

Hyaluronic acid at its Best

Minimally invasive HA-based treatment concepts for modern dentistry

_Introduction

The word 'esthetics' is on everyone's lips at the moment. But what does it actually mean?

Esthetics is more of a philosophical discipline than a term. Closely related to esthetics is 'beauty'. Beauty is an abstract term, with a strong connection to all aspects of human existence.

Like every value judgment, this positive term depends on values (yardsticks), which are strongly influenced by social convention.

If someone is considered beautiful, a number of facial characteristics are involved. These range from a striking facial structure to a beaming smile garlanded by sensual lips.

Some of these characteristics can very much be associated with the term 'hyaluronic acid' and many of you will already be familiar with facial and perioral indications for using HA and with HA treatment options.

But can hyaluronic acid also be used intraorally, perhaps even to treat esthetic gum problems? Or is hyaluronic acid condemned to remain on the margins of modern dentistry?

When we talk about gum esthetics, the prevailing values have largely been defined by key figures in modern dentistry.

Criteria for a healthy, esthetically-attractive gingiva (figs 1, 2):

- pale pink
- slight stippling
- symmetrical dental arcade
- 1st and 3rd arcades same height
- 2nd arcades smaller
- rising as you proceed backwards/upwards

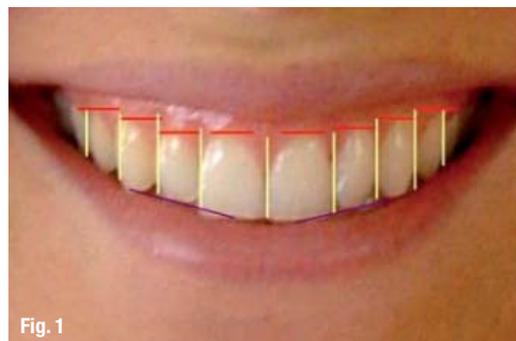


Fig. 1

Fig. 2

Another key parameter is the health of the papillae. Interdigital triangle, aka 'black triangle', has a significant negative effect on the pink esthetic score. Scientific studies performed in 1992 by Dennis Tarnow show that the distance between the crestal bone and the approximal tooth contact has a major effect on the complete regeneration of the papillae. Tarnow made 300 measurements on 28 patients and found that complete papilla regeneration was achieved in all cases where the distance between the crestal bone and the approximal contact was 5 mm or less.

Figs. 1 & 2_ Criteria for a healthy, esthetically-attractive gingiva.

Fig. 3_ Dentogingival dimensions.

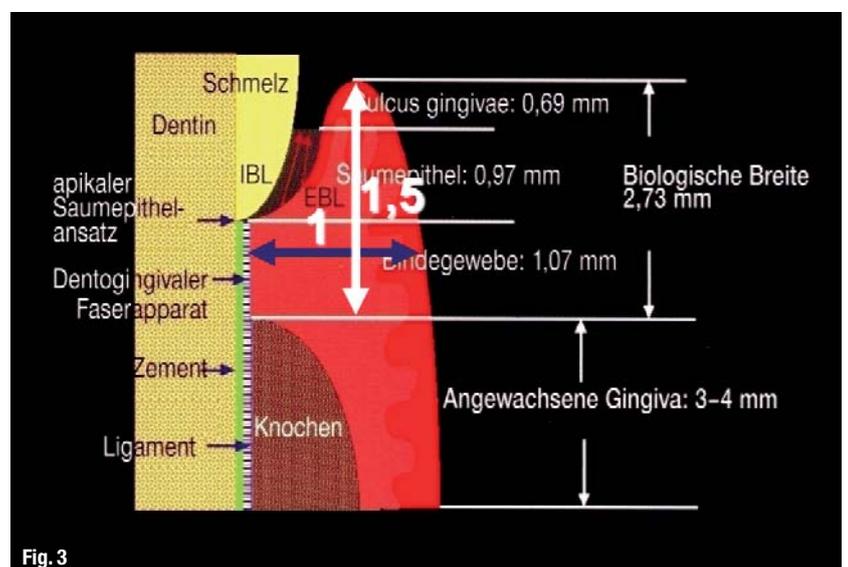


Fig. 3

Where this distance was 6 mm or more, just 65% of papillae completely regenerated and only 27% completely regenerated where it was 7 mm or more (Table 1).

Tarnow Prinzip	
5 mm or less	100% of papillae
6 mm	65% of papillae
7 mm	27% of papillae

It follows that correct contact point management, whether it is achieved through conservative or prosthetic treatment, is able to prevent interdental black triangles.

What is the role of hyaluronic acid in gum esthetics and what in fact is hyaluronic acid?

Can effects which are desirable when injecting wrinkles, such as stability, be used intraorally, and is the desired effect persistent?

