The accurate depiction of dental structures for restorative or prosthetic measures is an absolute requirement when paramarginal, submarginal or inframarginal tooth surfaces have to be worked on or reliably identified for further treatment stages. This procedure, which is as a whole termed tissue management, consists - strictly speaking - of three different partial steps, which, depending upon the requirements of each specific case, are performed individually or in combination:

- **Haemostasis**
- **Contraction** of the marginal gingiva in question (by means of astringent agents),
- **Retraction** of the gingival cuff (by means of mechanical force)

Materials for the efficient, that is - from a practitioner's viewpoint - quick and gentle achievement of dry and clearly visible marginal gingival conditions are of great benefit in daily tooth care routine involving direct or indirect treatment. However, the measures used for a procedure of this kind, known as tissue management, not infrequently take as much time as the subsequent tooth filling or the preceding preparation of the natural crown of the tooth. Therefore, this article describes an innovative product which is extraordinarily suitable for satisfying the clinical requirements for the efficient performance of tissue management.

Since it was not possible to insert cords for the retraction of the marginal gingiva, but at the same time, it was imperative to achieve efficient, but gentle, haemostasis before taking the impression, the measure chosen for the necessary tissue management was the aluminium chloride gel Racegel with ambient temperature-responsive reversible viscosity. This sophisticated material-science property enables the material to be comfortably applied selectively even to the narrowest region of the sulcus before it gels into a stable form as desired due to the warm temperature of the mouth. Note the uniform gel strand on the right (here, clearly orange in contrast to the pale pink gingiva) in the sulcus region of the prepared teeth.

**Efficient tissue management with Racegel**

The use of a special aluminium chloride gel with reversible temperature-responsive viscosity permits optimised control of bleeding and retraction in the region of the sulcus

reproduced with kind permission of Deutscher Ärzte-Verlag

Dr Markus T. Firla
If we ignore the fact that the most reliable method of avoiding bleeding of the sulcus tissue caused by treatment-induced irritation is to protect these structures by means of atraumatic procedures per se or to protect them by means of suitably positioned aids (wedges, cords, protective instruments, etc.), the termination of the bleeding of affected marginal gingival regions may be accelerated by means of agents which act appropriately on these regions, such as, for example epinephrine, aluminium sulfate, iron sulfate and aluminium chloride or locally applied compression by means of cotton rolls or caps, cords placed in the intracrevicular space or the like.

From the clinical aspect, this means that traditional tissue management methods frequently use a combination of measures for haemostasis and retraction of the marginal gingiva in the sulcus region. The classical example is the insertion of a cord, which has previously been soaked in a haemostatic agent, in the gingival pocket. However, this combination of two, in principle very different, processes can result in tissue loss in the marginal periodontium. In particular, in the case of very thin and narrow gingival conditions, otherwise favourable impacts of individual measures may be detrimental in combination. Therefore, whenever planning manipulations in the marginal periodontium, it is advisable to consider which procedure will be the least compromising for the tissue affected. For example, the use of suitable cords in the dental sulcus region is an excellent possibility for achieving a targeted and efficient, but also gentle retraction of the gingiva and even - depending on the prevailing initial situation - for achieving an additional haemostatic action due to the compression of the microvessels.

Four different products for gingival “tissue management” (haemostasis - contraction - retraction). Reversible temperature-responsive viscous Racegel from Septodont (second substance from the left) demonstrates its ability to undergo transient gelling on the glass plate heated to about 30 °C. In these temperature conditions, which are comparable to those in the oral cavity, this product is neither too solid nor too liquid. It is also evident that, compared to other materials, there are no problems discharging it from the thin application syringe at room temperature and that continuously uniform application is possible. Material-specific factors are very beneficial to manipulation both when using retraction cords and without them.

