# The benefits of iPhysio® healing abutments in managing the emergence profile in implantology

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**- What is an implant emergence profile?**

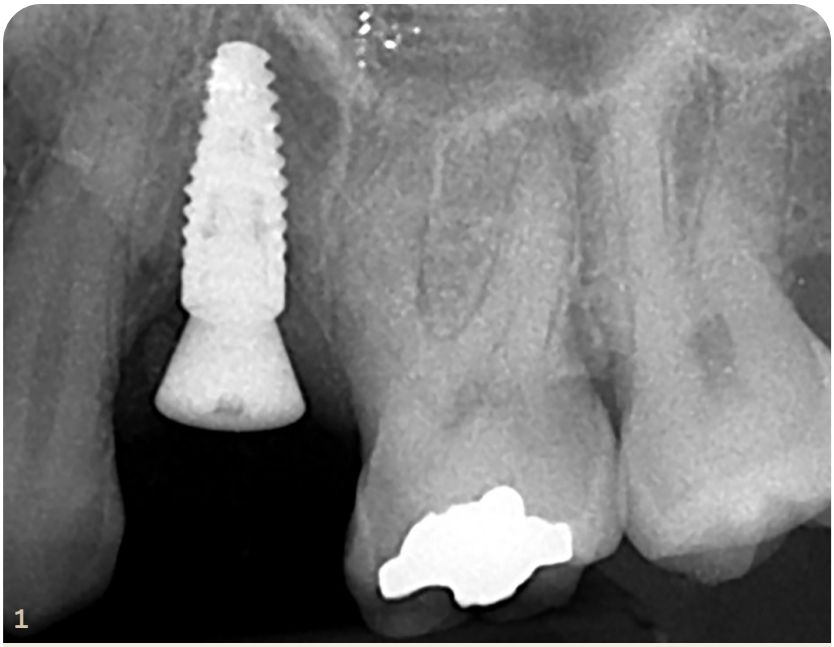
**- What role does the emergence profile play?**

**- What are the emergence profile's stability factors?**

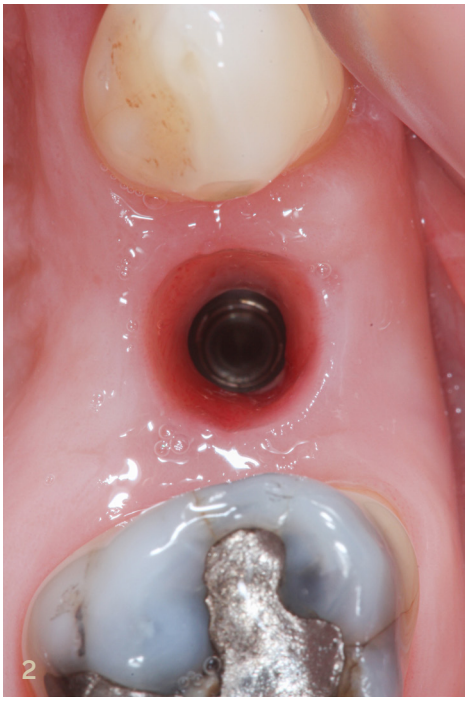
**- How does the IPhysio® system work?**

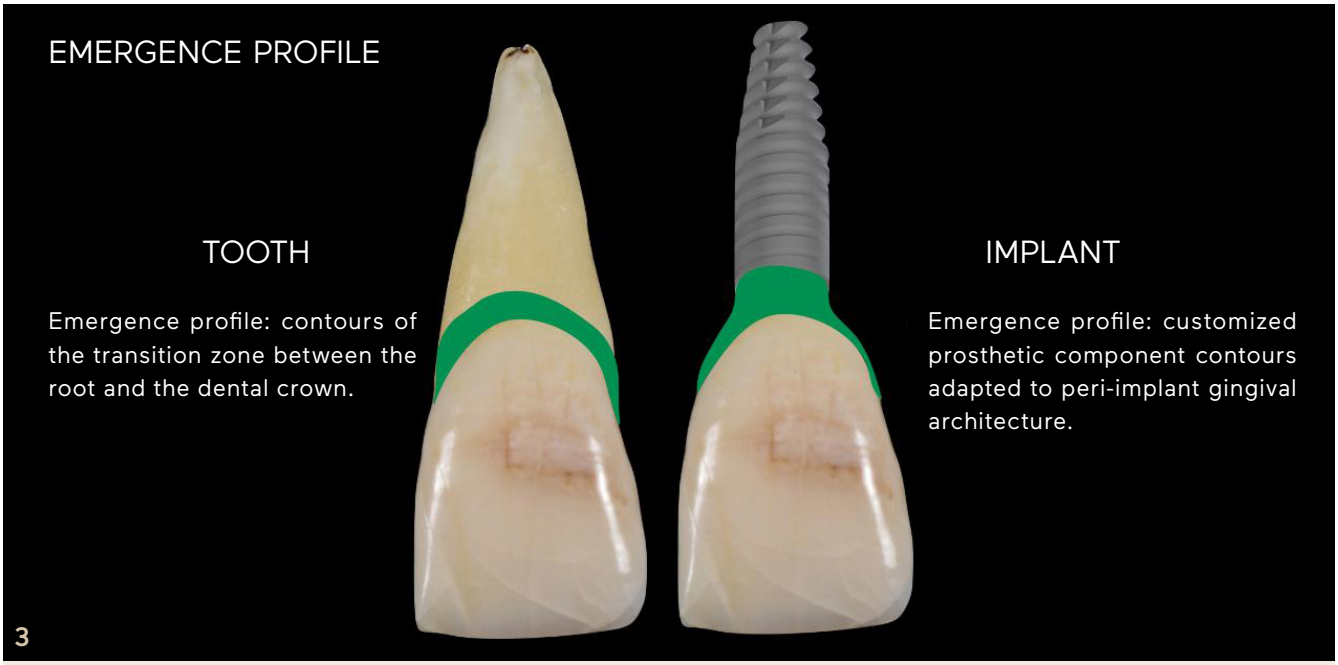
The criteria for successful osseointegration have been defined for decades (implant immobility, no radiolucency around the implant, no pain, limited bone loss and possibility of fitting a prosthesis) [1, 2] *(figs. 1 and 2)*. In addition to these clinical and radiological criteria, esthetic criteria are also used, such as the Pink Esthetic Score (PES) in the anterior region [3]. The PES is a tool for quantifying and comparing implant restorations. One of its major components is the presence and health of the peri-implant soft tissue, as well as the emergence line of the supra-implant prosthesis. This line and the health of the soft tissues are directly linked to the restoration's emergence profile, the transmucosal zone of the prosthesis, which is decisive in many respects: we'll go into more detail below.

The authors declare no relationship of interest.