Such questions needed answering.

HA is manufactured in a fermentation process and is a glycosaminoglycan macromolecule made up of repeating disaccharides of D-glucuronic acid and N-acetylglucosamine.

The molecule has a three-dimensional, charged structure and is very hydrophilic and therefore water retentive. The skin, containing about 5 grams and thus 55% of total HA, is the major hyaluronic acid store – and this includes the gingiva!

The general effects of HA in the tissues include:

– Integrative structural component of the extracellu-

lar matrix (regulates water content and the passage of substances into the interstitium)

- Complex interaction with intracellular and extracellular components as a result of osmotic, stereoscopic, and viscoelastic properties
- Direct, receptor-mediated effect on cell function and consequent effect on expression of specific genes

The impressive range of effects of HA is greatly expanded at the cellular level.

_HA's Top Ten

The basic idea behind using hyaluronic acid intraorally was the assumption that it would be possible to exploit the stability of cross-linked hyaluronic acid to minimize interdental black triangles.

In 1991, Sobocki studied dentogingival dimensions and found that vertical height could only be achieved with an adequate width of attached gingiva.

The ratio of width to height was 1:1.5.

Selecting the connective tissue attachment area as the main injection area is therefore the right choice for achieving a significant effect on papillary height.

We developed an injection technique, the three-step technique (TST after Göttfert, Schwenk, Striegel), which can be used in almost all cases where HA is indicated.

The objective of this technique is to create a stable foundation to enable the body to regenerate naturally. A cross-linked HA is used, ensuring a longer half-life in the gingival tissue.

Step 1: Injection of cross-linked HA Hyadent Barrier Gel into the marginal gingiva. The injection volume should be tailored to the situation.

Step 2: Injection into the attached gingiva

Step 3: Injection 2 mm below the highest point of the papilla to stabilize the papilla itself

_Case study 1

Initial situation was a necrotic papilla in the 14/15 area (fig. 1) caused by an adrenaline-containing preparation used for hemostasis.

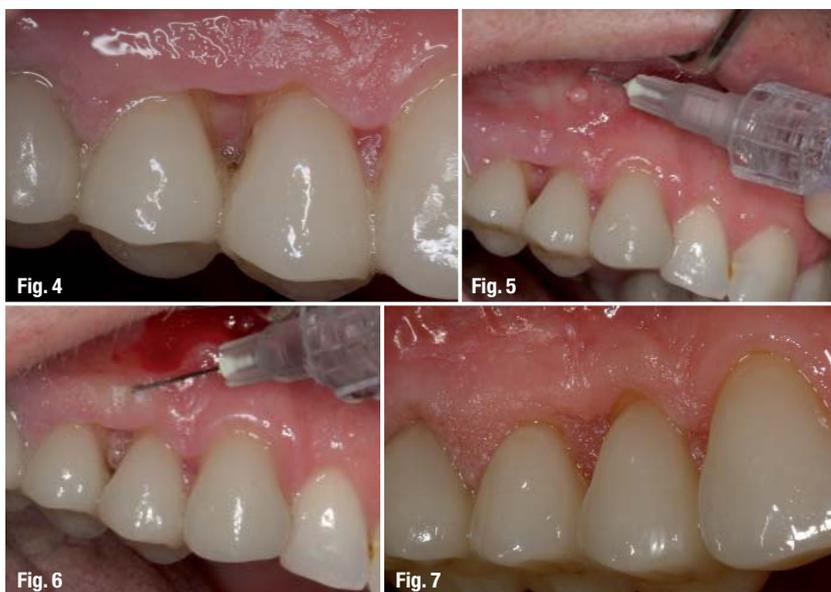
Curettage or antiseptic rinses were contraindicated in this case, as the site was no longer inflamed. Periodontal surgical measures to restore gum esthetics were in this case also unpromising. The objective was to achieve the fastest possible regeneration of the pa-

Fig. 4 Initial situation following necrosis.

Fig. 5 Step 1 of the three-step technique.

Fig. 6 Steps 2 and 3 of the three-step technique.

Fig. 7 Situation 10 post-op.





pillula. We decided to inject cross-linked HA as a 'regeneration booster' using the three-step technique (figs. 2, 3).

10 days after the first injection of Hyadent Barrier Gel, we were able to observe clear advances in papillary regeneration and healthy gingival conditions, and the patient was pain-free. Hyadent Barrier Gel is a HA product cross-linked with butanediol diglycidyl ether (BDDE). It promises good biocompatibility and good persistence in biological tissues and is one of two cross-linked HA products currently marketed in Germany for intraoral use.

Case study 2 (HA in periodontology)

In the following case study, we used hyaluronic acid as an adjuvant in view of its bacteriostatic (against Aa, Pi, Si Pirnazar P, Wolinsky L, Nachnani S, Haake S, Piloni A, Bernard GW: Bacteriostatic effects of hyaluronic acid. J Periodontol 70, 370-374 (1999)) and fiber-regenerating properties.

