

Enhancing esthetic outcome of soft tissues around implants

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Highlights

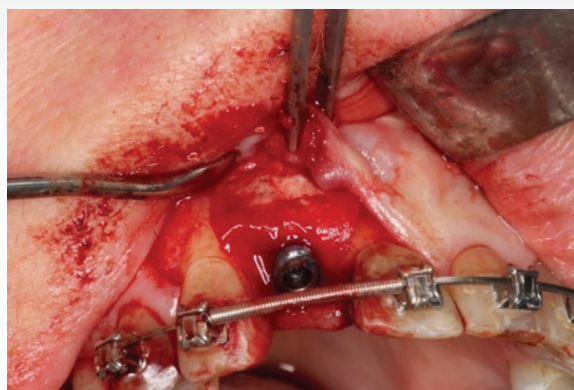
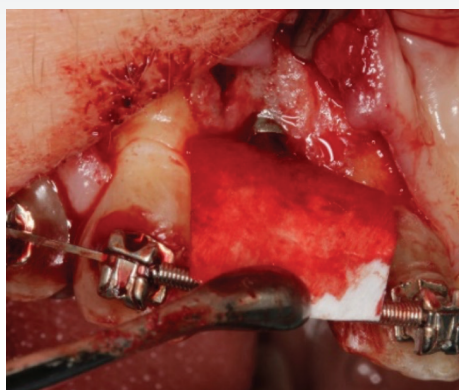
1. Stable peri-implant soft tissue can only be achieved with good oral hygiene and consistent follow-up.
2. "Pink" (soft tissue-based) factors are at least as important as "white" (prosthetics-based) factors for esthetically oriented patients.
3. Esthetic factors are only part of a comprehensive diagnosis, situation analysis and planning process.
4. Stable soft tissue demands frequently an adequate bony base and augmentations.
5. GBR treatments require different barrier membranes, depending on the defect size and complexity.
6. Good wound healing can be promoted by suitable techniques and biological solutions, such as Enamel Matrix Derivate (EMD).
7. Substitution materials are suitable for a natural buccal soft tissue contour.
8. A sufficiently wide keratinized mucosa is another important prerequisite for peri-implant stability.
9. Implant positioning and prosthetic workflows, including immediate digital options, also contribute significantly to ensuring that treatment outcomes remain esthetic.

In implantology, the oral mucosa is often the weakest link in the chain of care. If there is inflammation, the tissue can recede and lead to esthetic failure. In such cases, it is not uncommon that the implant has to be removed. To prevent these severe complications the peri-implant mucosa needs to be shaped and stabilized by an array of measures related to diagnostics and planning, surgery, prosthetics and long-term maintenance.



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"Pink and white" in perfect harmony: Soft tissue esthetics can be enhanced by means of various regenerative materials and clinical protocols. © Dr. Massimo Frosecchi, Firenze, Italy



Figures 1 and 2: After placement of an implant (2.9mm Straumann® BLT Roxolid®, SLActive® implant) to replace tooth 12, a thin and elastic collagen membrane (Jason® Membrane) is fixed in the anterior maxilla for a minor GBR treatment in the same surgery (bone substitute material: botiss cerabone®). The extended barrier function membrane is secured with the healing screw.



Figure 3: Following placement of the healing screw the site is sutured with 5.0 monofilament sutures for open healing. Multi-band was used for space opening at position 12.



Figure 4: Result with final ceramic crown: The natural buccal soft tissue contours and a wide keratinized cuff were successfully preserved. Operative and esthetic dentistry remains to be performed on natural teeth (by assigning dentist).

Is pink more important than white?

Patients do not want augmentations, but rather beautiful and properly functioning teeth – surrounded by natural-looking “gums”. “Pink”, i.e., soft tissue-based factors can be more important than “white” (restoration-based) factors. Thus dentists, in this case prosthodontists and periodontists, and non-professionals alike consider shade and color depth of the peri-implant soft tissues as the esthetically most critical parameters.¹ These are followed by other pink factors such as appropriate height of the gingival margin, intact papillae, natural volume (buccal contour) and physiological surface texture. In the case of restorations, color factors were also considered to be the most important. The fact that photographs (instead of patients) were evaluated may play a role here.¹

According to other studies, patients rarely consider esthetic factors as a high priority, in contrast to dentists.^{2, 3} It is less surprising that patients with a high smile line could assess these factors as more critical than those with a low smile line.⁴ The commonly used Pink Esthetic Score (PES) devised by the Viennese working group led by Prim. Dr. Rudolf Fürhauser also takes contralateral symmetry into account.⁵ Soft tissue scarring due to previous surgical procedures in the implant region can have a negative impact.⁶ Esthetics are generally only one factor in a comprehensive analysis, and specialists also have to take periodontal and systemic risk factors into account.^{7,8}

Think biologically for an esthetic outcome

Stable soft tissue is known to require a sufficient bony base.

