

Expanding the indication span of recent immediate intermediate abutments

Transforming “bone level” implants into “tissue level” implants

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Manufacturers of two-piece implants are now offering a dedicated immediate intermediate abutment which is seated directly into the implant neck during surgery and which is no further removed. This item transforms a ‘bone level’ implant into a ‘tissue level’ one. Aim of the present paper is to present a clinical example of the use of this intermediate abutment, beyond its intended intraoperative indication.

Introduction

Since the early days of modern implantology, two distinct designs of dental implants have coexisted to suit the 1-stage and the 2-stage surgical approaches.

Implants dedicated to 1-stage surgery comprised two different portions within a single piece: a roughened screw portion in contact with bone, and a smooth neck in contact with the gingiva. Immediately after surgery the soft tissues start healing around the implant neck. The gingival seal that is further obtained is no longer disturbed during the subsequent prosthetic stage because it takes place at the level of the sulcus. This implant form is known as ‘tissue level’ implant.

Advantage of this implant design from the biological point of view in relation to the crestal bone is that there is no implant-abutment junction or micro-gap between these two components. Inconvenient is that the height of the implant collar is given; it cannot be accustomed to the local soft tissue conditions. At most two collar heights have been offered to adapt to the gingival thickness. Because

this implant design does not allow closed adaptation to the local gingival tissue thickness, the aesthetic results do not always meet expectations. It is still possible to circumvent this difficulty by placing the implant in a subcrestal position; however, subcrestal position of the limit between the machined part of the collar and the roughened area of the implant results in permanent physiological bone loss [10, 2].

Implants dedicated to 2-stage surgery comprise two distinct pieces: a threaded screw portion and a transgingival abutment which is subsequently secured into the threaded portion. The junction between implant and abutment is in close proximity to the crestal bone; it is therefore known as ‘bone level’ implant. When a 1-stage surgery protocol is implemented with this 2-stage surgery implant, the prosthodontist removes the healing abutment and can choose the adequate prosthetic abutment height corresponding to the local soft tissue thickness. This allows precise adaptation of the abutment height to the local condition of the gingiva, it helps better predicting the ex-

pected aesthetic result. From a biological point of view however, this implant design presents two disadvantages. First, it introduces a gap between the implant neck and the prosthetic abutment, even more precisely at the bone level; second, the gingival seal is damaged multiple times during the prosthetic steps. These local irritations provoke apical migration of the junctional attachment entity and a subsequent crater-shaped bone resorption [1, 15]

To avoid migration of the gingival seal, it has been suggested to affix immediately a final prosthetic abutment which would not be removed; this has been named “one abutment-one time” protocol [8]. Clinical studies have demonstrated efficacy of this method in comparison to screwing-unscrewing multiple times the healing abutment during the conventional impression stages and before attaching the final prosthesis definitively [8, 3, 13].

Up until very recently, the abutment that best suited this ‘one-abutment-one time’ approach was the multi-unit abut-

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1a

1b

Figures 1a to c | Connect (MIS) immediate intermediate abutment

1a | Connect abutments of various length, 1.5–4 mm aimed at meeting the local requirements of crestal or subcrestal placement and soft tissue thickness

1b | Intermediate abutments for narrow platform (NP) and standard platform (SP) implants. The standard platform is colour-coded.

1c | Cross-section of the Connect showing the abutment mounted on the Connect platform



1c

ment (MUA), an item that has been developed to accommodate the plural prosthetic restoration. Moving the prosthetic working plane away from the bone level to the soft tissue level means that the mucosal seal initially formed during gingival healing is no more disturbed by any operation involved in securing the final prosthesis. However, MUA abutments are bulky and are not suited to the narrow spaces commonly restored with a single crown [7].

To better implement this recent concept, manufacturers of two-piece implants have lately brought to market a dedicated immediate tissue level abutment (ITLA). The latter is screwed directly into the implant neck during surgery and is no more unscrewed. This abutment is available in several lengths, from 1.5 to

4 mm (Figs. 1a to c); the aim is to closely adjust to the local soft tissue thickness and to the crestal/subcrestal position of the implant. After seating the ITLA to the implant collar, a cover screw is placed and sutures are secured around the abutment. Bone and gingival healing then take place simultaneously and the gingival seal is no more disturbed during the prosthetic steps. Manufacturers' indication of the ITLA is to seat it intraoperatively during implant surgery into the implant neck as shown in figures 2a to k, with the intention of no more violating the gingival seal that will be obtained.