Injection of Hyadent Barrier Gel using the three-step technique was followed by topical application of non cross-linked HA directly into the pocket. Hyadent. Scaling and root planning, and laser treatment were performed prior to the injection, and antibiotic therapy was therefore omitted.

Prior to treatment, the microbial load was found to be significantly raised (fig. 2). The combined therapy succeeded in restoring normal microbial levels (fig. 4) and achieving a significant improvement in gum esthetics (fig. 5).

Case study 3

"Small papillary defects between implants and teeth can be corrected by injecting a hyaluronic acid gel." This is the summary of a pilot study by W. Becker.

The following case study supports this statement. From the outset this was a very difficult case. The patient, a 25 year old man, presented in our practice 5 years after losing tooth 12. Against our advice, the patient decided not to have bone augmentation

prior to primary implantation in the esthetically sensitive 21 area. Correct positioning of the implant was unable to prevent an unsatisfactory end situation after fitting the temporary crown.

Available options for correcting the problem were limited. We decided to carry out conservative correction of contact point 21/22 and minimally invasive treatment to stabilize the gingiva using cross-linked HA Hyadent Barrier Gel.

There was a significant improvement in gum esthetics just one day after carrying out the injection using the three-step technique. 6 weeks after injection, the overall picture is far more harmonious and an outstanding treatment success compared to the initial situation.

Summary

In modern esthetic dentistry, just a few millimeters can be the difference between success and failure for gum esthetics, especially in the highly sensitive esthetic zone.

'Minimally invasive' is today a key treatment concept. Despite the availability of a wide range of periodontal

Fig. 8 Situation following aggressive periodontal disease.

Fig. 9 Microbial test prior to laser and HA therapy.

Fig. 10 Applying Tissue Support in the pocket.

Fig. 11 Microbial test after laser and HA therapy.

Fig. 12 Provisional end situation.

Fig. 13 Initial state.

Fig. 14 Injection.

Fig. 15 Immediately after injection.

Fig. 16 Six weeks post-injection.



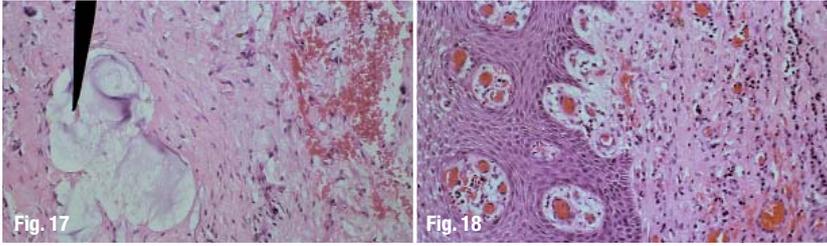


Fig. 17 Accumulation of hyaluronic acid (FlexBarrier) in the dermis, many connective tissue fibers, fibroblasts and no inflammatory cells.

Fig. 18 Reactive hyperplastic gingiva, inflammatory cells in the dermis, few fibroblasts.

and orthodontic treatment options, gaining those few millimeters has proven to be very difficult, not always crowned with a good chance of success, and furthermore not always indicated!

CE approved HA products specifically designed for intraoral use have been on the market since 2009. Hyadent und Hyadent Barrier Gel are specially tailored to the demands imposed by dental practice and are enjoying rapid growth in demand. They also eliminate the risk to the practitioner from off-label use.

Having an ace up your sleeve – or in your sterile refrigerator – thus comes highly recommended! Hyaluronic acid – abbreviated to HA – is making inroads into dentistry.

The outstanding characteristics of HA have proven especially useful as an adjuvant to periodontal disease, implantology, esthetic and surgical treatments. Subjective changes, such as reduced hypersensitivity and reduced bleeding in gingivitis, are just some of the beneficial side-effects of using HA.

Dental treatment should be all about long-term success, and for this reason we too are casting a highly critical eye on the intraoral use of HA.

HA treatments have now been ongoing for 18 months and in no case has the improvement in the stability of the gingival state brought about by using HA diminished.

In collaboration with a Nuremberg-based pathology institute, one year after injecting cross-linked HA into the retromolar 48 area, we have been able to observe hyaluronic acid particles and non-inflamed connective tissue with a good collection of fibroblasts and connective tissue fibers (fig. 1). This is in contrast to the inflamed tissue 1 cm distal to the injection site (fig. 2).

This observation is enough to remove all remaining doubt.

HA has delivered convincing scientific results for many years, and now it is delivering convincing clinical results too.

It is simple to apply for any dentist and, where the correct indications for use are present, the results should dispel any remaining doubts.

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