The status of this can be assessed, for example, by using specific defect classifications.^{9, 10} Given that there is usually only a thin buccal bone lamella in the anterior maxillary region and that there tend to be defects,¹¹ augmentation often has to be performed before, in connection with or separately after implant placement.^{12, 13} Physiological and unavoidable bony remodeling processes after extractions can thus be taken into account in advance.¹³ Otherwise, an initially adequate soft tissue level has a high risk of receding over the years.

For augmentations, guided bone regeneration with collagen membranes and particulate bone or substitute materials as well as methods using only autogenous bone have proven effective.¹⁴ Non-cross-linked collagen membranes are relatively quickly integrated into the tissue but will resorb faster. Non-resorbable membranes or elastic collagen membranes with an extended life may be more suitable for larger augmentations (Fig. 1 to 4).

To avoid traction on the soft tissue, ligaments and muscles should be separated, for example in conjunction with an apical displacement flap. Tunnel techniques have also proven effective, ensuring that circulation to the augmented areas, especially the papilla, is preserved.¹⁵ Ideally, these measures are carried out micro surgically and with magnification.

To improve wound healing and thereby esthetic appearance, a number of substances and methods have been proposed. These include the application of platelet rich fibrin (PRF) or Enamel Matrix Derivative (EMD, Straumann® Emdogain®). For EMD a randomized study has shown an improved oral health-related quality of life of patients due to improved healing after surgery, which was due to reduced post-operative pain and swelling.¹⁶ After implant placement topical application of EMD on peri-implant tissues increased the number of blood vessels in comparison to a control treatment.¹⁷

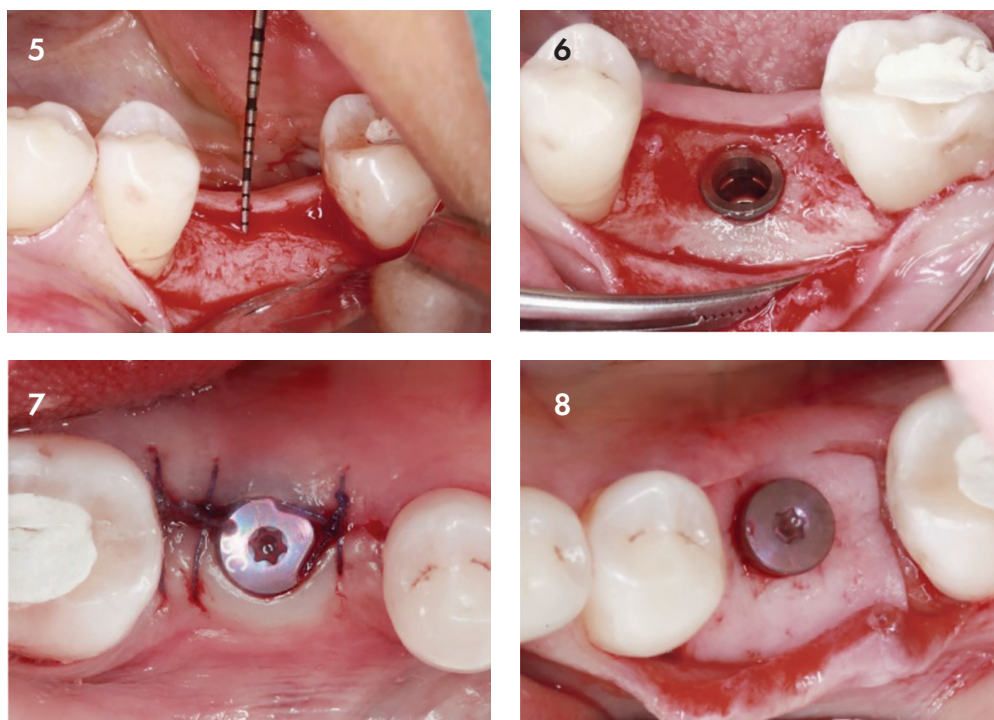


Figure 5: In posterior areas the thickness of the mucosa over the alveolar ridge has been shown to determine the degree of bone resorption.³⁵ In this clinical case the vertical tissue dimension is only 2 mm as measured with a periodontal probe.

Figure 6: The bone is prepared and a Straumann® Bone Level Implant (Regular Neck Ø 4.8 10 mm, SLActive®) placed.

