MINIMALLY INVASIVE IMPLANT PLACEMENT WITHOUT THE USE OF BIOMATERIALS

The bone expansion technique

by **Dr. Gilles Chaumanet, MSc**

The success rate in implantology is close to 96 per cent. Thanks to well-established implant placement protocols, with a few differences according to the implant system used, predictability of the result under optimum tissue conditions is quite significant. It is very different when these conditions do not meet the recognised standards in terms of volume and quality for reproducibility in implantology.

Thin ridges, for instance, which are frequent occurrences, will require a long and costly process for patients because they entail bone augmentation or possibly support tissue grafts. In this case, would there be a minimally invasive alternative that can be performed without problems?

One line of thinking is to stop the systematic practice of implantology as subtractive at the tissue level, but rather to transfer these volumes and thereby ensure a minimally invasive procedure. This implies reviewing all the biomechanical principles of implantology, not only in terms of implant structure and design but also in relation to peri-implant tissue.

The general surgical principle of modern implantology since Brånemark has been bone preparation (osteotomy) as close as possible to the dimensions of the implant that will be placed. This principle is still widely prevalent. However, soft tissue management has evolved and the trend over the past few years has been to manage soft tissue from the first surgical step.

With the arrival of self-tapping conical implants, a new technique was developed, which enables lateral and vertical bone compressing, condensing or expanding. In addition, in 1994, Summers, practising his crestal sinus lift technique with careful choice of conical taps, was the first to demonstrate the capacity of cancellous bone to be modelled (Figure 1).[1]

The following clinical cases will show that it is possible for implant placement to be minimally invasive and precise, and that the use of biomaterials can be avoided simply by exploiting the biomechanical properties of bone tissue and its capacity to regenerate.

Respecting guided regeneration principles (implementation of physical barriers to isolate the epithelial and connective tissue cells from the operating site) enables regeneration of the different tissues. These principles are as follows (Figure 2):

– Primary closure of the surgical site to enable undisturbed and uninterrupted healing;

– Completion of the best possible angiogenesis to provide the required vascularisation and undifferentiated mesenchymal cells;

– Creation and maintenance of a space to facilitate bone formation inside this space; and

– Stabilisation of the surgical site to induce blood clot formation and facilitate healing;

Thanks to the careful choice of healing screw or implant abutment/temporary crown pair, these two entities with different regeneration potentials can be hermetically sealed, thereby avoiding cell competition, which contributes to the growth of epithelial cells that develop more rapidly.

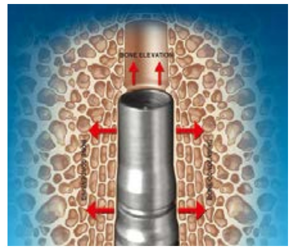


Fig. 1: Original explanatory sketch of Summers' technique.

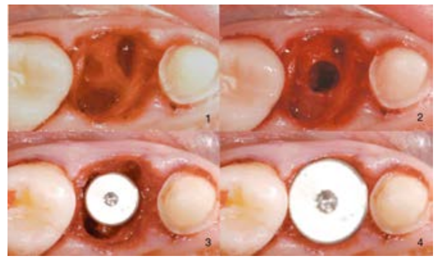


Fig. 2: 1 and 2: Bone expansion through the septum with the use of osteotomes;
3 and 4: Choice of healing screw that enables primary closure of the soft tissue.

Case 1

The patient presented with a fracture of tooth #16 (Figure 3) and periapical cysts. With the patient's consent, the decision was made to perform extraction, debridement, socket decontamination and immediate placement of a non-submerged implant (implant + healing screw) using Summers' method (crestal sinus lift). The patient was on standard pre-medication with amoxicillin and corticosteroids.

Tooth #16 was carefully extracted by radicular separation to avoid bone fracture especially in the vestibule, where the cortical bone is very thin. The lamina dura, which enables the attachment of

Fig. 3: Pre-operative view: Fractured and infected tooth # 16.

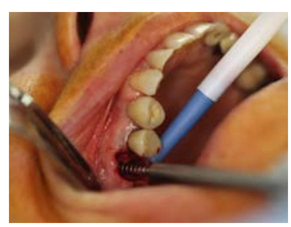


Fig. 4: OsteoSafe® in use.

