

Factors Influencing the Preservation of the Periimplant Marginal Bone

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Numerous techniques within surgical hard-tissue and soft-tissue management are available today to assist in achieving an ideal aesthetic treatment result. The current view is that the long-term preservation of healthy periimplant tissues is of primary importance for ensuring function and esthetics over an extended period. The following parameters play a significant role: (a) considerations of biologic width; (b) the concept of platform switching; (c) implant design in the cervical region; (d) nanoroughness; (e) fine threads; (f) insertion depth; (g) abutment design; and (h) the avoidance of microlesions in the periimplant soft tissue created by the exchange of various secondary prosthetic components.

A stable bone level around the implant neck is a prerequisite for achieving support and, hence, long-term optimal and stable gingival contours. This is especially so with regard to the interdental papillae in the anterior region.¹ It is important to consider all the possible factors that may exert an influence within this sensitive region when designing an implant treatment plan to achieve an optimized functional/esthetic treatment outcome.

Biologic Width

The clinical term *biologic width* denotes the dimensions of periodontal and periimplant soft-tissue structures such as the gingival sulcus, the junctional epithelium, and the supracrestal connective tissues. According to

Esthetic outcomes cannot be attributed to a single parameter. Rather, as this article shows, they are the result of a number of important factors, especially in the esthetic zone. An understanding of the meaning of biologic width, of the integration of the platform-switching concept into implant treatment facilitates the preservation of a stable marginal bone level around the implant neck. This stable bone then serves to support the soft tissue, determining the long-term esthetic and functional treatment outcomes stability.

The following points should be noted: (1) A prefabricated post that can be used both as a temporary post and as the definitive abutment helps to avoid a frequent replacement of secondary components, provided that the 3-dimensional position of the implant is correct. It prevents a repeated destruction of the connective-tissue at-

tachment on the biologic width, which would carry with it the risk of bone resorption. (2) A special implant and abutment design (a ledge and integration of the biologic width/tapered shape of the post) facilitates nonsurgical lengthening and thickening of the periimplant soft tissue. This leads to the establishment of a wider and more resistant zone of connective tissue. (3) A microrough and nanorough titanium surface extending to the implant shoulder in conjunction with the platform-switching concept provides osseous integration along the entire length of the implant. A fine thread optimally distributes the masticatory forces in the region of the implant neck, avoiding further bone loss in this region. (Implant Dent 2007;16:165–175)

Key Words: *biologic width, platform-switching, implant macro, micro- and nanodesign*

Tarnow *et al.*,² the bone facing the oral cavity is invariably covered by periodontal tissue, connective tissue, and epithelial tissue, all of which may vary in thickness. The original studies of the “dentogingival complex” can be traced back to Gottlieb,³ to which Orban and Kohler⁴ returned many years later. Gargiulo *et al.*⁵ examined the dimensions of these tissues in dead human bodies. One year later, in 1962, Cohen⁶ defined the clinical concept of biologic width to include the dimensions of the epithelial and connective tissue attachments. The definition of the dentogingival complex additionally includes the vertical dimension of the gingival sulcus.

According to measurements conducted by Gargiulo *et al.*,⁵ the average biologic width (from the base of the sulcus to the alveolar bone margin) is 2.04 mm, of which 0.97 mm is epithelial attachment and 1.07 mm is connective tissue attachment. These dimensions, however, are in no way static but subject to interindividual variation (from tooth to tooth and from patient to patient)⁶ and will also vary according to gingival types and implant concepts.

Numerous studies have shown that bone resorption around the implant neck does not start until the implant is uncovered and exposed to the oral cavity. This invariably leads to

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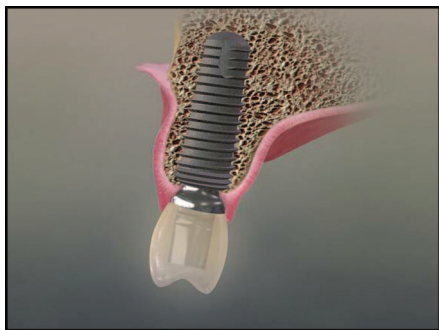


Fig. 1. Attachment of hemidesmosomal fibers to the nanorough abutment surface. Stabilization and nonsurgical soft-tissue augmentation thanks to the abutment's tapered shape.

bacterial contamination of the gap between the implant and the superstructure.⁷⁻¹⁰ Bone remodeling will progress until the biologic width has been created and stabilized. Not only does this width progress apically, along the vertical axis, but according to studies conducted by Tarnow *et al*,² there is also a horizontal component amounting to 1–1.5 mm. This is the reason to maintain a minimum distance of 3 mm between 2 implants and platform switching in the esthetic reconstruction zone in order to obtain intact papillae and stable interimplant bone. Fig. 1 is a schematic representation of the principle of integrating the biologic width and platform switching into the surgical/prosthetic treatment concept.

