**No clasps please! A further attachment**

_by Ulrich Heker, Master Dental Technician & Chris Thomas, PhD (Molecular Biology)_

**Introduction**
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 prosthesis.

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 i.e. 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.
solution

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 for removable prostheses are generally enhanced by the addition of a stress breaker.

The pros and cons of attachments

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 telescope (double crown) solutions with two crowns or less.

Advantages:

- No solder or glued connections (apart from with RSS 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 mechanics
- 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 telescope solutions
- Price advantage over telescope crowns with 3 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 as you either pay more for the parts with one or the labour with the other.

I've worked almost exclusively with ROD attachments over the past 15 years. The ROD attachment is an extracoronal connective element, which impresses through its simple functionality and longevity. The male part is supplied as a modelling accessory and is cast together with the abutment crown. The female component is made from a Teflon wear-resistant synthetic cap, which is available in three different frictions. Additionally, the adhesive strength can be adjusted via the length of the female component.

![Close up of Rod Attachment - Male Part](image)

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.

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 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.

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 components (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, rod 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 RSS).

Conclusion

Ninety-five per cent of all attachment work can be 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.
About Ulrich Heker

Ulrich Heker is the owner-manager of Ulrich Heker Dental Laboratory founded in 1996 with the strap line TEETH ‘R’ US. As a qualified master craftsman (German Master Dental Technician) since 1991, he has over 26 years’ experience both at the bench and in running a successful business. Ulrich lives in Mülheim on 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:

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