**1, 2.** Clinical and radiological signs of osseointegration.



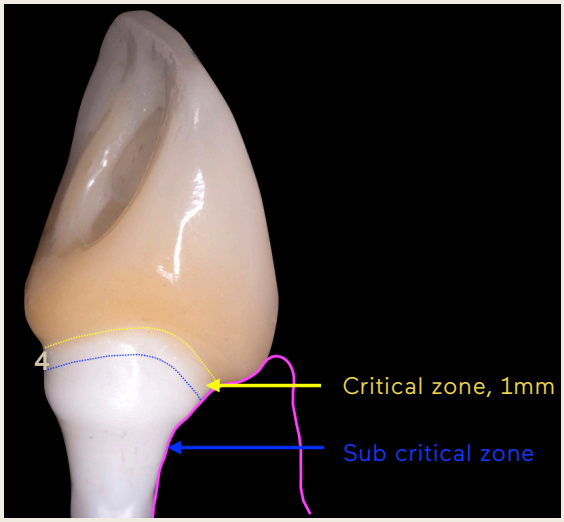



**3.** Dental and implant emergence profile diagram (editing: Dr Hervé Plard).

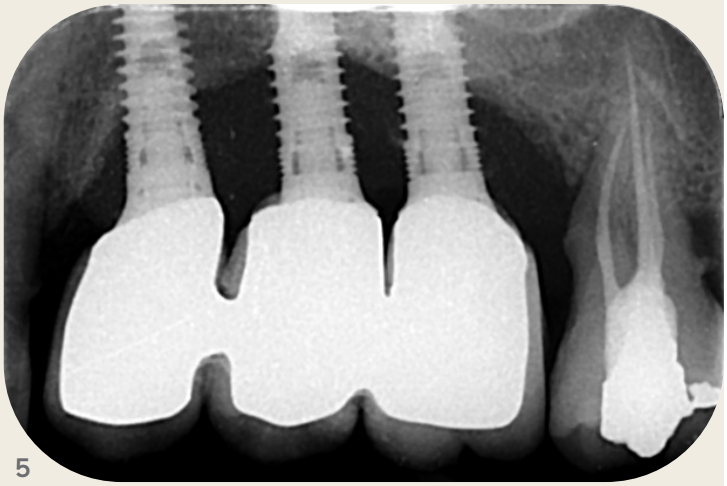
## THE EMERGENCE PROFILE

### Definition and shape of emergence profile [4]

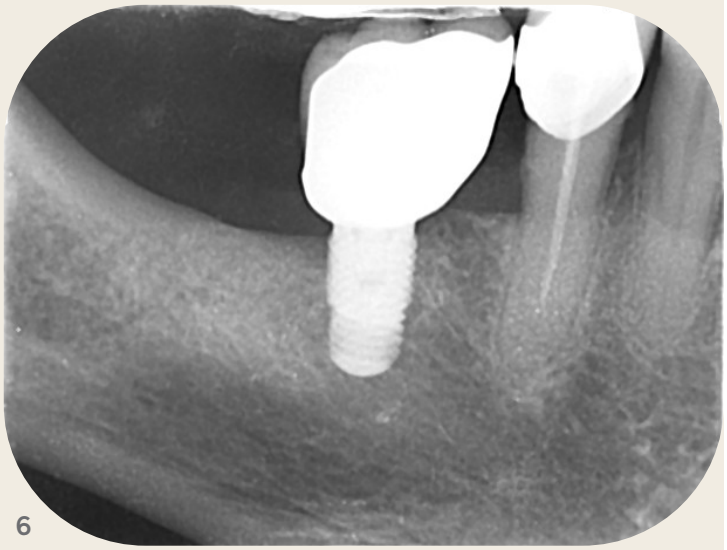
On a natural tooth, the emergence profile is the transition zone between the root and the dental crown. In implant prosthetics, the emergence profile is defined as the contour of personalized prosthetic components adapted to the peri-implant gingival architecture *(fig. 3)*. The problem is that dental roots, unlike the implants that replace them, are not round in cross-section [5]. The various healing screws do not allow us




**4.** Implant emergence profile description (according to Su [7]).




**5.** Radiography of peri-implantitis in the presence of transition angles greater than 30 degrees.




**6.** Radiograph of an excessively convex emergence profile (the painful prosthesis has been replaced).

to obtain an emergence profile close to reality.

There is now a consensus on the design of the transgingival part of prostheses (concave profile in the deep subcritical zone, convex profile in the marginal sulcus, also known as the critical zone). An increase in prosthetic volume in the critical zone will lead to recession of peri-implant tissues, while a decrease in volume in the subcritical zone will result in coronal migration of these same tissues [6, 7, 8] *(fig. 4)*. The literature also indicates that on Bone Level implants, an emergence angle greater than 30° is a risk factor for peri-implantitis (the risk is doubled), and that an excessively convex emergence profile increases this risk [9] *(figs. 5 and 6)*. As a general rule, overcontouring should be avoided, as this can also lead to peri-implantitis [10]. By integrating all these features, we can create implant prostheses with an ideal emergence profile.

## Emergence profile roles

The conditions for achieving this emergence profile are mainly anatomical. To achieve a durable and esthetic implant-prosthetic result, the implant must be optimally positioned within the bone volume (in accordance with a prosthetic plan), and peri-implant soft

tissues must be present. It appears that 2 mm of keratinized tissues around the implant acts as a shield, protecting it from biofilm-induced tissue destruction [11, 12]. The primary role of the emergence profile is therefore biological, protecting the implant-prosthetic assembly. The second role is mechanical, limiting aggression by the alimentary bolus [13] and facilitating brushing (an absence of keratinized tissues makes brushing painful and less frequent) [11, 12]. Finally, of course, the role of the profile is aesthetic, to reproduce the natural situation and transpose it to dental implants.

## Emergence profile stability

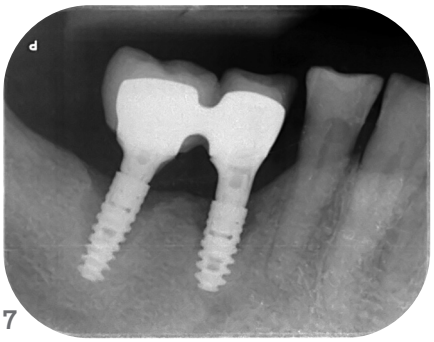
The stability of soft and hard tissues around implants depends on prosthetic manipulation. In dogs, repeated screwing/unscrewing of supra-implant abutments has been shown to compromise the mucosal barrier, resulting in a more «apical» position of the connective tissue zone [14]. The same consequences can be expected when screwing/unscrewing healing screws, and when handling impression transfers (whether for physical or digital impressions). Ideally, supra-implant parts should be handled as little as possible, even when sterile, and unscrewing should be limited.

Stability is also linked to the assembly method: excess cement can lead to mucositis and peri-implantitis in the long term. Whenever possible, a screw-retained assembly should be preferred to cementing [15, 16] *(figs. 7 and 8)*. Soft tissue health also appears to be better when prostheses are trans-screwed rather than cemented (probably due to the absence of residual cement) [17].

It has also been shown that excessively compressive profiles are deleterious to peri-implant tissues and may be the cause of migration or pain [18, 19].