Figs. 2 and 3 demonstrate the intraoperative inclusion of biologic width considerations during implant surgery. The implant used (Revois; Curasan AG, Kleinostheim Germany) has a microrough and nanorough surface extending to the implant shoulder, accommodating biologic width by featuring a prepared margin 1.9 mm above the shoulder (Fig. 3). This integrated distance takes into account the average formation of biologic width around implants. The special paralleling post available for this implant assists in ascertaining the optimal insertion depth and the correct distance from adjacent teeth or implants. The diameter of this paralleling post is the same as that of the definitive abutment; its height is 1.9 mm (Fig. 2). Equally important is the distance between the implant and the tooth, as

first defined by Tarnow *et al*¹¹ in 1992 and modified in 2003,¹² and the distance between the bony base of the papilla and the contact point of the superstructure. Only if all these points are observed can we expect the interdental space to be filled in completely, leading to an optimal esthetic outcome.

The Platform-Switching Concept

The platform switching effect was first observed in the mid-1980s. At the time, larger-diameter implants were often restored with narrower abutments (Ankylos Densply, Friadent, Germany; Astra-Zeneca, Sweden; Bicon, Boston), as congruent abutments were often still unavailable. As it later turned out, this was a remarkable coincidence.

The abutments used with conventional implant types are generally flush with the implant shoulder in the contact zone. With many implant systems, this results in the formation of microcracks between the implant and the abutment. Numerous studies¹³⁻¹⁵ have shown that bacterial contamination of the gap between the implant and the abutment adversely affects the stability of the periimplant tissue. If above-average axial forces are exerted on the implant, a pumping effect may ensue (depending on the positive internal/external connection at the interface) that may then result in a flow of bacteria from the gap, provoking the formation of inflammatory connective tissue in the region of the implant neck. Ericsson *et al*⁹ coined the term *distance-sleeve-associated infiltrated connective tissue* to describe this phenomenon. They interpreted this to be a biological protective mechanism against the bacteria residing in the microcrack, explaining the plaque-independent bone loss of approximately 1 mm during the first year. This bone loss may result in a reduction of the marginal bone level in both the vertical and the horizontal dimensions. The entire process must be seen as a bacterial infection occurring naturally on transgingival implants and on submucosally placed implants as they are exposed, in both cases as a result of the communication with the oral cavity.⁷⁻¹⁰ If the microcrack is located close to the bone, the creation of

the biologic width will occur at the expense of the bone.^{5,16-18}

The platform-switching concept requires that this microcrack be placed away from the implant shoulder and closer toward the axis in order to increase the distance of this microcrack from the bone.¹⁹⁻²¹ This generally implies the use of a reduced-diameter abutment (Figs. 1 and 4). The implant used has a standard abutment diameter of 3.05 mm. With implant diameters of 3.8, 4.3, and 5.0 mm, the abutment margin runs between 0.375 and 0.975 farther axially than the circumference of the implant. According to the microbiological considerations outlined above, this delivers a measure of protection for the marginal bone.

The preservation of the periimplant bone is particularly important in the esthetic zone and in areas with a limited bone supply. Here the objective is to avoid provoking an additional postprosthetic bone loss and to preserve the long-term stability of the bone and soft tissue alike.

Implant Design in the Cervical Region: Nanoroughness, Fine Threads, and Insertion Depth

Conventional implant types generally feature a smoothly polished cervical region that may vary in width. As a result of the radiologic and histologic studies conducted by Hermann *et al*,^{13,22} there is awareness of the implications of the position of the implant shoulder on crestal bone resorption. The relative positions of the interface between the implant shoulder and the abutment and the transition zone from the smooth to the rough implant surface, respectively, to the alveolar ridge are of eminent importance. The literature mentions a distance of 3.6 mm in the mandible and 4.1 mm in the maxilla between the point of first bone-to-implant contact and the implant shoulder for ITI (Straumann, Switzerland) standard implants (2.8 mm) with this neck configuration.²³ Current trends in implant design favor a reduction or elimination of the smoothly polished segment. In newer implants, the rough segment was extended 1 mm coronally. Here the biologic width created was reduced to an average of 2.19 mm after 32 months.²⁴ Therefore, it is to be ex-