Goal of the clinical cases shown here is first to show the classical use of this item and then how it suits an indication other than the initially dedicated one. In this alternative clinical situation, instead

of being placed intraoperatively, the ITLA is affixed to the implant collar at the end of the osseointegration period within a transgingival 1-stage healing protocol. Advantages and disadvantages of this new protocol are presented and discussed.

Clinical cases

Case 1.

Intraoperative placement of the ITLA

A patient attended to restore the edentulous site of her left maxillary first bicuspid (Fig. 2a). A $\text{\O} 3.9 \times 13$ mm implant (V3, MIS) and a 3 mm long immediate intermediate abutment (Connect, MIS) have been selected for treatment (Fig. 2b). The abutment was fastened intraoperatively into the implant neck with a 30 Ncm

Figures 2a to k | Restoration of a maxillary bicuspid using an immediate tissue level abutment fixed intraoperatively



2a



2b

2a | Preoperative radiograph of the edentulous left first bicuspid site 2b | Selection of a 3 mm long Connect SP abutment



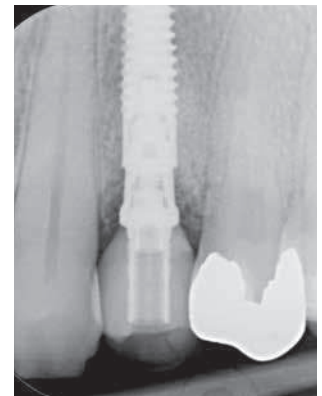
2c | Intraoperative placement of the ITLA with a 30 Ncm torque into the implant neck



2d | Placement of the cover screw on top of the ITLA.



2e | Lateral augmentation intended to fill the peri-implant bone defect 2f | Postoperative radiographic control showing the implant, the immediate tissue level abutment and its cover screw 2g | Occlusal view of the soft tissues at the end of the osseointegration period



2h | Radiograph control showing the ITLA and the good seating of the impression coping 2i | Master cast with the Connect analog in place 2j | Radiographic control after placement of the temporary prosthesis. One can see the implant, the immediate tissue level abutment and the metallic temporary abutment with its crown made of resin. 2k | Radiographic control of the final prosthesis showing the implant, the ITLA and the E.Max crown mounted on a titanium abutment

torque (Fig. 2c); then its cover screw was placed (Fig. 2d). Lateral augmentation using Bio-Oss (Geistlich) was performed in order to fill the bone defect (Fig. 2e); the flap was sutured around the ITLA. The post-operative radiographic control shows the V3 implant, the 3 mm long tissue level abutment and its cover screw (Fig. 2f). At the end of the healing period (Fig. 2g),

the cover screw was removed and a specifically dedicated impression coping was screwed onto the abutment to carry out an open tray impression (Fig. 2h). The master cast included a Connect analog (Fig. 2i) and the laboratory prepared a temporary crown mounted on a titanium abutment (Fig. 2j). After an 8-week period of soft tissue maturation, the final crown

was prepared and screw-retained on top of the implant neck (Fig. 2k). Because the ITLA was screwed in intraoperatively, the prosthetic working plane was moved from bone level to tissue level. All the prosthetic manipulations leading to final seating were performed without disturbing the mucosal seal at any time.