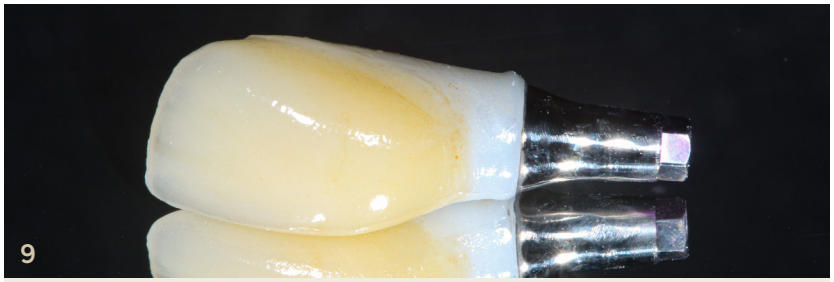
Emergence profile stability also depends on the materials in contact with the transgingival soft tissues. This stability is equivalent with titanium, gold or alumina: none of these materials appears superior to the others. On the other hand, zirconia seems to provide a better tissue response than titanium, although the difference is not very marked [20]. The only precaution is to place raw zirconia (unglazed or glazed) in contact with the soft tissues (emergence profile area) [21] and polish it meticulously [22] *(fig. 9)*.

All these considerations regarding the emergence profile have prompted manufacturers to propose solutions to sculpt it as closely as possible to the natural situation, integrating literature data and limiting the manipulations required for prosthetic procedures. Below, we describe the iPhysio® (LYRA ETK) solution, which appears to meet these requirements.

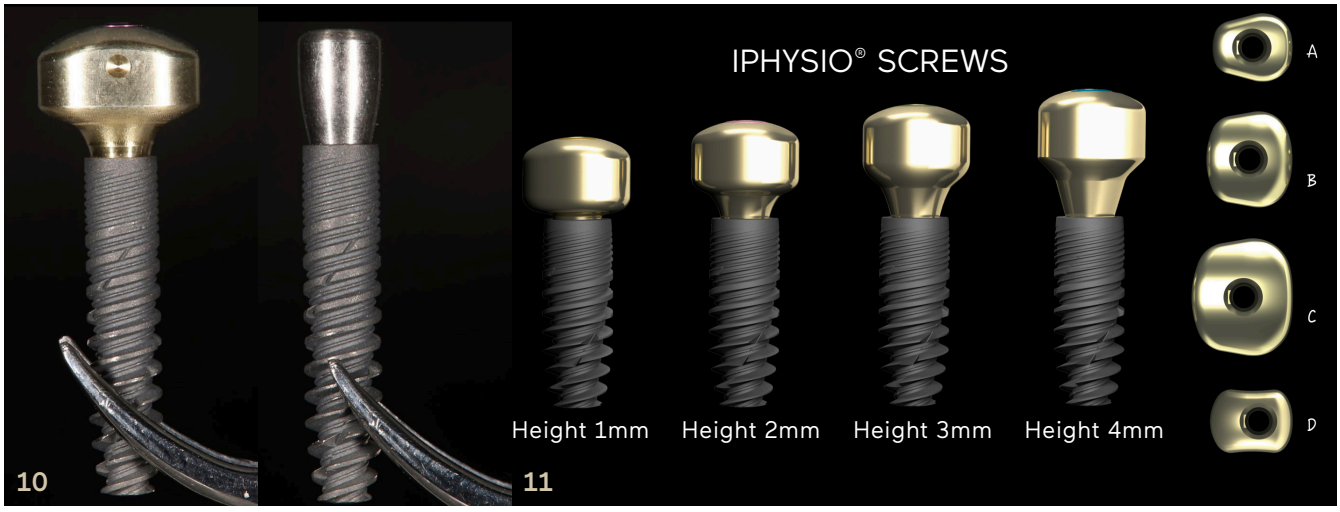




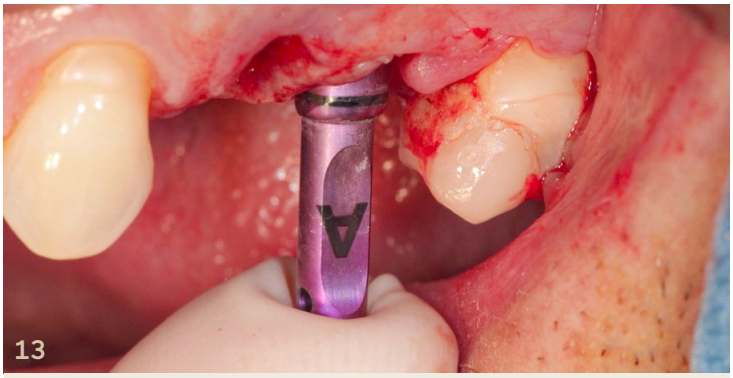
**7, 8.** Radiograph of peri-implantitis: excess cement present when the prosthesis is removed.




**9.**Used zirconia prosthesis on titanium base: the transgingival part is rough, unpolished (laboratory: Nicolas Laferté).