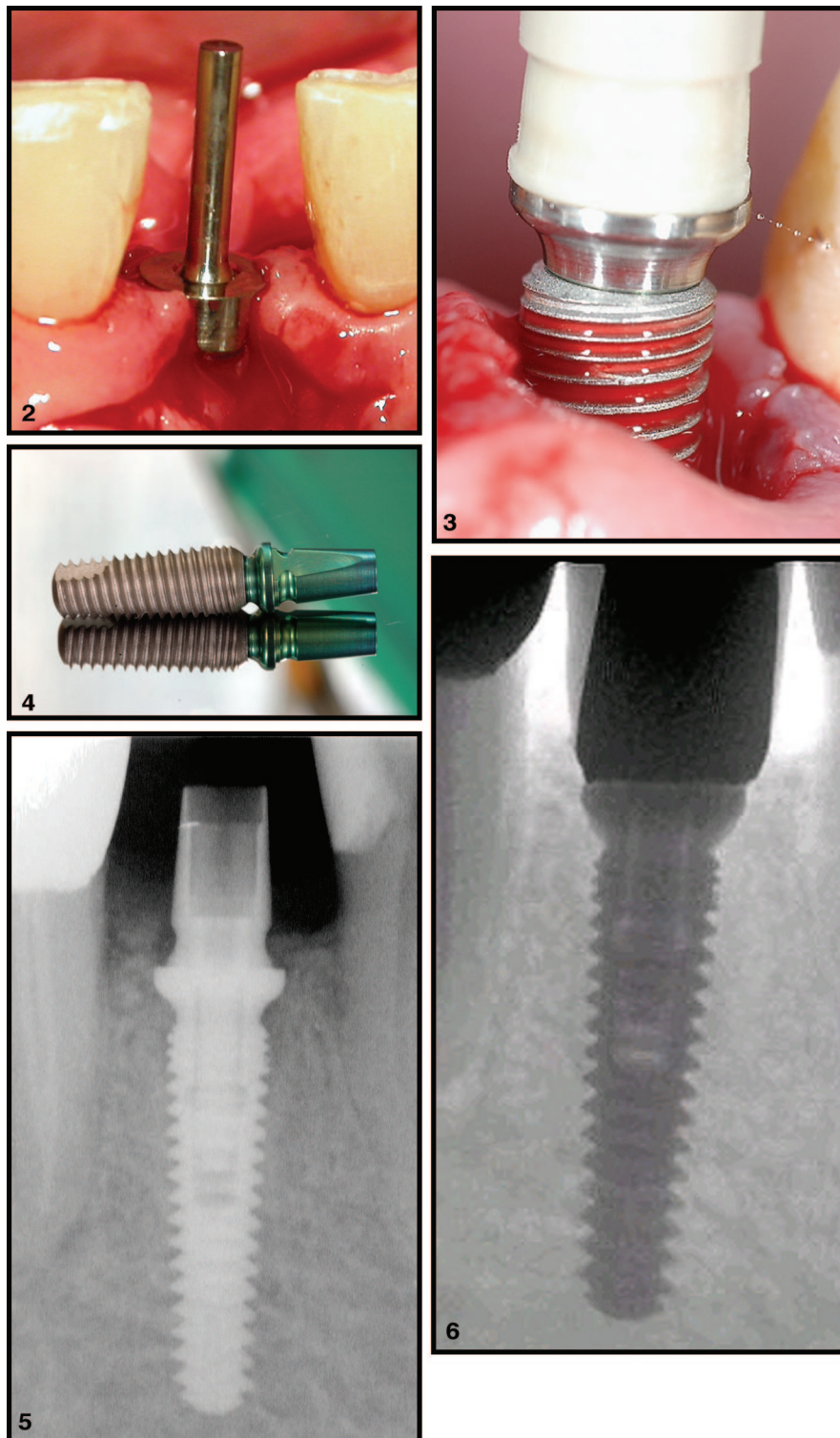


Fig. 2. Checking the 3-dimensional position, using parallelizing posts.

Fig. 3. Macrodesign of an implant and the integrated platform-switching concept.

Fig. 4. Revois implant with a rough titanium surface extending to the implant shoulder, integrated platform switching, and a fine thread around the implant neck.

Fig. 5. Radiological control prior to impression-taking showing the multifunctional precision post.

Fig. 6. Radiological situation at the 1-year follow-up. The marginal bone level is preserved.

pected that the biologic width will be reduced by limiting the width of the smoothly polished cervical region. However, if the smooth segment is inserted below the bone level, the bone will resorb all the way down to the rough-to-smooth transition line.²⁵ Moreover, it was shown that the amount of bone loss also depends on the nature of the adjacent structures (cantilever situation, implant, natural dentition). The biologic width in 2-piece implant systems invariably starts at the implant-abutment interface. Depending on the positive fit of the internal or external connective interface, this microcrack might provoke bone loss to an extent that will vary, depending on the insertion depth of the implant.¹³

Our experience with an implant design of the most recent generation that has continuous microrough and nanorough surface extending to the implant neck and a fine thread in the cervical region (Fig. 6) has shown that the crestal bone level was stabilized in numerous clinical cases. Integrating the platform-switching concept in the presence of a completely rough implant surface played a central role in moving the microcrack on the implant platform more closely to the implant axis, counteracting bone resorption tendencies.