Figure 7: The crestal bone around the implant is then contoured with a round bur, and the healing cap screwed down. A botiss mucoderm® collagen matrix is rehydrated to ensure a sufficient flexibility of the graft, and then perforated. Next, the matrix is pulled over the healing cap and placed in direct contact with the bone.

Figure 8: Finally, the margins of the flap are adapted and sutured with 4.0 PGA synthetic suture, leaving the healing abutment open.

© Figures 5-8: Dr. Algirdas Puišys, Kaunas, Lithuania. First publication of the entire case on youTooth <https://www.straumann.com/en/discover/youtooth/article/esthetics/2016/algirdas-puys-botiss-mucoderm-mucosal-tissue-thickening-around-bone-level-implants.html>

Thicken buccal tissue

There are many ways in which bone augmentations can be combined with buccal soft tissue thickening; or alternatively, the latter can be carried out as a separate procedure.¹⁸ According to the latest literature, the esthetic contour in the anterior maxilla can be successfully improved with autologous connective tissue grafts combined with immediate implantation.¹⁹⁻²¹ In this case, thickened keratinized tissue can help to reduce inflammation, especially in patients with periodontitis.²²

According to recent systematic reviews, autografts are considered the gold standard, although not all studies have demonstrated any difference between autograft and substitution materials (Fig. 5-8).²³⁻²⁵ Since grafting materials do not require a removal procedure, the products could represent an alternative especially for pain-sensitive patients.²⁶ A broad portfolio of allogenic, xenogeneic and synthetic products for regenerative procedures is available from Straumann®.

Creating keratinized tissue

A sufficiently wide keratinized cuff around the implant appears to be of equal importance as adequate tissue thickness²⁶. In the posterior region, this is primarily for functional reasons, while it is also for esthetic reasons in the anterior. However, collagen membranes can alternatively be used to cover the exposed alveolar region. An esthetically relevant advantage of xenogeneic membranes is that they blend in after the integration as they provide an appropriate shade and do not stand out from surrounding tissue.²⁷

An interaction between soft tissue thickness and width is also discussed in the research field. A clinical pilot study shows that the soft tissue volume is affected by the width of the keratinized mucosa after surgical peri-implantitis therapy.²⁸ A working group coordinated by the Bern-based periodontist Prof. Dr. Anton Sculean describes how peri-implant mucosal recessions can be successfully treated.²⁹

After treatment, oral health has to be maintained by adequate personal and professional biofilm management.³⁰ State-of-the-art prophylaxis sessions include both individual and repeated hygiene instructions and professional cleaning of the whole mouth including the implant-retained restoration, e.g., by means of airflow and ultrasonic devices. Chitosan brushes based on marine biopolymers can support maintenance by their anti-inflammatory and bacteriostatic action.³¹

Immediate and digital workflows

The type of implants and abutments used and the prostheses placed can also help to keep soft tissues stable and esthetically

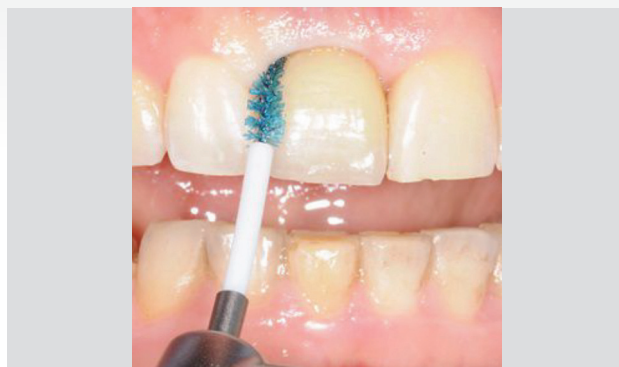


Figure 9: Meticulous personal and professional maintenance helps to preserve the esthetic result achieved. Oscillating chitosan brushes (Straumann® Labrida BioClean®) have bacteriostatic and anti-inflammatory effects on perio and peri implant soft tissues.

pleasing – or not. Only an adequate design of the prosthetics ensures appropriate long-term access to the peri- implant soft tissues for personal and professional prophylaxis measures (see above). Intensive research is also carried out into the role of the material, the surface structure and the macro design for all components. For instance, it is evident that ceramic abutments offer improved esthetics in anterior regions or regions with thin gingival mucosa compared to titanium.³² Due to anatomic and physiological issues customized CAD/CAM abutments (e.g. Straumann® CARES®) have the potential to further improve soft tissue quality and esthetics.³³ The high biocompatibility of zirconia may also improve peri-implant soft tissue integration of implants manufactured from this material (e.g. Straumann® Ceramic Implant Systems).