**10.** Comparison of the emergence profiles of an iPhysio® (left) and a conventional screw.

**11.** Panorama of iPhysio®: variable heights and shapes.

**12.** Try in abutment kit to select the most suitable iPhysio®.

**13.** Test gauge in place during surgery.

## THE IPHYSIO® SYSTEM

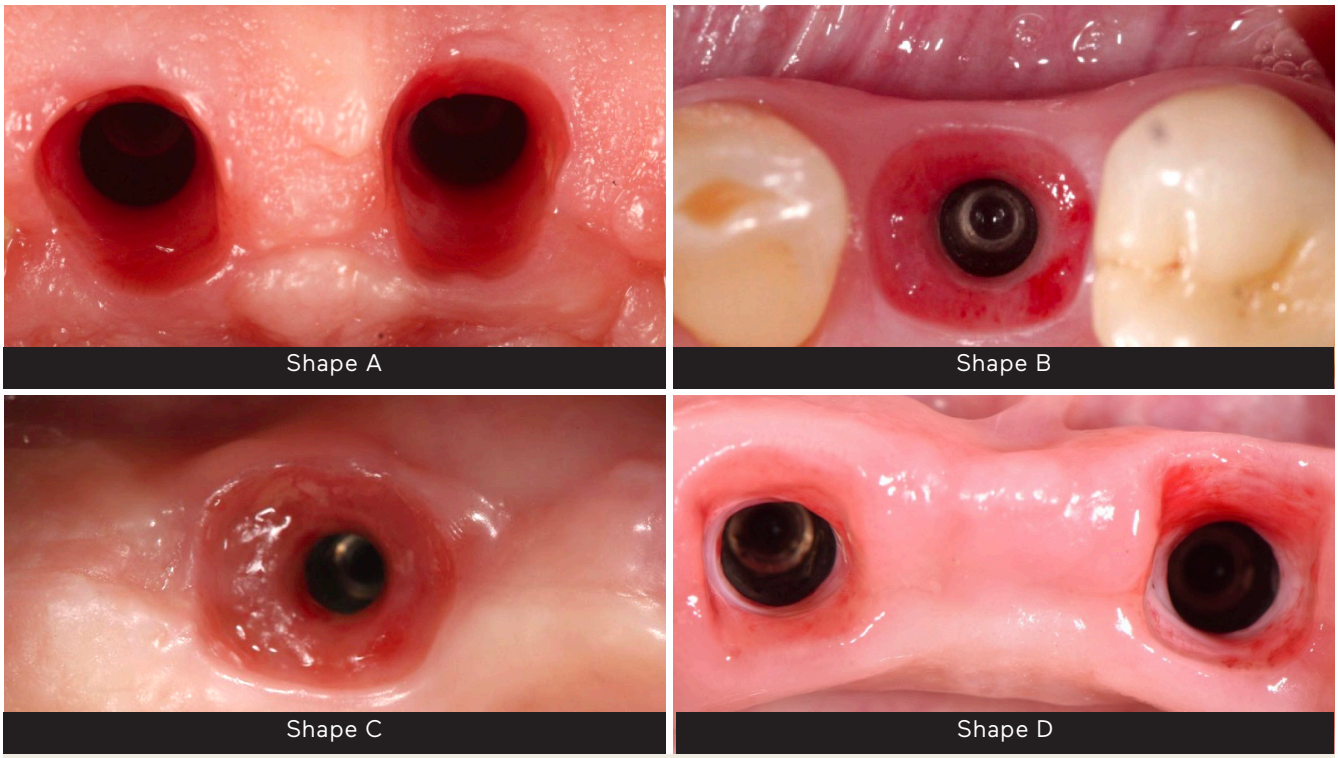
### Description and functions

The iPhysio® system is based on healing screws that are more anatomical than conventional screws *(fig. 10)*, with a concave transgingival section to meet the specifications of the ideal emergence profile. Several screw shapes (A, B, C, D) are available to reproduce different cervical sections depending on the tooth to be replaced (incisors, canines, premolars and molars) *(fig. 11)*. Several heights are available, from 1 to 4 mm.

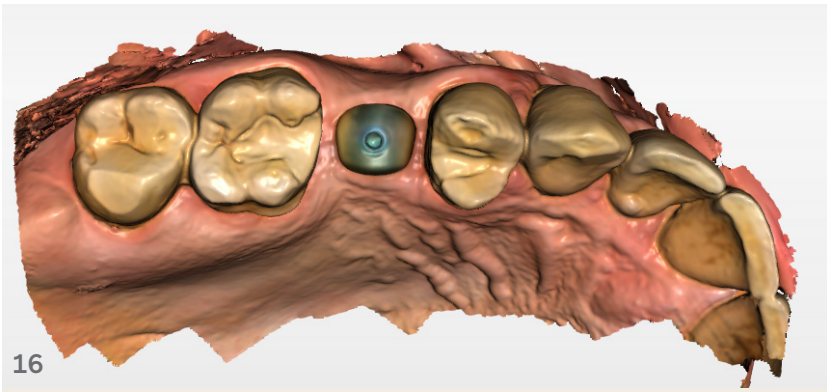
The choice will depend on the implant's placement. During the surgical phase, once the implant has been inserted, a try in abutment kit is used to choose the most suitable height and shape. This allows the screw to be selected before it is removed from the sterile packaging *(figs. 12 and 13)*.

Angulated IPhysio® are also available (screwing solutions with axis adjustment). When an IPhysio® screw is removed, the emergence profile obtained is closer to reality than with conventional screws (always if the implant is well positioned and the soft tissues present in quantity and quality) *(fig. 14)*.

These screws are therefore excellent abutments for healing and shaping soft tissues, but not only that. They also serve as scanbodies, enabling impressions taking