Implants with a continuous microrough and nanorough titanium surface extending to the implant neck facilitate osseointegration along the entire length of the implant, involving the entire implant surface. A fine thread in the cervical region results in functional loads being transmitted to the adjacent bony structures, supporting the formation of trabecular bony structures and stabilizing the region in question. Complete bony coverage of the entire implant surface can be attained upon successful osseointegration if the platform-switching concept is implemented.

When inserting implants in a reduced-bone environment, an additional advantage of the fine thread around the implant neck becomes manifest: the thread stabilizes the implant in the presence of an under-prepared osteotomy (implant bed preparation), contributing to the achievement of primary stability. This

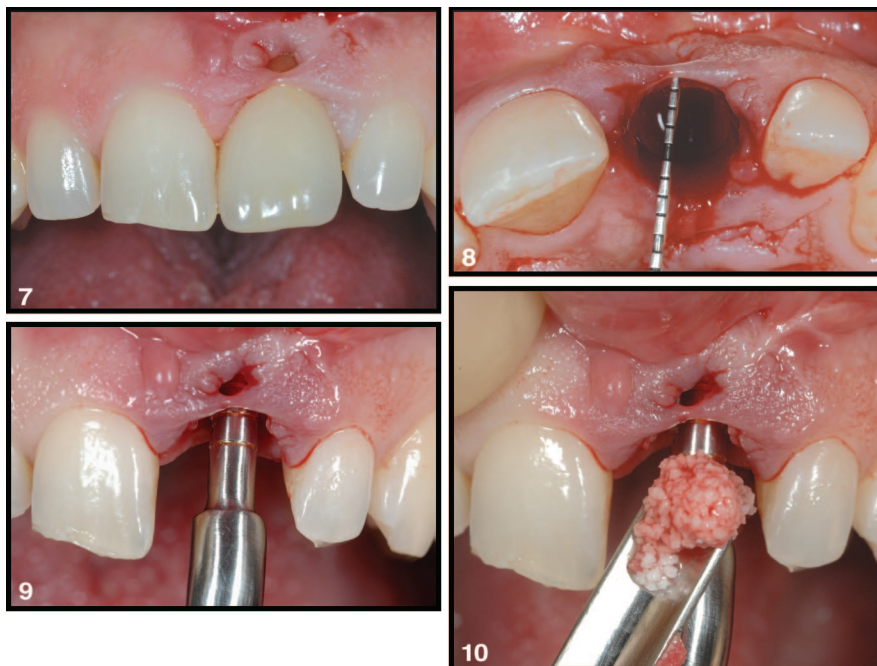


Fig. 7. Planned immediate implementation, with immediate restoration in the region of tooth 21. **Fig. 8.** Multiple apical resections have been performed. Note the perforation of the soft tissue. **Fig. 9.** After using a pilot drill 2-mm Ø, a nonablative cavity preparation using the osteotome technique to increase primary stability has been performed. **Fig. 10.** Inserted osteotome to keep the prepared implant bed clear; bone augmentation using β -TCP (Cerasorb M; Curasan AG, Kleinostheim, Germany).

in turn may help reduce the length of time for the healing phase.

Abutment Design and the Avoidance of Microlesions: Radiologic Follow-Up

The radiologic follow-up images in Figs. 5 and 6 impressively demonstrate the effect of platform switching. Following immediate placement of an implant (Revois 3.8/13 mm; Curasan AG) in the region of tooth 45, a transgingival healing mode using a narrower healing cap was selected. Following a healing phase of 4 months, an impression was taken using a multifunctional precision post that, if the 3-dimensional position of the implant is correct, doubles as a definitive post, *i.e.*, it will not be removed (Fig. 6). The 1-year follow-up radiograph shows that the periimplant marginal bone has clearly been preserved (Fig. 5).

By analogy with the results of Abrahamsson *et al.*,²⁶ an additional replacement of secondary components at the time of insertion of the prosthetic superstructure, which would carry a risk of additional marginal bone loss, can therefore be avoided. Studies have

shown that micromovements associated with the replacement of the secondary components (violation of the established biologic width) may result in an apical migration of the epithelial tissue around the implant neck, with more bone resorption and a reduction of the marginal bone level as a consequence.

Berglundh *et al.*²⁷ concluded from the results of their studies that a reaction takes place between the connective tissue and the titanium-oxide surface of the abutment, a reaction that they termed *connective-tissue integration*. Cochran *et al.*²⁸ demonstrated the adhesion of epithelial cells and fibroblasts to rough and smooth titanium surfaces. The results indicated that a connective-tissue attachment could help avoid the apical proliferation of the epithelial tissue on titanium surfaces.

The results from periodontal structural biology, regarding the formation of a long junctional epithelium after root planing, whose apical proliferation is limited by connective-tissue fibers inserting on the surface, can

also be applied to the periimplant situation. A good connective-tissue attachment to the titanium surface of the implant/abutment could prevent apical proliferation of the epithelial tissue. However, if the connective-tissue attachment process is disturbed by plaque accumulations or by exchanging secondary components (healing caps, posts, etc), this will facilitate apical migration of the epithelial tissue all the way down to the bone, with the concomitant risk of additional bone resorption.