For the prudent implementation of tissue management, it is important to know that epinephrine is absorbed via exposed regions of tissue into the organism where it can have detrimental systemic effects, known as the epinephrine syndrome. This can result in tachycardia, raised blood pressure, rapid respiration, headache and anxiety or even psychological stress. In addition, the vasoconstrictive action of epinephrine only lasts for a limited period and, as a result, the vessels in the affected tissue can undergo relaxation during the decisive impression process. Although aluminium sulfate, which has been known as a method for general haemostasis for a long time, does not trigger any adverse systemic effects, but in gingival tissue it can result in an identifiable atrophy of the underlying alveolar crest. Another problem is the unpleasant taste, which not infrequently causes discomfort to the patients treated with this substance. The sulfur content can also inhibit complete setting of addition-curing silicone impression materials if aluminium sulfate is not completely removed from the regions from which an impression is to be taken.
The latter also applies to iron sulfate, which is one of the most recognised agents for the rapid local arrest of bleeding, since its haemostatic effect is in particular based on intravasal coagulation in the ends of the exposed vessels. However, at the same time, sudden coagulation - including of the blood in the gingival cuff - and the, in some circumstances, resultant extreme accumulation of blackish-brown particles of coagulum in the treated areas can also be seen as a serious drawback specific to this substance since the necessary removal of the superficial blood clots can be time-consuming and laborious.

Like aluminium sulfate, a buffered aluminium chloride solution does not have any systemic effects when applied topically for haemostasis. The tissue damage potential for the gingiva of a 25% aluminium chloride solution is comparable to that of a 15% iron sulfate solution, with both these agents being markedly less harmful to the gingiva than aluminium sulfate.

Racegel

As a buffered glycol-based 25% aluminium chloride gel which exhibits reversible temperature-responsive gelling behaviour, which is very useful to practitioners, Racegel is easy to apply without streaking or agglutination. On application to the tooth substance and the marginal gingival tissue, the thermal activation that occurs during adaptation to the temperature conditions in the oral cavity brings about a change in the viscosity of this material allowing its targeted application - since it is initially free-flowing - in a thin strand even to hard-to-access cervical cavities and preparation areas. Then, due to the thermally induced gelling, it remains securely in a dimensionally stable form at the site of the wetting of the periodontium. The excellent adhesive force until sprayed with cooler spray water from the multifunction syringe, even on steep slopes of ground teeth, is a product-specific achievement of material science attributable to the temperature-responsive reversible gelling capacity of this material.

From a clinical aspect, another benefit is that the use of this product does not cause any discoloration of the gingiva. Neither do any
blood clots form and so there is no need for laborious cleaning of the visible treatment area. The exposure time required for optimum haemostasis is 2 minutes per application. However, it has been found, that with low bleeding levels, this period can be even shorter due to the very good haemostatic action of this aluminium chloride gel. However, in the case of larger areas of gingival bleeding, it should be noted that, in the case of multiple applications of the material, an overall exposure time of ten minutes for the same area of tissue must not be exceeded in order to avoid the risk of destructive effects on the marginal periodontal tissue.

The pronounced haemostatic effect is accompanied by a clear astringent effect. In suitable cases, this enables mechanical retraction of the free gingiva (for example with cords inserted in the sulcus) to be dispensed with entirely. Particularly with very delicate marginal gingival conditions in aesthetically critical regions of the jaw, it is impossible to overvalue the advantage of this possibility of dispensing with the, in some circumstances - despite the greatest care - excessively traumatic displacement of the marginal gingiva with respect to the retention of the gingival cuff in the treatment area. Particularly with all-ceramic crowns and veneer work in the region of the upper anterior teeth, the risk that the post operationem “by a whisker” aesthetically displeasing atrophied bucco-cervical marginal gingiva of a tooth represents a permanent threat on the incorporation of the finished restoration, even for an experienced, dexterous and cautious practitioner.