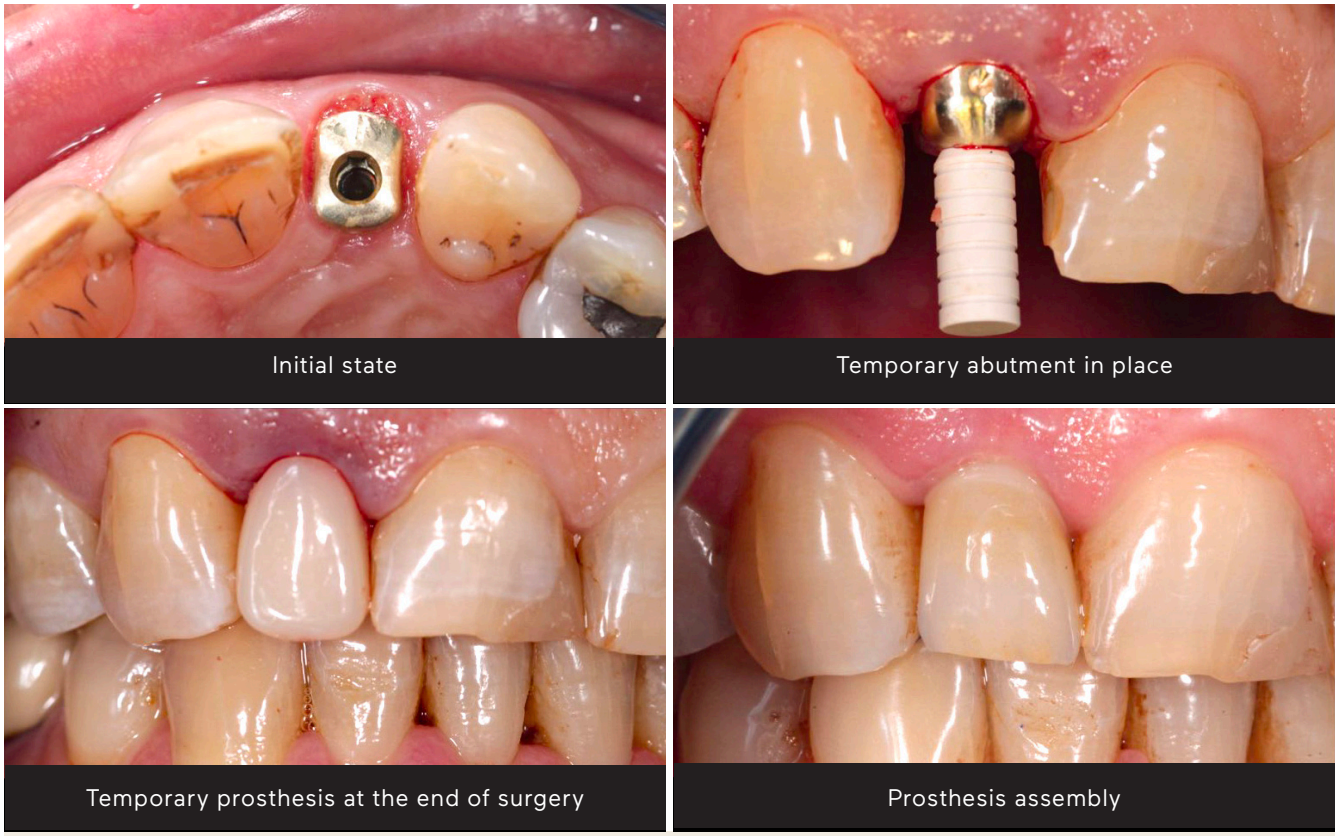

**14.** Peri-implant emergence profiles with the 4 different iPhysio® shapes.

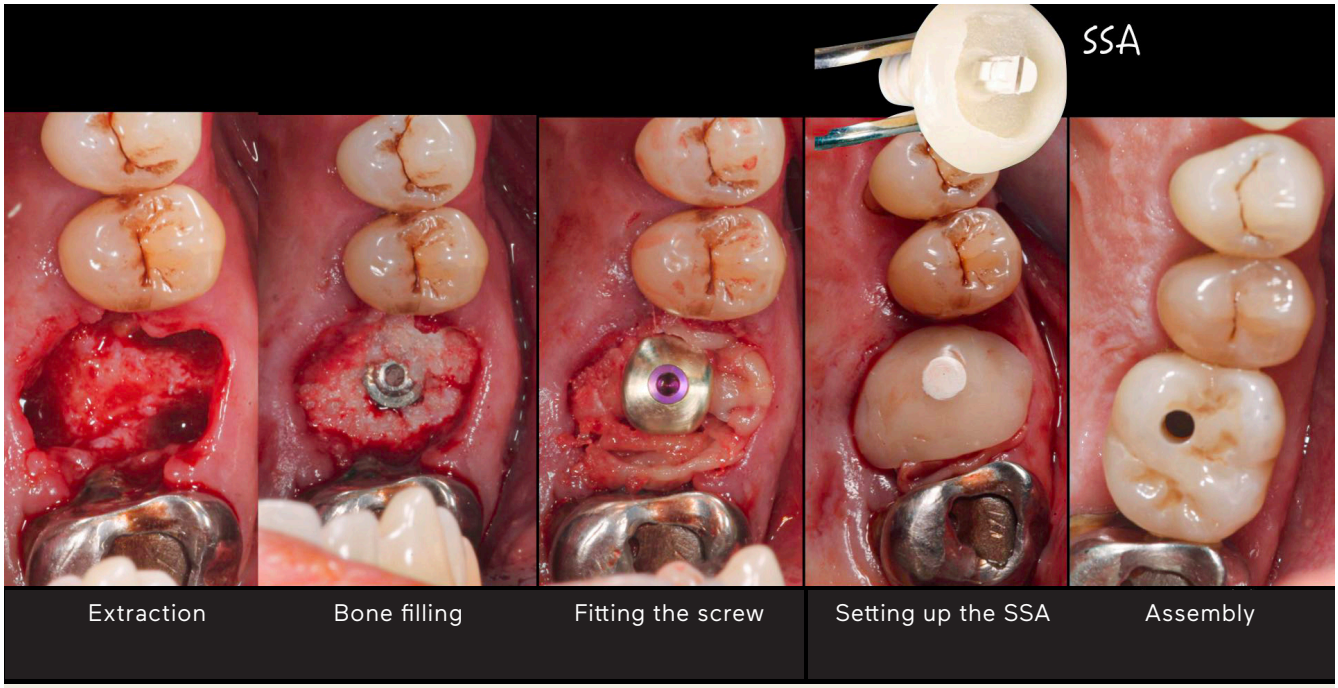

**15, 16.** Clinical view of the iPhysio® in the mouth and implant impression of the screw.

(physical or digital) without the need for handling and removal *(figs. 15 and 16)*, to preserve peri-implant tissue architecture. These screws can also be used to assemble clipped temporary prostheses: here too, unscrewing is not necessary, and there is no cement to protect the tissue environment (a temporary peek abutment clip into the IPhysio® abutment's screw hole) *(fig. 17)*. This clip-on customization abutment can also be used to create a Sealing Socket Abutment (SSA) *(fig. 18)*. In this way, the emergence profile of the freshly extracted tooth can be maintained with an IPhysio® healing screw to which the SSA is clipped.

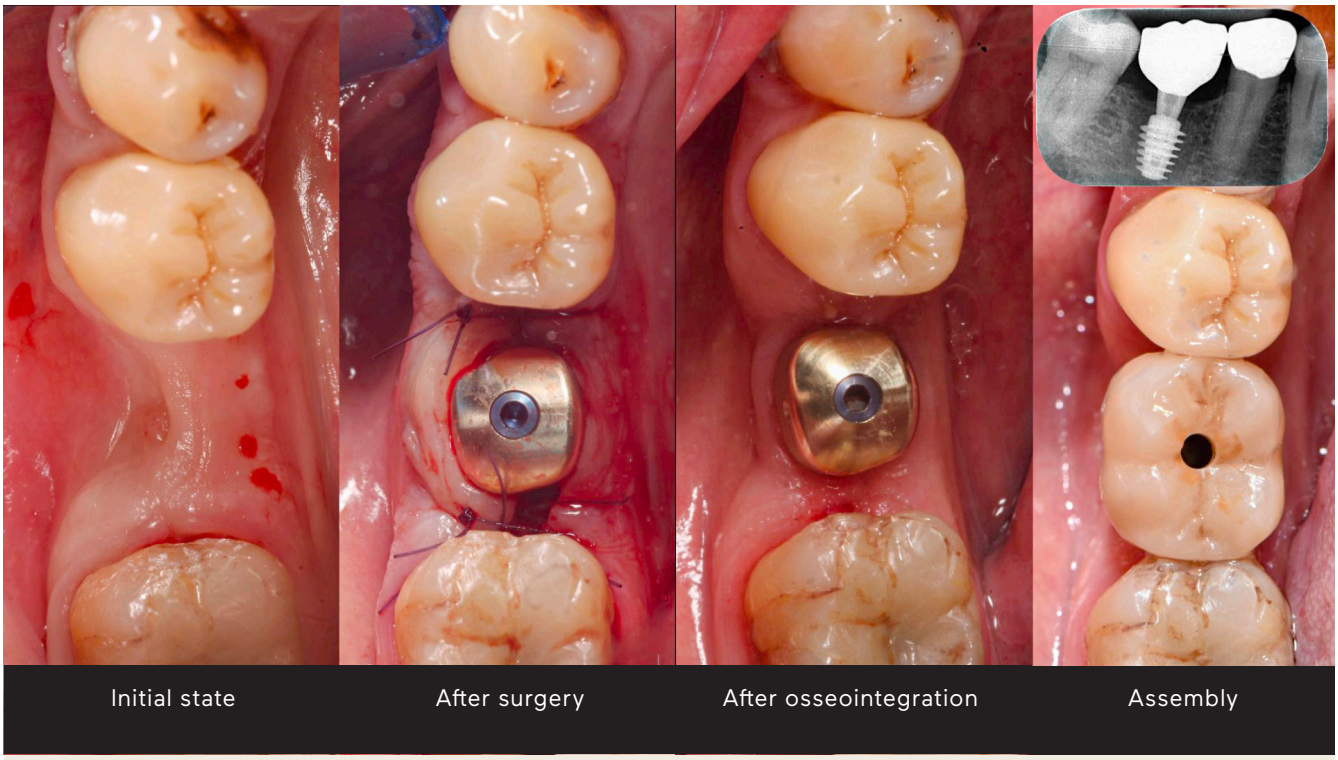
During the impression, only the SSA needs to be removed, while the screw and SSA are recorded to restore the original profile [23].