Consequently, a surgical/aesthetic concept should be devised that facilitates the creation of a permanent connective-tissue attachment to limit the proliferation of epithelial tissue. The first step would be a reduction in the number of traumatic events, such as surgical procedures or the replacement of secondary components, and implementation of an efficient mode of plaque control.

The multi-functional precision post of the implant system used (Revois; Curasan AG) has a reduced diameter of 3.05 mm (compared to the implant diameter of 3.8 mm), which relocates the biologic microcrack inward toward the implant axis and reduces the amount of distance-sleeve-associated infiltrated connective tissue formed. Additional nonsurgical thickening of the soft tissue is caused by the tapered shape of the post and its tulip profile as the prepared ledge 1.9 mm above the implant shoulder is approached (Figs. 1, 4, 5, and 6). Fig. 6 shows the situation directly before the impression was taken, whereas Fig. 5 shows the situation 1 year after insertion of the prosthetic reconstruction. The standardized radiologic follow-ups clearly show the preservation of the interdental bone, which is located at the level of the prosthetic platform. It should be noted that this effect is not created by platform switching alone but is the result of the combination of all the factors previously described.

The influence of additional parameters on the functional and esthetic long-term results of implant therapy will be discussed in the next installation of this series of articles titled "Parameters of Esthetics." This is intended to be able to integrate many criteria and documented results into im-

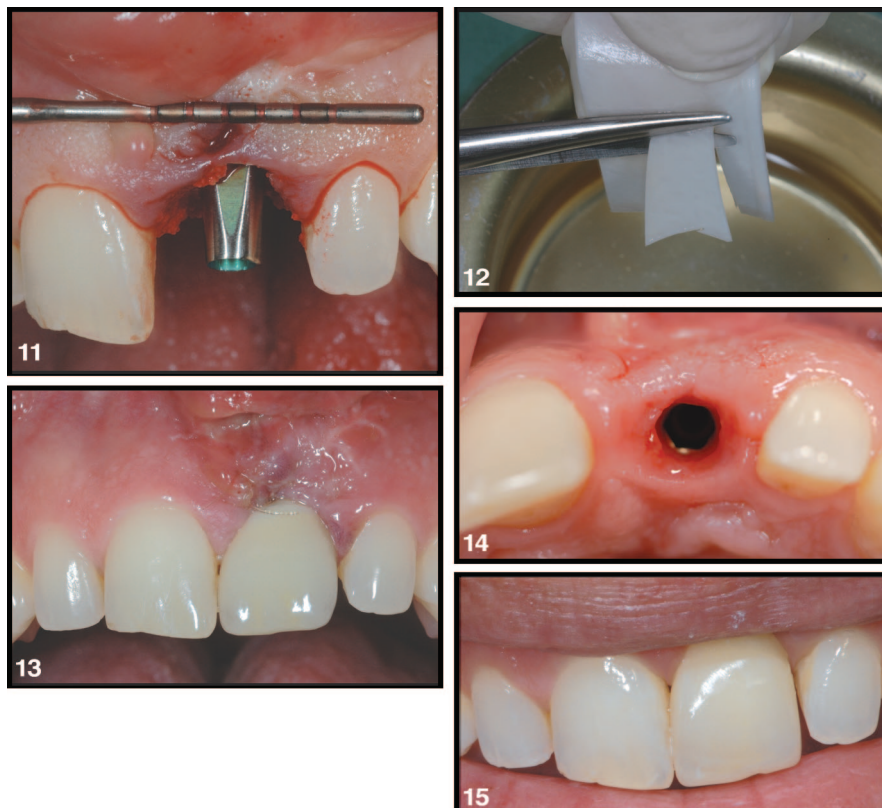


Fig. 11. Final position of the Revois implant with final abutment. Checking the insertion position.

Fig. 12. Preparation of an absorbable membrane (Epi-Guide; Curasan AG, Kleinostheim, Germany) to cover the soft-tissue perforation.

Fig. 13. Postoperative situation after suture adaptation. The soft-tissue perforation has been closed. Note the patient's crown, which is in nonocclusion ($-50 \mu\text{m}$).

Fig. 14. Soft tissue situation after 12 months: compared to the initial thickness, an addition of 3 mm.