Ah. And, the use of Racegel avoids yet another problem: the taste which the patients find so unpleasant. On contact with the tongue and its further distribution in the oral cavity, this innovative gel only produces a slightly acid impression with a hint of bitter fruit and with no strong unpleasant afttaste… The best thing would be to try it for yourself!

In order to “err on the side of caution”, when taking the impression for the production of the laboratory-made long-term temporaries, before the primary impression during the correctable impression technique after the action and subsequent spraying of the described 25% aluminium chloride gel, knitted cords (Ultrapak Retraction Cords, Ultradent Products) were inserted into the gingival pockets. A perfect, advantageous combination of a chemically-induced haemostatic-contracting action and mechanical retraction. All in all, a gentle yet efficient - and above all rapid - method of tissue management.

The remaining upper anterior teeth of a 67-year-old female patient following the removal of the splinted single crowns in regions 11 to 13 and 21 to 23. The crowns had to be removed after the presence of combination restorative dentistry for more than 20 years due to the irreversible loss of the removable partial prosthesis during the necessary renewal of the maxillary prosthesis. In the regions of splinted crowns and the locations of the distal attachments on the canine teeth, the marginal gingiva had pronounced inflammation. To enable systematic periodontal treatment to be performed before the final prosthetic care, it is necessary to protect the anterior teeth with “periodontal-friendly” and “oral-hygiene promoting” long-term temporaries. To this end, initial gentle repreparation of the teeth is necessary.

The remaining mild intracrevicular seeping haemorrhage was arrested by another selective application of the gel directly into the marginal sulcus regions. (Note the stable gel layer in the cervical region of the stump of 21 after application from the thin needle). Here, once again, we can see benefits of the thermogelling properties of the material which permit precise application into the desired areas and immediately thereafter effect stable adherence to the wetted solid and soft tissue. The exposure time until repeat spraying was once again two minutes.
Even the most careful preparation caused massive bleeding, which with an initial, relatively extensive application of Racegel was virtually completely arrested (see photo). As specified by the manufacturer, Septodont, the aluminium chloride gel was allowed to act for two minutes. After this, the blood and the gel were thoroughly sprayed off using a suitable water spray.

The subsequent correctable impression directly after the impression. Although very delicate due to the extremely shallow sulcus regions, the preparation limits are clearly visible. All quality criteria required to produce a perfect prosthodontic master model have been met. It is also evident that the use of high-dose aluminium chloride gel has not caused any material-induced drawbacks with respect to the curing of the A-silicone used (Hydrorise Putty fast set and Hydrorise Extra Light Body fast set, Zhermack GmbH).

Conclusion

The product Racegel for gingival tissue management during precision impressions and fillings extending into the paramarginal or submarginal gingival sulcus, which the manufacturer Septodont launched on the dental market represents an innovative “high-tech material” with which the tissue of the marginal periodontium can be prepared gently with no mechanical injury or pain to the patient. The temperature-responsive variable viscosity of this gel containing 25% aluminium chloride means that, until it has heated up to mouth temperature, it can be applied in free-flowing state by means of extremely fine needles with optimum control, even in hard-to-access gingival pockets. When mouth temperature is achieved and the thermogelling effect sets in, it remains stably in situ without slipping or running off.

The, once again, simple, rapid and complete removal of Racegel is greatly assisted by the fact that, when sprayed with water from a multifunction syringe, the temperature of the material drops markedly again returning it to a fluid state in which it can be easily rinsed off. Following the required exposure time of 2 minutes, the atraumatic astringent effect on the periodontal soft tissue is manifested as optimally controlled haemostasis and sulcus opening.

Compared to other - not as effective - products, Racegel is definitely worth its price, considering the cost-benefit ratio. After all, there is no doubt that the principle “time is money” applies at all stages of efficient gingival tissue management during dental prosthetic measures, including preservative fillings.

Author: Dr Markus T. Firla
Hauptstrasse 55
49205 Hasbergen-Gaste
Email: Dr.Firla@t-online.de
References