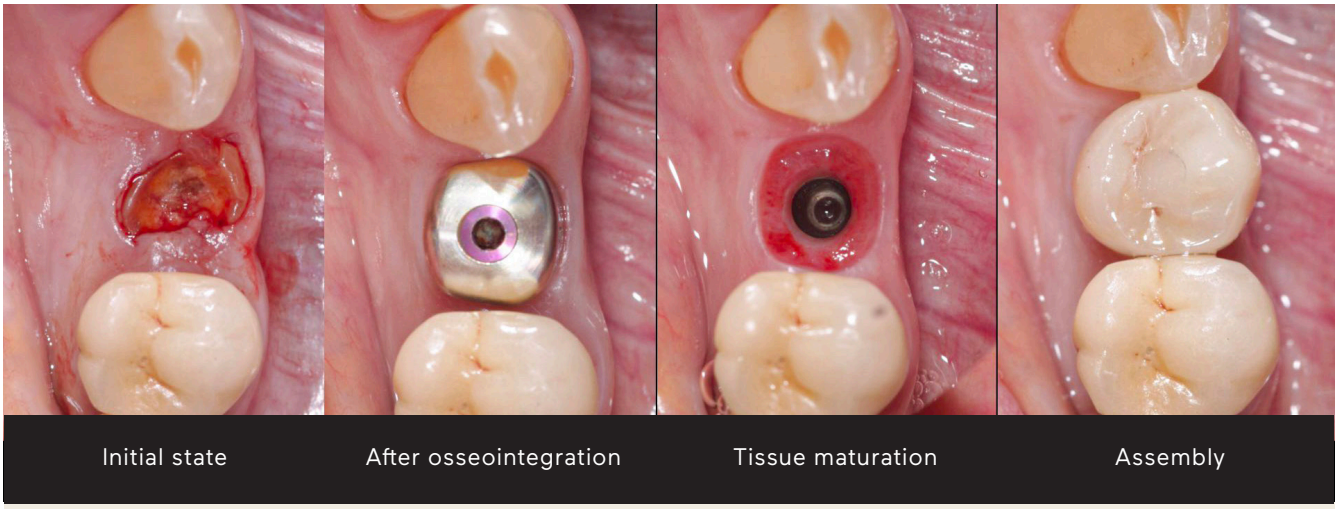

**17.** Temporary prosthesis clipped onto the iPhysio®.




**18.** SSA clipped onto an iPhysio® for immediate extraction-implantation.




**19.** Placement of an iPhysio® on a healed crest.




**20.** Placement of an iPhysio® in immediate extraction-implantation.

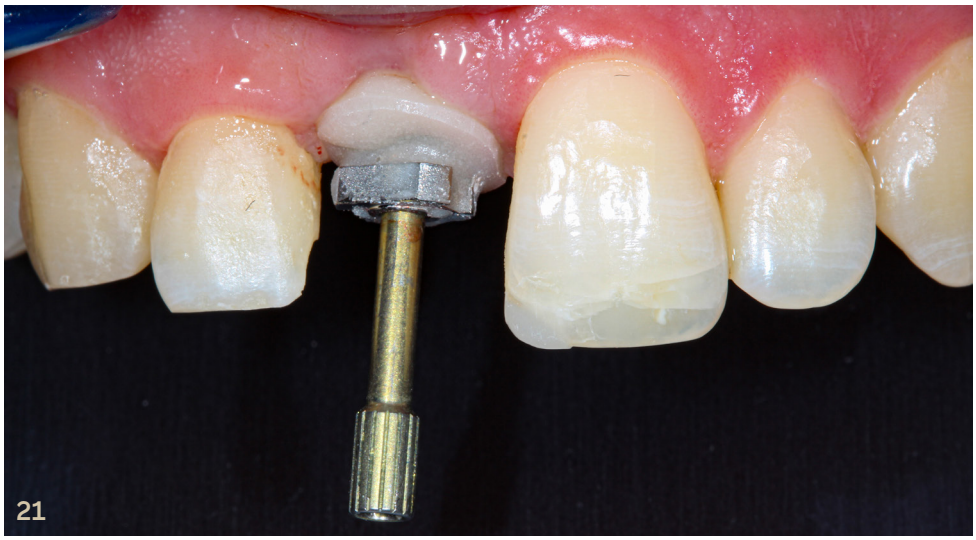
It is important to note that these screws are made of anodized titanium coated with a layer of zirconia, to limit biofilm attachment and thus the risk of inflammation. As this fragile coating does not withstand sterilization cycles, IPhysio® abutments are single use, which in any case seems to be the norm for implant healing screws [24, 25].

## Applications

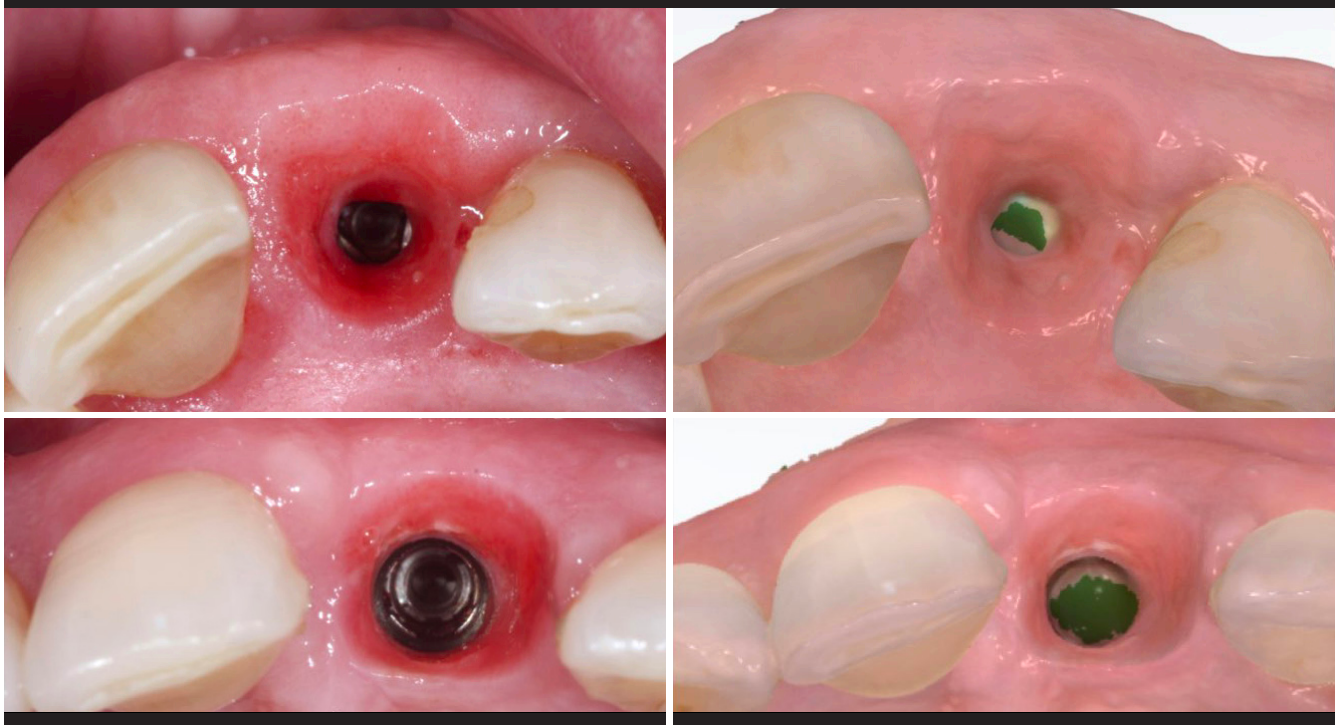
The IPhysio® healing screw acts as an emergence profile designer on both healed ridges and extraction sites *(figs. 19 and 20)*.

