No clasps please! A further attachment solution

Ulrich Heker and Chris Thomas

In this last article we looked at telescopic or double crowns and their application in the production of removable dentures. Here we will consider another alternative – attachments – that also make use of precision milling.

Attachments are elements for linking removable prosthetics with existing teeth (abutment teeth). These require crowns in order to accept the attachment. They can be used with removable prosthetics and with crown and bridge techniques.

They comprise a primary element that is permanently cemented in the oral cavity and the secondary component that is firmly linked with the actual prostheses. Attachments are particularly applicable when it proves impossible to produce parallel abutment teeth simply. The attachment is used to create a bridge between misaligned abutment teeth such that a secure insertion becomes possible.

Types of attachments
Attachments are divided into two groups, intracoronal attachments (within the crown of a tooth) and extracoronal attachments (exterior to the tooth crown).

Both types are available either as prefabricated attachments ie they are manufactured commercially and are then simply ‘assembled’ by the technician. They can be obtained in a wide variety of shapes, sizes and materials.

Alternatively, there are bespoke attachments, which are wholly prepared in the laboratory, though sub-units can be incorporated during construction.

Whether prefabricated or bespoke, an attachment is always made of a male and female part. Both parts slide together during the insertion of the prosthesis and result in a firm connection. Attachments are divided into:

- Intracoronal attachments
- Extracoronal attachments

Advantages:

- No need for a glued connection (apart from with RDS attachments)
- Patient-friendly insertion and removal of the prosthesis
- Precision calibration of friction settings
- Ease with which female components can be interchanged in practice
- Longevity and robust functionality as there are no complicated mechanisms
- Easily adapted to the local space constraints and therefore no reduction of the prosthesis aesthetics; more graceful than double crowns
- Abutment teeth are coated in ceramics in contrast to telescopic solutions
- Price advantage over telescopic crowns with 5 or more crowns

Manufacturing

Bespoke attachments require a high level of competence in milling and casting methods; however, they can be adapted to nearly all situations. If you compare the costs of prefabricated standard-sized attachments versus the bespoke attachments, (taking account of the work involved), then the cost difference is negligible

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Disadvantages:

- Intracoronal attachments require a lot of space during preparation – loss of tooth material
- Extracoronal attachments placed at too great a distance can result in unfavourable lever and pressure distribution.
- A loss of an abutment tooth at a later date does not permit a restoration of function.
- Price disadvantage to telescopic (double crown) solutions with two crowns or less.

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The pros and cons of attachments

As with any crown or bridge, the work on an attachment begins with the preparation of the abutment teeth. The individual abutment blocks are taken into account when determining the alignment direction for the attachment. The alignment direction is determined in exactly the same way as for the planning of individual small bridges. Circumstances permitting, it is beneficial to create a bit more space on those dental surfaces where the attachments are to be fixed to bring the male components as close to the tooth axis as possible to avoid the creation of damaging lateral forces.

In order to protect the attachment from overloading by tension and pressure forces, each component is protected from these forces via a stress breaker: this avoids breakage of the male element or expansion of the female one.

A horseshoe-shaped depression is milled into the crown(s), which has vertical grooves milled at either end. This prevents movement of the attachment along the sagittal axis. The ledge of the milled horseshoe depression is able to absorb axial pressure and distribute it over the crown block. The stress breaker then fits the male component.

The final casting of the preparations is no different to that for larger bridge work. The milling model is produced as usual then based on the model. The optimal alignment position for the attachment is determined such that the rods on the male attachments are aligned parallel to one another.
snugly into this milled groove and rests on the ledge.

The grooves and ledges are already incorporated during wax modelling and are pre-milled with special wax mills.

The cast crowns then proceed to the first fitting and the coping impression in the dental practice. The crowns are returned to the lab with the over-impression from which the master model is created. The abutment crowns are shaded with ceramics. Due to the expected oxidation during the firing of the ceramics, it is only possible to mill and polish the surfaces afterwards.

It is a great help at this juncture if the dental positioning has been established previously.

After firing, the crowns carrying the attachments are transferred with a key to the milling plate (made out of plaster of Paris or an appropriate holder).

The milling plate now determines the position of the attachment. All the milling surfaces previously cast in wax are then milled and polished. All milled planes are now absolutely parallel.

The Teflon female component for each tooth is shortened, as required, to fit the attachment's length and is applied to the male component.

Undercuts are filled with wax. Here the female attachment cap also acts as a spacer – so do not interchange!

Further casting proceeds as usual and the work is ready for the production of the model cast. The casting of the grooves, ledges and attachment components must be bubble-free.

As with the production of telescopes, the handling of the model and the casting materials require considerable experience in order to get a really good fit of the stress breakers and the base of the cast.

The insertion of the female component (usual colour yellow) into the cast is facilitated by a special tool which is included in each package. Insertion of the female component into the model cast should be possible using light pressure. If it is too loose, then it will fall out later: if too tight, then the whole model could be lifted or the patient cannot remove the prosthesis. The walls of the female part should be parallel, sitting completely within the model. Otherwise the model casting needs to be reworked.

The conversion of the wax model into methacrylate does not require any special effort; however, one should not forget to protect the attachment from unwanted intrusion of the resin by blocking with wax.

The housings for the female components are coated with composite, rendering the attachment invisible.

It is advisable to have a notch close to the attachment, in the resin of the prosthesis, where the patient can find a hold with a fingernail for easier removal of the prosthesis. Small beads of clear plastic applied to the prosthesis can fulfil the same objective.

Generally, rot attachments and similarly constructed attachments require a bordering gap in order to incorporate an extracoronal attachment.

If the construction requires an attachment point in a still-complete dental row, then a groove-shoulder attachment can be used.

These are intracoronal horseshoe-shaped elements that are attached to the oral side of the crown (hiding them from view) to which the matching interlocking denture with mirrored elements can attach (see article 1 in this series). The secondary construction, as well as a stress breaker, is made of high-quality gold alloy that is soldered with the model cast to guarantee a perfect and tension-free fitting (Note: you cannot exchange the male component within R55).

**Conclusion**

Ninety-five per cent of all attachment work is completed with the two attachment types described here.

Attachments are particularly applicable when it proves impossible to produce parallel abutment teeth. The attachment is used to create a bridge between misaligned abutment teeth such that a secure insertion of a prosthesis becomes possible. They can be a cost-effective alternative to double crowns. They are aesthetically attractive and user-friendly solutions for the patient.

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**About the author**

Ulrich Heker is the Owner-Manager of Ulrich Heker Dental Laboratory, founded 1896 with the strap line “TEEH ‘R’ US.” As a qualified Master craftsman (German Master Dental Technician) since 1891, he has over 20 years experience both at the bench and in running a successful business. Ulrich rides in Multihulls at the river Ruhr and is an accomplished “Western Style” rider in his spare time. Ulrich is fluent in English and can easily be contacted at: Ulrich Heker D-45130 Essen Corneliastr. 17, T: +49 201 797951, www.german-smile.info, ulrich@teethrus.de

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**“Excellence is the result of always striving to do better”**

- Pat Riley