversal connection. One must endeavor to close anterior gaps by means of a fixed denture.

Disadvantages of a horseshoe-shaped base (horseshoe major connector)

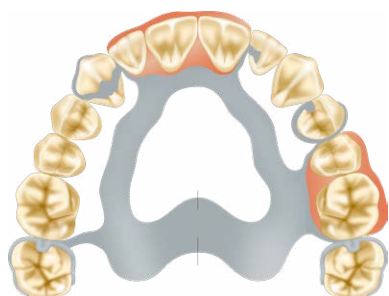
- Anterior palate region is covered by denture elements
- Creation of mucous membrane areas that are not as well supplied with blood circulation as a result of lacking massage effect of the tongue (the covered palate area takes on a palish white color)
- Functions of the tongue (swallowing, speech, taste) may be impaired
- Tactual sensation for consistency and temperature of food is restricted
- Frequently depression at dorsal denture edge



Horseshoe shape

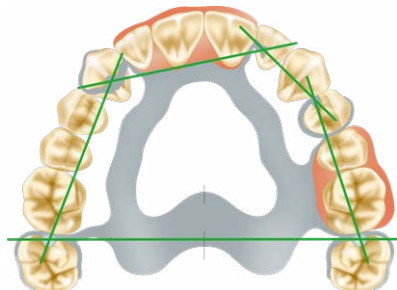
In the case of horseshoe-shaped constructions, the denture parts are nearly exclusively positioned on inclined planes. Under masticatory pressure this leads to depression of the dorsal denture edge with the possible consequence of sore spots and settling. A slight partial vacuum may be created if the denture rises again while relieved. A suction effect associated with that, though minor, may lead to locally restricted mucous membrane irritations in the long run. At the same time, the surface of the mucous membrane takes on a raspberry-like structure. The patient is only rarely aware of this change. The indication for a horseshoe-shaped base also exists if the palate has a very pointed shape and shows little resilience.

The skeleton framework base is brought to bear mainly in tooth-bounded situations. A prerequisite for this application is a predominantly periodontal support of the entire denture (Kennedy classes III and IV). Construction should always be carried out in connection with a transversal bar designed with adequate stability. In the case of a skeleton framework base, the anterior palatal area remains extensively free of denture elements. The connecting elements running in the sagittal direction are consistently placed with a minimum distance of 4 - 5 mm from the marginal gingiva. If a key support abutment is lost, the skeleton framework base is unfavorable in terms of its prognosis. Normally it cannot be extended. Under masticatory pressure, only little relief of the support abutments is provided by the denture base. The support area towards the mucous membrane is not sufficient. This design of the major connector merely acts as a connecting and stabilizing element.



Skeletonized base

This construction is mainly periodontally supported.



Parodontally supported denture (supporting line course)

An extensive base is advantageous with a significantly reduced remaining number of teeth because it relieves existing teeth under masticatory pressure (snowshoe effect). The fewer teeth exist, the more decisively the guidelines of full dentures apply to base design. Furthermore, a denture

with an extensive base (major connector, saddles) compensates better for the leverage applied. The function of the denture can also be impaired by muscle movements. For this reason, the ligament attachments are to be recessed extensively at the denture edges. An expansive base extension secures the denture in its rest position. The hard anterior palatal area and the fibrous median zone are not very resilient and can be ideally used as a support surface to compensate for the masticatory pressure.

The middle palatal suture (median palatin s.) and the papilla incisiva are covered with blocking-out wax on the master model, particularly if they are extremely pronounced and fissured. The same applies to palate folds. In areas where more pronounced atrophy is to be expected (extraction areas, etc.), the relinable saddle part is placed far to the palatal side. In accordance with the extension of the retentions (long saddles), it is advantageous to set up the replacement teeth beforehand and fix them with an overcast (matrix).

The dorsal base expansion also depends on the hard/soft palate border line. It must be traced and transferred to a study model. Its individual line can also be marked in the mouth of the patient with a toxin-free pencil and transferred to the model via the impression. The posterior palatal area with its fatty gland tissue is not suitable as a support surface. Therefore, it is important that the dorsal denture edge be positioned at a sufficient distance, a minimum of 5 mm, from the hard/soft palate border line at least in toothbounded situations. In the case of shortened dental arch and a greatly reduced remaining number of teeth, the guidelines of the full denture apply. Extension of the denture base to the hard/soft palate border line is advantageous here.

Forms of maxillary base design

Transversal connection (palatal bar, midpalatal or posterior palatal strap)

Preferred standard restoration in the case of remaining anterior teeth. High support value and advantageous solution in terms of periodontal prophylaxis. The connector supported on the posterior side extensively leaves the anterior palatal area open. Direct connection from saddle to saddle. Too narrow bars with an inaccurate fit may lead to infiltration of food particles..



Transversal connection

Images and illustrations are examples. Colors, symbols, designs, and information on the depicted labels and/or packaging may differ from reality.

Horseshoe-shaped base (horseshoe plate, anterior palatal strap)

Indicated in connection with replacement of front tooth gaps and with pointed-shaped palate. Since important functions are impaired due to covering of the anterior palatal field, it is a more critical form of base. Controversial as major connector for purely free-end situations.



Horseshoe-shaped base

Complete palatal plate (full plate)

Restoration in the case of extremely reduced remaining number of teeth. Extensive coverage of palatal arch with minimal rationing of approx. 4 – 5 mm to the natural teeth. The large extensive support prevents depressions and thus unfavorable leverage.



Complete palatal plate

Skeletal Frame (gracile double palatal bar, circular bar)

Typical restoration where incisors are missing in connection with small edentulous gaps in the posterior tooth area (pronounced partially edentulous arch). Predominantly dental support. The additional narrow anterior palatal band often has a disturbing effect due to its height.



Skeletal frame