In addition, the selected surgical-prosthetic protocol is important. Only if the implant is placed in a biologically sound three dimensional position will the surrounding bone and mucosa receive an adequate blood supply and peri implant tissues remain stable in the long term.³⁴ According to a systematic review in connection with an ITI consensus conference, in order to avoid excessive bone loss due to remodeling, implants should be placed within the first four months after tooth extraction.³⁵

Depending on the clinical case immediate placement of the implant and restoration can help to preserve the original soft tissue architecture (Figs. 10-15).¹³ Concerning the timing of implant placement, specific macro designs have been developed for increased primary implant stability (e.g. Straumann® BLX).³⁶ In regard to prosthetic planning a comprehensive 3D data set acquired with a CBCT and an intraoral scanner will allow an accurate design and

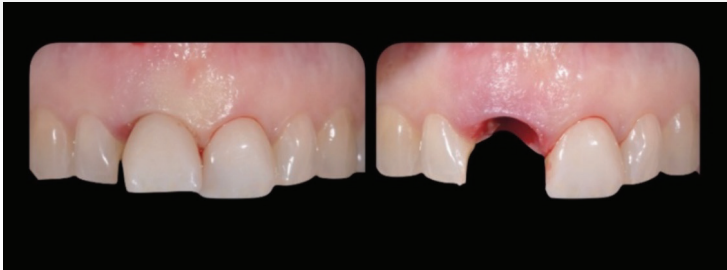


Figure 10: Tooth 11 had to be removed due to a cervical horizontal fracture caused by a direct trauma.

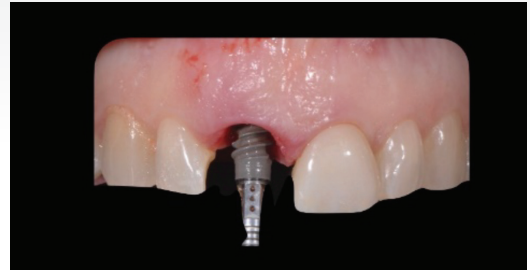


Figure 11: A Straumann® BLX (diameter 4.5 mm) was placed in a prosthetically driven 3D position.

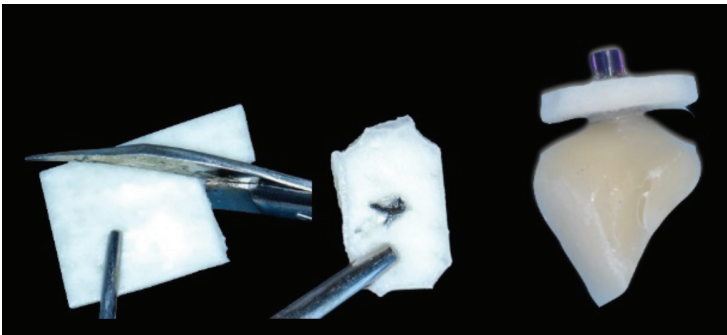


Figure 12: A composite crown is modeled on the temporary abutment. Then an acellular dermal collagen matrix (botiss mucoderm®) is modified and shaped as a disk with a centric hole.



Figure 13: On the same day the temporary abutment is screwed into the implant, in this way fixing the collagen matrix in the position desired.



Figure 14: After 3 months the temporary abutment is unscrewed, and a digital impression is taken. The collagen matrix has successfully separated the peri implant bone from the mucosa.

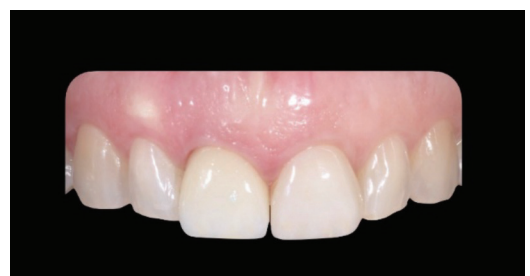


Figure 15: The final ceramic crown is on the implant (situation on the day of delivery).

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manufacture of the restoration. With digital technologies a consistent transfer of the temporary and final soft tissue profile can be achieved in a patient-friendly way. This also relates to a reduced number of less invasive surgeries required.

Conclusions and outlook

To gain, shape and preserve soft tissue in the esthetic area even in the long term is a complex task. It initially demands careful planning, then prudent treatment and meticulous long-

term maintenance. An esthetically pleasing implant-retained restoration can only be achieved with suitable materials and tried and tested techniques. These can include up-to-date digital options for increased patient and clinician convenience. The reward will be satisfied patients, glad to recommend their dentist and team.

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