Once the emergence profile has been obtained, there are several ways of recording it. In physical impressions, the production of a customized transfer

**21.** Creation of a personalized transfer for a physical implant impression of a central incisor.




Optical impressions of emergence profiles



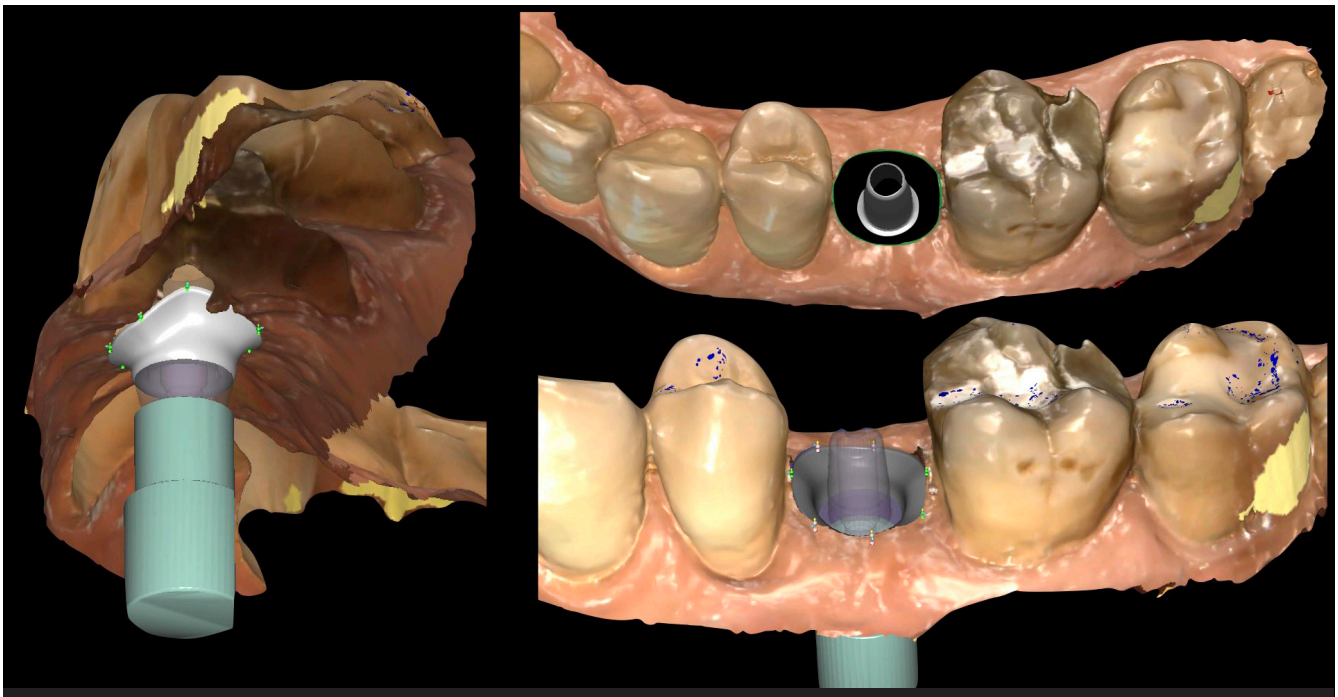
In-mouth situation

Optical impressions

**22.** Digital impressions of peri-implant emergence profiles.

is well codified and gives reproducible results *(fig. 21)*. However, it requires prosthetic manipulations and resin contact with soft tissues [26].

With digital techniques, intraoral scanners can easily record the gingival bed *(fig. 22)*, but it's important to remember that the gingiva is not fixed and that, as soon as the temporary prosthesis or



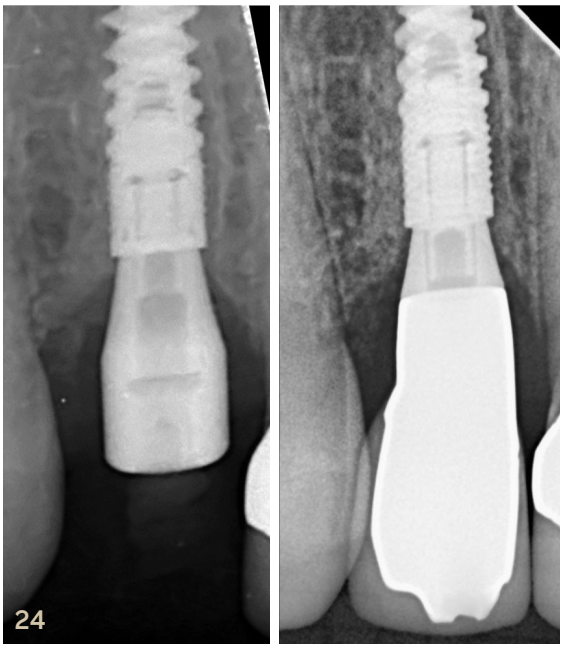
Screenshots of laboratory software, images by Nicolas Laferté

**23.** Laboratory software (Exocad) using the emergence profile defined by the screw.

healing screw is removed, the peri-implant tissues will collapse (which is also why the impression transfer must be customized, to maintain the gingival architecture in place). These impressions require at least one impression with scanbodies and one without (gingival bed), which takes time. However, soft tissues collapse occurs quickly: the volume of the supra-implant emergence profile decreases by an average of 5% at 30 seconds, 10% at 2 minutes and 14% at 5 minutes [27]. It's an illusion to think that even with the fastest CT scanners, the tissues won't collapse once the temporary prosthesis or screw has been removed.

The fact that the IPhysio® screw is not removed guarantees tissue protection and stability (the screw provides information on the implant's three-dimensional position and its subgingival profile is known, giving the dental technician all the data required to produce the prosthesis for use) *(fig. 23)*. In addition, the shapes of the titanium interfaces of the prostheses in use correspond to the shapes of the healing screws, so that the prostheses occupy strictly the same volume as the screws *(fig. 24)*. Once the screw impression has been taken, the digital chain in the laboratory ensures a perfect match.

For the sake of completeness, we should point out that there are other healing screws that are also scanbodies: Bellatek's Encode system, for example [28]. However, these screws are circular and are not designed to hold temporary prostheses *(fig. 25)*. They do not allow soft tissues to be sculpted into a variety of shapes, but, like the IPhysio®, they do reduce the number of manipulations required.