Fig. 15. Patient situation after 12 months, with the natural tooth.

plant therapy in the esthetically sensitive anterior region to achieve optimal long-term treatment outcomes. These criteria include:

1. Anatomy: bone volume/bone quality²⁹
2. Mucosal quality: type/thickness^{30,31}
3. Condition of the adjacent teeth: classification of Palacci³²
4. Distances to the adjacent teeth: Tarnow relations^{2,11,12}
5. Biologic width and the platform-switching concept³³⁻³⁶
6. Implant design: macro-/micro-/nanolevel design and implant dimensions³⁷
7. Abutment design: macro-/micro-/nanolevel³⁸
8. Augmentation procedures: type/materials/membranes³⁹
9. Surgical procedure: soft-tissue management/point of time of insertion⁴⁰⁻⁴²; implant insertion

depth^{13,22,25,43}; time of loading/time of restoration

10. Prosthetic procedure: frequency of secondary-component replacement²⁶
11. Suturing techniques: materials
12. Provisional restorations: abutment materials/abutment shapes; crown materials/crown shapes
13. Definitive restorations: abutment materials/abutment shapes; crown materials/crown shapes
14. Patient compliance: oral hygiene/smoking/nutrition/recall intervals

CONCLUSION

For long-term esthetic results with implant restorations, the following parameters are important:

- Implant position following the literature concerning distance between implants or implants and natural teeth.

- Implant design and macro-, micro-, and nanostructures play an important role in maintaining the bone and soft tissue in the initial positions.
- Platform switching in combination with a final abutment inserted the day of implant placement (nonocclusal restoration) can be useful to obtain and maintain the long-term result concerning the biological width.

Clinical Case

Figs. 7 through 15 exemplify our procedure by showing a clinical case.

Disclosure

Each of the authors claims to have a financial interest in Curasan Company, whose product Revois Implant is mentioned in this article, inasmuch as each author lectures for Curasan.

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Abstract Translations

GERMAN / DEUTSCH

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Parameter der Ästhetik - Teil 1

Einflussfaktoren für den Erhalt des periimplantären marginalen Knochens

ZUSAMMENFASSUNG: Ästhetische Behandlungsergebnisse sind nicht einem einzelnen Parameter zuzuordnen, sondern, wie in diesem Artikel gezeigt, Resultat einer Reihe von Einflussfaktoren, denen vor allem in der ästhetischen Zone eine entscheidende Bedeutung zukommt. Das Verständnis um die Bedeutung der Biologischen Breite und die Integration des Konzeptes des "platform switching" in die implantologische Behandlung ermöglichen es, ein stabiles marginales Knochenniveau am Implantathalsbereich zu erreichen. Diese knöcherne Stabilität stellt die Stütze des Weichgewebes dar und determiniert somit das ästhetische und funktionelle Behandlungsergebnisse langfristig.

Dabei gilt es folgende Punkte zu beachten:

1. Ein präfabrizierter Pfosten, der sowohl als provisorischer, wie als endgültiger Pfosten verwendet werden kann, ermöglicht es bei optimaler 3-D Positionierung des Implantates, ein häufiges Auswechseln der Sekundärteile zu vermeiden. Dies bietet die Möglichkeit, eine erneute Zerstörung des bindegewebigen Attachments und der Biologischen Breite mit der Gefahr der Knochenresorption zu vermeiden.
2. Ein spezielles Implantat- und Pfostendesign (Stufe mit Integration der Biologischen Breite/Verjüngung des Pfostens) ermöglicht eine nicht-chirurgische Verlängerung und Verdickung der periimplantären Weichgewebe, wodurch eine breitere und widerstandsfähigere Bindegewebszone etabliert werden kann.
3. Eine mikro- und nanorauhe Titanoberfläche bis zur Implantatschulter verbunden mit dem Prinzip des "platform switching" ermöglicht die ossäre Integration der gesamten Implantatlänge. Ein Feingewinde führt zur optimalen Verteilung der Kaukräfte im Implantathalsbereich mit der Vermeidung weiteren Knochenverlustes in dieser Region.

SCHLÜSSELWÖRTER: Biologische Breite, platform-switching, Makro-, Mikro- und Nano-Design des Implantates

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Parámetros de la estética: Parte I

Factores que influncian la preservación del hueso marginal periimplante

ABSTRACTO: Los resultados estéticos no pueden atribuirse a un solo parámetro. En cambio, como lo demuestra este artículo, es el resultado de un número de factores de importancia, especialmente en la zona estética. Un entendimiento del significado de ancho biológico, o la integración del concepto de cambio de

plataforma en el tratamiento con implantes facilita la preservación de un nivel estable de hueso marginal alrededor del cuello del implante. Este hueso estable luego sirve para apoyar el tejido suave, determinando el resultado estable del tratamiento funcional y estético a largo plazo.