AD

collagen and Sharpey's fibres, presents a high potential for contamination. Consequently, a light manual curettage of the socket was carried out, followed by superficial debridement (vaporisation) of the entire lamina dura with an Erbium laser (2,870nm) and decontamination with a diode laser (940nm). This was a flapless surgery.

Expansion osteotomy was performed through the inter-radicular septum. It was initiated with a very thin manual bone tap (pointed) and then an automatic mechanical osteotome (Figures 4 and 5, Osteo Safe®, Anthogyr) was used. The use of convex inserts in the beginning enables lateral expansion of the native or healed bone.

In addition, concave inserts during the breaking of the last sub-sinus millimetre enable lateral bone recovery of this "bone socket" while projecting it apically. During sinus progression, PRF membranes (or native collagen membranes) are placed in the osteotomy opening to fill the intra-sinus space that is thereby gained (they also provide protection of the sinus membrane).

The Erbium laser is again passed through the osteotomy socket to vaporise the bone debris and sludge along the walls of this osteotomy. The implant is placed according to the manufacturer's recommendations, but with an even slightly higher torque if the titanium grade allows doing so. A healing screw that fits the diameter and height of the residual gap to be closed is carefully chosen (Figure 6).

If the healing screw does not enable primary closure of soft tissue, PRF membranes are used to fill the gap. If this gap is too big, a mucoperiosteal detachment (6mm to 10mm) and then a horizontal incision of the periosteum (6mm to 8mm) are made. This technique serves to pull the gum around the healing screw by maintaining it with two sutures.

The control x-rays clearly showed good osseointegration of the implant, significant filling and regeneration in only three months, and then perfect filling and regeneration four months after surgery.

Bone remodelling around and above the implant neck also seemed to be well-executed. The cone beam 3D imaging showed a healthy sinus without

Fig. 5: Complete OsteoSafe Kit.

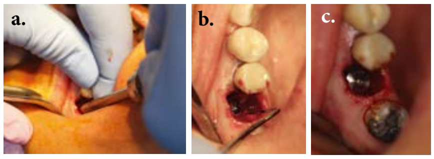


Fig. 6: a) Bone expansion; b) Positioning of the implant; c) Choice of the healing screw.

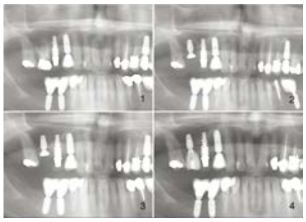


Fig. 7: Panoramic views: 1 and 2) Pre-op,; 3) At three months, 4) Follow-up at one year.

Fig. 8: Control at six months.

inflammation or infection, as well as bone remodelling at the apex and around the implant (Figures 7 and 8).

In the case of a trans-alveolar sinus lift combined with the placement of an implant by bone expansion, convex-tipped inserts should be used first to enable lateral expansion, and then concave inserts for scraping of the bones of the lateral walls of the osteotomy to enable apical projection after breaking the last millimetre under the sinus floor.

If a maxillary implant is to be placed completely in native bone, convex inserts suffice. The last insert placed was smaller in diameter than the chosen implant.

The advantage of this technique was noted in 1996 by Summers himself with the use of conical osteotomes as opposed to cylindrical osteotomes, which were the only ones available up until then. The idea was actually to enable lateral peri-implant bone condensing in order to increase primary stability and compensate for the lack of vertical dimension of the sub-sinus native bone.

The objective of this technique is to maintain (if possible) the entire maxillary bone by laterally pushing back the bone with minimum trauma while creating a precise osteotomy that breaks the last millimetre of the sinus floor while protecting the sinus membrane. The consequence is the notable increase in peri-implant bone density with a high elevation of BIC (bone implant contact) and therefore, bone stability.

Case 2

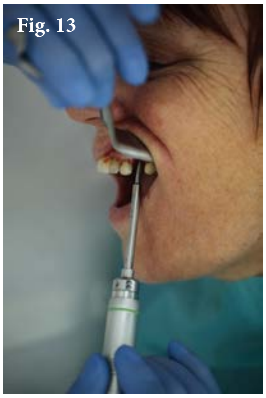
The patient presented with a fracture of tooth #24 with significant periapical infection (Figures 9 and 10). It was decided that extraction would be performed with immediate placement and loading of an implant after complete decontamination of the extraction socket using lasers (Figures 11 and 12).