Case 2. Placement of the ITLA at the end of the osseointegration period

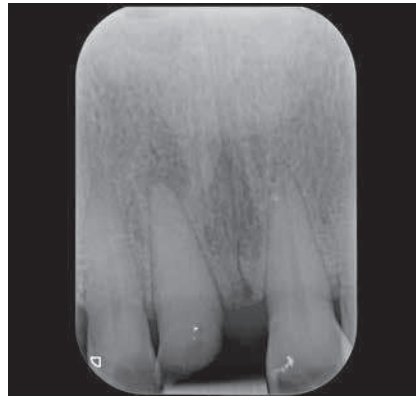
A patient attended after having experienced pain for a certain time at the area of the right central incisor. A subgingival fracture of the tooth was identified (Figs. 3a and b) and extraction of the tooth was diagnosed. Immediately after extraction, implant restoration was undertaken with a \varnothing 3.9 X 16 mm implant (V3, MIS) (Fig. 3c). A 5 mm long healing abutment was screwed into the implant neck (Fig. 3d); a lateral augmentation procedure (Bio-Oss, Geistlich) protected by a

resorbable collagen membrane (Bio-Gide, Geistlich) was implemented (Figs. 3e and f). The flap was sutured around the healing abutment. By the end of the osseointegration period, the healed soft tissues have shaped and organized a gingival seal around the healing abutment (Fig. 3g). The 5 mm long abutment was unscrewed (Fig. 3h), and a 2 mm long ITLA was affixed with a 30 Ncm torque (Figs. 3i and j). The radiographic control showed the proper seating of the tissue level abutment (Fig. 3k). From this moment and forward, the prosthetic working

plane was situated at the soft tissue level; the gingival seal from then on would no more be disturbed at any additional occasion but at removal of the healing abutment.

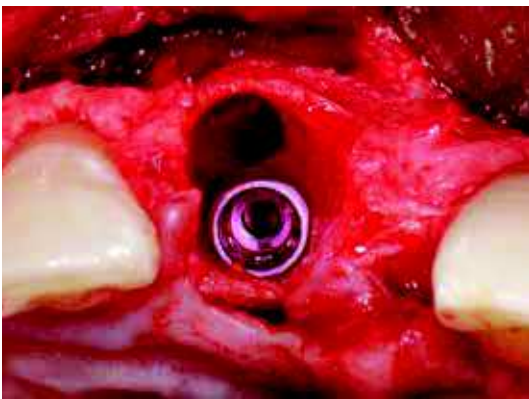
An open tray impression was taken with an impression coping specific to the abutment (Fig. 3l). The impression taken on the head of the abutment with the impression coping abutment (Fig. 3m) was sent to the dental technician lab; the latter prepared a temporary crown to be screwed on top of the Connect platform (Figs. 3n and o).

Figures 3a to o | Restoration of a right central incisor with an ITLA affixed at the end of the healing period instead of during surgery



3a | Patient attended with pain in the area of the right central incisor.

3b | Periapical X-ray of the incisor, showing the presence of a periapical cyst



3c | Placement of a \varnothing 3.9 x 16 mm V3 implant immediately after extraction and cyst removal

3d | Placement of a 5 mm long healing abutment



3e and f | Filling the bone defect with Bio-Oss and covering with a resorbable collagen membrane



3g | View of the soft tissues with the healing abutment at the end of the osseointegration period, just before starting the prosthetic stage

3h | Postoperative radiographic control showing the implant and the 5 mm long healing abutment



3i | Removal of the healing abutment and one-time rupture of the mucosal attachment. The violet colour-coded implant neck is visible deep in the gingival tissue.

3j | Selection of a 2 mm long Connect abutment



3k | View of the ITLA torqued into the implant neck before placing its protection screw

3l | Radiographic control of proper seating of the ITLA

3m | Radiographic control of proper seating of the Connect impression coping



3n | Frontal view of the temporary crown in place

3o | Radiographic control at temporary crown delivery. Note the implant, the ITLA, the prosthetic abutment screwed into the Connect and the resin crown.

Discussion and conclusion

The concept of the immediate 'one abutment-one time' abutment protocol gained clinical acceptance after it was acknowledged that repeated rupture of the gingival seal was leading to crestal bone resorption [1, 3, 8, 13, 15]. Implant manufacturers have therefore developed dedicated immediate tissue level abutments to be affixed during surgery with the objective to move the prosthetic working plane away from the crest, thus avoiding any further damage of the epithelial attachment, either during the various steps of impression-taking or during prosthetic fitting in.

Immediate tissue level abutments like the Connect have been developed by manufacturers with a per-operative intent and with the objective of no more being removed after seating. Their recommendations refrain the clinician from implementing this type of abutment in indications other than within the frame of the 'one abutment-one time' protocol.