**24.** Radiographic correspondence between the screw profile and the profile of the prosthesis in use.

**25.** Clinical view of an Encode screw.

## CONCLUSION

No implant prosthesis will replace a tooth as well as if the patient kept it [29], but the practitioner now has devices at his or her disposal that allow this to be approached. The IPhysio® system enables the emergence profile to be sculpted, without the need for iatrogenic manipulation. It fits in with current implant therapies (immediate and delayed loading, SSA), while adapting to technological developments in the office (digital impression) and laboratory. This system seems to meet the need for an «emergence profile creator» (semi-anatomical) and a means of recording it accurately, without disturbing the fragile peri-implant attachment system.

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## Self-evaluation

| | | | |
|---|---|---|---|
| 1 | The emergence profile is identical for natural teeth and implant-supported prostheses. | | |
| 2 | Ideally, the implant emergence angle should be greater than 30°. | | |
| 3 | Zirconia is the material that brings the greatest stability to the emergence profile. | | |
| 4 | There are 3 types of iPhysio® to suit all clinical situations. | | |
| 5 | Implant impressions are taken directly on the iPhysio®, using physical or digital impressions. | | |

# Bibliography


1. Albrektsson T, Zarb Ga, Worthington P, Eriksson Ar.The long-term efficacity of currently used dental implants: a review and proposed criteria of success. Int. J. Oral Maxillofac. Implants, 1986, vol. 1, n°1, pp. 11-25.
2. Smith DE, Zarb GA. Criteria for success of osseointegrated endosseous implants.J Prosthet Dent. 1989;62(5):567-72.
3. Fürhauser R, Florescu D, Benesch T, Haas R, Mailath G, Watzek G. Evaluation of soft tissue around single- tooth implant crowns: the pink esthetic score. Clin Oral Implants Res. 2005; 16(6):639-44.
4. Perrin J, Plard H. Roles of temporary anterior supra-implant prostheses in «conventional» loading. Nrpi,2021;2,117-130.
5. Llobel P. Managing emergence profiles in the laboratory. Part one: from profile study to prosthesis design. QDRP. 2018;12(4):363-74.
6. Rompen E, Raepsaet N, Domken O, Touati B, Van Dooren E. Soft tissue stability at the facial aspect of gingivally converging abutments in the esthetic zone: a pilot clinical study. J Prosthet Dent 2007;97 (suppl.): S119-S125.
7. Su H, Gonzalez-Martin O, Weisgold A, Lee E. Considerations of implant abutment and crown contour: critical contour and subcritical contour. Int J Periodontics Restorative Dent. 2010;30(4):335-43.
8. Gancel T, Saizou Y, Crenn MJ. Transgingival shape of the prosthetic abutment: implications for gingival behavior around implant-supported anterior prosthetic restorations. Implant 2017;23:31-8.
9. Katafuchi M, Weinstein BF, Leroux BG, Chen YW, Daubert DM. Restoration contour is a risk indicator for peri-implantitis: A cross-sectional radiographic analysis. J Clin Periodontol. 2018;45(2):225-32.
10. Yi Y, Koo K-T, Schwarz F, Ben Amara H, Heo S-J. Association of prosthetic features and peri-implantitis: A cross-sectional study. J Clin Periodontol. 2020;47(3):392-403.
11. Souza AB, Tormena M, Matarazzo F, Araújo MG. The influence of peri-implant keratinized mucosa on brushing discomfort and peri-implant tissue health. Clin Oral Implants Res. 2016,27(6):650-5.
12. Warrer K., Buser D., Lang N. P. , Karring T. Plaque-induced peri-implantitis in the presence or absence of keratinized mucosa. An experimental study in monkeys. Clin Oral Implants Res. 1995;6(3):131-8.
13. Jeong JS, Chang M. Food Impaction and Periodontal/Peri-Implant Tissue Conditions in Relation to the Embrasure Dimensions Between Implant-Supported Fixed Dental Prostheses and Adjacent Teeth: A Cross-Sectional Study. J Periodontol. 2015;86(12):1314-20.
14. Abrahamsson I, Berglundh T, Lindhe J. The mucosal barrier following abutment dis/ reconnection. An experimental study in dogs. J Clin Periodontol 1997;24:568-72.
15. Linkevicius T, Puisys A, Vindasiute E, Linkeviciene L, Apse P. Does residual cement around implant-supported restorations cause peri-implant disease? A retrospective case analysis. Clin Oral Implants Res. 2013;24(11):1179-84.
16. Wilson G.W. The positive relationship between excess cement and peri-implant disease: a prospective clinical endoscopic study. Journal of Periodontology.2009;80: 1388-92.
17. Weber HP, Kim DM, Ng MW, Hwang JW, Fiorellini JP. Peri-implant soft-tissue health surrounding cement- and screw-retained implant restorations: a multi-center, 3-year prospective study. Clin Oral Implants Res. 2006;17(4):375-9.
18. González-Martín O, Lee E, Weisgold A, Veltri M, Su H. Contour Management of Implant Restorations for Optimal Emergence Profiles: Guidelines for Immediate and Delayed Provisional Restorations. Int J Periodontics Restorative Dent. 2020;40(1):61-70.
19. Perrin J. Therapeutic approach to painful implant prosthesis. Information dentaire 2023.10:32-5.
20. Linkevicius T, Apse P. Influence of abutment material on stability of peri-implant tissues: a systematic review. Int J Oral Maxillofac Implants. 2008 ;23(3):449-56.
21. Linkevicius T, Apse P. Influence of abutment material on stability of peri-implant tissues: a systematic review. Int J Oral Maxillofac Implants. 2008 ;23(3):449-56.
22. Happe A, Röling N, Schäfer A, Rothamel D.: Effects of different polishing protocols on the surface roughness of Y-TZP surfaces used for custom-made implant abutments : a controlled morphologic set and profilometric pilot study, J Prosthet Dent. 2015;113(5):440-7.
23. Finelle G, Popelut A. Immediate implant extraction protocol: the benefits of using CAD/CAM-designed anatomical healing abutments (SSA Abutment). JPIO,2016,35(4);311-21.
24. Sahin, S.C., Dere, K.A. Evaluation of residual contamination on reused healing abutments. Clin Oral Invest 25, 5889-5895 (2021).
25. Wadhwani C, Schonnenbaum TR, Audia F, Chung KH. In-Vitro Study of the Contamination Remaining on Used Healing Abutments after Cleaning and Sterilizing in Dental Practice. Clin Implant Dent Relat Res. 2016 ;18(6):1069-74.
26. Hinds KF. Registration of the healed tissue in the esthetic implant restoration. Int J Periodontics Restorative Dent 1997;17:585-91.
27. Galibourg A, Dumoncel J , Cormary J , Maret D. Volume of unsupported peri-implant soft tissue over time: A cross-sectional observation study. J Prosthet Dent 2021;125(6):883-9.
28. Derhalli M. The digitalizing of implant dentistry: a clinical evaluation of 15 patients Compend Contin Educ Dent. 2013;34(3):192-6.
29. Pjetursson BE, Heimisdottir K. Dental implants – are they better than natural teeth?. Eur J Oral Sci 2018; 126(Suppl. 1): 81-7.