Osteo Safe® was then used (Figure 13) to enable gentle trabecular expansion and placement of a self-tapping conical implant (Axiom PX®, Anthogyr).

In this case wherein bone recovery along the osteotomy walls was not necessary, only convex inserts were used. The palatal and sub-crestal position of the implant was respected (Figure 14). The gap between the implant and vestibular cortical bone is not filled. Careful choice of implant abutment enables an ideal emergence in both hard and soft tissues. The temporary crown is thereby shaped in such a way that it closes the gap by slightly compressing the marginal gum (Figure 15).

Fig. 9: Pre-operative view: Fistula on tooth #24.

Fig. 10: Panoramic view with gutta percha cone perforating the root apex.



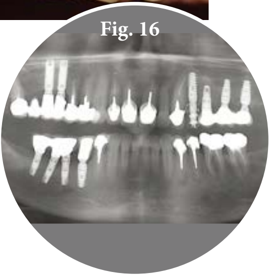


Fig. 11: Laser decontamination.
Fig. 12: Laser degranulation.
Fig. 13: Use of OsteoSafe® in the extraction socket after debridement and decontamination.
Fig. 14: Positioning of the implant.
Fig. 15: Immediate implant placement with temporary crown.
Fig. 16: Control panoramic view at two months.

It was mounted out of functional occlusion. The patient was advised to avoid voluntary chewing on this implant, as well as local cleaning with cotton soaked in chlorhexidine. Following verification of the osseointegration (Figure 16), the impression was made eight to ten weeks after surgery, followed by placement of the permanent prosthesis (Figure 17).

Fig. 17: Permanent crown at three months.

Conclusion

Implant placement using osteotomes is not a new concept. Using an automatic osteotome provides a better view of the site, facilitates flapless surgery and a more precise positioning, and achieves a more homogeneous progression in comparison to using bone taps with a surgical mallet.

From a patient's perspective, surgical comfort is of utmost significance. Tissues must be conditioned to enable regeneration if the operator wishes to avoid the use of filling materials.
For immediate post-extraction implant placement, lasers are of unrivalled usefulness, because they enable socket decontamination and induce bone regeneration. If the basic principles of bone regeneration are respected, the conditions are adequate enough to enable bone growth without the use of biomaterials. These advantages are decisive during preparations such as alveolar sinus lift, as well as "split crest" where the buccal cortical bone is generally very fragile.
Vital importance is attributed to the closure of soft tissue during implant placement – either by carefully choosing the healing screw (height and diameter) or implant abutment, enabling slight compression of soft tissue and providing the implant/prosthetic connection system with a 'barrier' that enables the regeneration of the two families of tissues. These minimally invasive techniques still require several improvements and more widespread validation. However, for ethical and safety reasons, the practitioner should always suggest the least invasive technique that contributes to, guides and induces tissue regeneration to retain the bulk of matrix necessary around these traumatised zones. DA

Note: A list of references is available from the author.

About the Author

Dr. Gilles Chaumanet graduated from the University of Nantes in 1983. Dr. Chaumanet is a visiting professor at Taipei Medical University, Professor AC at the University of Cagliari in Italy, adjunct professor at AALZ, and visiting professor at the University of La Plata, Buenos Aires, Argentina where he teaches minimally invasive surgery.
He is currently serving as president of the following institutions: Society for Oral Laser Applications of France, Academy of Laser Education of France, and International Institute of Laser Implantology (where he is also a board member). He is an ambassador of the Global Oral Implant Academy and an active member of CENALOS, French Society of Medical Lasers, International Academy of Periodontology, Italian Society of Oral Surgery, AGLZ Academy, and International Congress of Oral Implantologists.
He runs private practices (focusing in oral surgery and implantology) in Villeneuve Loubet, France and Verona, Italy. He holds multiple mastership-level accreditations in lasers, periodontology, implant therapy, oral surgery, radiology, and anatomy from various institutions of higher learning.