Deberán notarse los siguientes puntos:

1. Un poste prefabricado se puede usar como un poste temporal y como el pilar definitivo ayuda a evitar un frecuente reemplazo de los componentes secundarios, siempre que la posición tridimensional del implante sea correcta. Previene una destrucción repetida del contacto del tejido conectivo en el ancho biológico, que ocasionaría el riesgo de la reabsorción del hueso.
2. El diseño de un pilar e implante especial (un borde e integración de la forma cónica/ancho biológico del poste) facilita el alargamiento no quirúrgico y espesamiento del tejido suave periimplante. Esto lleva al establecimiento de una zona más amplia y resistente de tejido conectivo.
3. Una superficie de titanio micro áspera y nano áspera que se extiende hasta el hombro del implante junto con el concepto de cambio de plataforma ofrece la integración ósea a lo largo de toda la longitud del implante. Una rosca fina óptimamente distribuye las fuerzas masticatorias en la región del cuello del implante, evitando una mayor pérdida del hueso en esta región.

PALABRAS CLAVES: ancho biológico, cambio de plataforma, diseño macro, micro y nano del implante

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Parâmetros de Estética: Parte I

Fatores que Influenciam a Preservação do Osso Marginal do Periimplante

RESUMO: Resultados estéticos não podem ser atribuídos a um único parâmetro. Ao contrário, como este artigo mostra, eles resultam de inúmeros fatores importantes, especialmente na zona estética. Uma compreensão do significado da largura biológica, da integração do conceito de mudança de plataforma no tratamento do implante facilita a preservação de um nível de osso marginal estável em torno do colo do implante. Este osso estável serve então para suportar o tecido mole, determinando os resultados estéticos e funcionais do tratamento de longo prazo.

Os seguintes pontos devem ser observados:

1. Um pino pré-fabricado que pode ser usado tanto como pino temporário como suporte definitivo para evitar sub-

stituição freqüente de componentes secundários, contanto que a posição tri-dimensional do implante esteja correta. Ele previne a destruição repetida do attachment do tecido conjuntivo na largura biológica, o que carregaria com ele o risco de reabsorção do osso.

2. Um design especial de implante e suporte (uma saliência e integração da largura biológica/forma afunilada do pino) facilita o alongamento e espessamento não-cirúrgico do tecido mole do periimplante. Isso leva ao estabelecimento de uma zona mais larga e mais resistente de tecido conjuntivo.
3. Uma superfície de titânio micro-rugosa e nano-rugosa estendendo-se até a plataforma do implante em conjunção com o conceito de mudança de plataforma proporciona integração óssea ao longo de toda a extensão do implante. Um fio fino distribui otimamente as forças mastigadoras na região do colo do implante, evitando perda adicional de osso nesta região.

PALAVRAS-CHAVE: largura biológica, mudança de plataforma, macro, micro e nano-design de implante

RUSSIAN / РУССКИЙ

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Параметры эстетики: часть I

Факторы, влияющие на сохранение краевой кости вокруг имплантата

РЕЗЮМЕ: эстетические результаты не могут быть обусловлены каким-либо одним параметром. Как показано в данной статье, это скорее результат

действия целого ряда важных факторов, в особенности в эстетической области. Понимание значения биологической ширины, применения концепции переключения платформы (platform-switching concept) в лечении с использованием имплантата способствует сохранению устойчивого уровня краевой кости вокруг шейки имплантата. Устойчивая кость служит опорой для мягких тканей, определяя стабильность долгосрочного эстетического и функционального результата лечения.

Необходимо отметить следующие моменты:

1. Готовый штифт, который может использоваться как временный штифт, так и окончательная супроструктура, помогает избежать частой замены вспомогательных элементов при условии, что имплантат правильно установлен в трехмерном отношении. Это предотвращает частое разрушение соединительнотканной связи на биологической ширине, которое связано с риском резорбции кости.

2. Специальная конструкция имплантата и супроструктуры (фланец и интеграция биологической ширины /коническая форма штифта) способствует нехирургическому удлинению и утолщению мягких тканей вокруг имплантата. Это ведет к формированию более широкой и устойчивой зоны соединительной ткани.

3. Титановая поверхность с микрошероховатостью и наношероховатостью, продолжающаяся до уступа имплантата, в сочетании с концепцией переключения платформы обеспечивает оссеоинтеграцию по всей длине имплантата. Мелкая резьба оптимально распределяет жевательные усилия в области шейки имплантата, не допуская дальнейшей потери костной массы на этом участке.