The aim of the present article was to open and expand the indication span of the ITLA item. The objective is to show that placement of an ITLA is appropriate at two distinct time junctures. First is intraoperative as recommended by the manufacturers to follow the "one-time abutment" concept; advantage is that pristine integrity of the muco-epithelial

seal obtained after soft tissue healing is kept untouched over time. Second is at the end of the osseointegration period according to a one-stage transgingival healing protocol; at that occasion the healing abutment is unscrewed, the gingival seal is violated and the tissue level abutment is affixed to the implant neck. However, this will be the only time that the epithelial attachment will be damaged. Studies [11, 9] have shown that 2–3 repeated ruptures of the attachment caused only slight bone loss, in the range of 0.16 mm, with no clinical significance or consequences. Therefore, although not strictly following the one abutment-one time concept, placing the ITLA after having damaged the muco-epithelial seal only once is still in line with the pristine concept of preserving the integrity of the bony crest from a significant apical resorption. Advantage of placing the ITLA at the end of the osseointegration period is threefold: 1) After soft tissue maturation the prosthodontist can choose the ITLA height size that best suits the local soft tissue thickness; sometimes during implant placement it is rather difficult for the surgeon to anticipate the final thickness of the gingiva. 2) The item the prosthodontist places instead of the removed healing abutment is clean and sterile, it arrives from the manufacturer. The healing abutment which has been

in place for several months has become contaminated with bacteria [4]; putting it back after impression-taking into the implant neck in contact with a soft tissue that has been weakened by hemi-desmosome ruptures and which is often bleeding can only contribute to increase the bacterial load in the emergence profile area. 3) Similarly, the temporary or final prosthesis that arrives from the dental technician lab is neither perfectly clean nor sterile [5]; most often it is placed in contact with the weakened soft tissue of the emergence profile following a brief dental office cleaning procedure [5] if any [6]. Placing a non-contaminated component in contact with the soft tissue can only be an improvement to conventional procedures. The prosthetic parts prepared subsequently by the dental technician will then be placed in contact with a healthy healed gingival tissue. ■

The references are available at www.teamwork-media.de/literatur

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Advantages of the Connect immediate tissue level abutment are as follows:

- 1) The 'one abutment-one time' concept and protocol can be easily implemented, disConnection and reConnection are completely eliminated.
- 2) It turns a 'bone level' implant into 'tissue level' implant. The mucosal seal formed during initial tissue healing is no more disturbed by any prosthetic manipulation.
- 3) The conical ITLA-implant neck connection leads to an optimal seal at the implant-abutment junction situated at immediate proximity of the bony crest.
- 4) Impression taking is made simpler, this is a real advantage for the general practitioner restoring implants. Whether impressions are conventionally or optically acquired, the impression coping-Connect-connection is flat; it is easier to manage than a conical connection.
- 5) The component coming in close contact with the soft tissues is clean and sterile; it emanates from the manufacturer's stringent cleaning and sterilization process. Such an uncontaminated state is rarely achieved when an abutment returns from the dental technician lab [5].
- 6) A higher torque is exerted to seat it which prevents loosening. Fatigue testing of the Connect-implant neck connection has shown that the unscrewing torque needed to loosen it was higher than the torque needed to tighten it by 85% [12].
- 7) Need of a healing abutment is eliminated.
- 8) Shape is slimmer than a MUA abutment; it is minimally bulky and appropriate for single restorations.
- 9) The screw-retained mode can be considered for any type of prosthesis; this skirts the diffusion risk of excess cement linked with cement-retained prostheses.
- 10) When the biotype is thin, a more aesthetic result is obtained due to the golden tone obtained by anodization of the item [14].
- 11) In a plural restoration, the Connect-prosthesis connection allows compensation for axial divergences of up to 40°.
- 12) If the ITLA is a one-piece item like the Connect, there is no passage for bacteria at the implant neck level at immediate proximity of the bony crest. If the ITLA is a two-piece item bacteria might reach the ITLA-implant neck junction and come in contact with the bony crest [7].