КЛЮЧЕВЫЕ СЛОВА: биологическая ширина, переключение платформы, макро-, микро- и нанодизайн имплантата

歯科審美学のパラメーター：パート1

ペリ-インプラント・マージナル・ボーン保存の影響要因

著者：フレデリック・ヘルマン、DDS*、ヘンリエット・ラーナー、DDS**、アディ・パルティ、DDS***

要約： 審美的結果を単一のパラメーターに帰結させることはできない。治療に審美的影響を持つ部分は、この論文が示すように、いくつかの重要な要因の組み合わせの結果である。Biologic widthと、platform-switching conceptのインプラント処置への統合が、インプラント頸部の安定したマージナル・ボーン・レベルの保存を可能にする。この骨の安定によって軟組織の支持が行われ、それが長期的に審美的で機能的な処置の結果の安定を決定する。

重要なポイントを以下に挙げる：

1. テンポラリー・ポストとdefinitive abutmentの両者として使用できるprefabricated postは、インプラントの3次元的位置が正しい場合に、secondary componentsの頻繁な交換を不要にする。これが、骨吸収リスクを生じさせるbiologic widthの結合組織接合部の破壊の繰り返しを予防する。
2. インプラントとアバットメントの特殊なデザイン (ledge, biologic widthの結合/テーパーを持つポストの形) が、インプラント周辺の軟組織の非外科的lengtheningとthickeningを可能にする。これによって、結合組織のより広くresilientな形成がもたらされる。
3. インプラントのshoulder部分へのmicroroughとnanorough titanium surfaceの延長とplatform-switching conceptとの組み合わせが、インプラント長さ方向全体のosseous integrationをもたらす。Fine threadによってmasticatory forcesがインプラント頸部に最良に分配され、この部分のその後の骨損失を予防する。

キーワード： biologic width、platform-switching、インプラントのマクロ、マイクロとナノデザイン

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美學參數：第一部分

影響媒體週邊邊緣骨維持的因素

作者： Frederic Hermann，DDS*、Henriette Lerner，DDS**、Ady Palti，DDS***

摘要：美學結果不能歸因於單一參數。如同本文顯示，它反而是一些重要因素的結果，其中尤其包括美學領域。了解生物寬度的意義、平台轉換概念與植體治療的整合，能促進植體頸部的邊緣骨水平保持穩固。此穩固的邊緣骨將能支撐軟組織，對穩定的長期美學和功能治療結果有決定性影響。

以下幾點值得特別注意：

1. 如果植體的三維位置正確，則可同時作為臨時根柱和最終支柱牙的現成根柱，將能幫助避免頻繁替換次要元件。它能預防反覆損壞生物寬度上的結締組織連結，從而避免骨質流失的風險。
2. 特殊的植體和支柱牙的設計（支柱的生物寬度／槓形的平台與整合）能促進植體週邊軟組織的非外科手術加長與增厚。這將建立一個更寬且更持久的結締組織區域。
3. 擴大至與平台轉換概念連結的植體肩台的孔壁粗糙和表面粗糙的鈦表面，會沿著植體的整體長度提供骨整合。細牙螺紋將咀嚼力量理想的分布到植體頸部區域，避免本區進一步骨流失。

關鍵字：生物寬度、平台轉換、植體宏觀、微觀和奈米設計

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심미성 파라미터 : 제1부

임플란트 주위 변연골의 보존에 영향을 미치는 인자들

저자 : 프레데릭 허만, 치과의사*, 헨리에트 러너, 치과의사**, 애디 팔티, 치과의사***

초록: 심미적 결과는 하나의 단일 파라미터에 좌우될 수 없다. 오히려, 본 논문에서 보여주는 것과 같이, 심미적 결과는 다수의 중요 인자들, 특히 심미적 영역의 중요 인자들에 기인한다. 임플란트 치료에 통합된 Platform-switching 개념에서 생물학적 폭경의 의미를 이해하면 임플란트 목 주위의 안정 변연골의 높이를 보존하는 것이 용이하게 된다. 이 안정 골이 연조직을 지지하는 역할을 하며, 심미적 및 기능적 측면에서 안정된 장기적 치료 결과를 결정한다.

다음과 같은 점들에 주목하여야 한다:

1. 임시 기둥으로도 사용될 수 있고 최종 지대주로도 사용될 수 있는 조립식 기둥은, 만약 임플란트의 삼차원적 배치가 정확하게 이루어진다면, 보조 구성품의 빈번한 교체를 피하는 데 도움이 된다. 이것은 골 재흡수의 위험을 수반하게 될, 생물학적 폭경에 대한 연결 조직 부착의 반복적 파괴를 방지한다.
2. 특수한 임플란트 및 지대주 설계(레지(ledge) 및 생물학적 폭경/테이퍼형 기둥의 통합)는 수술에 의하지 않고도 임플란트 주위 연조직의 연장 및 비대를 용이하게 한다. 그 결과 보다 넓고 보다 많은 연결 조직 저항 구역이 확보된다.
3. 임플란트 주변부까지 연장되어 있는 마이크로 및 나노 수준 거칠기를 가진 티타늄 표면은 platform-switching 개념과 함께 임플란트 전 길이를 따라 골이 융합되도록 한다. 정교한 나사산으로 인해 저작력이 임플란트 목 영역에 최적 분산되므로, 이 영역에서는 더 이상의 골 손실이 일어나지 않게 된다.

핵심 단어: 생물학적 폭경, platform-switching, 임플란트 매크로, 마이크로 및 나노 설계

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