Bone management and ceramic implants

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Bone formation is a complex biochemical process of endogenous regeneration that is influenced by a broad variety of factors. Scientific studies and everyday experience in dentistry practices confirm that the vitamin D3 level and the LDL level impact significantly on healthy bone formation. A patient with a vitamin D3 level below 70 ng/ml and an LDL level above 1.4 g/l will scarcely be able to form entirely healthy bones, no matter how much effort is invested in the procedure. A notable fact in this respect is that 85 per cent of all Germans return a D3 level below 30 ng/ml.[1–4] This article addresses the issue of bone management for ceramic implants and outlines a protocol designed to stimulate and preserve healthy bones.

It is reasonable to consider the D3 and LDL levels to be reliable indicators, as vitamin D3 in its metabolised form of $1,25(OH)_2D_3$ calcitriol is one of the most important human hormones. In this capacity is responsible not only for controlling the transcription of more than 1,000 specific genes, but it also has the following capacities that are of significant interest to dental medicine. Namely, to increase osteoblast activity, to reduce osteoclast activity, to participate decisively in cellular repair and cell division mechanisms, to stimulate intestinal absorption of calcium and phosphorous, to stimulate resorption of calcium and phosphorous in the kidneys, to raise the number of circulating immunoproteins, to elevate the cytotoxicity of macrophages, to increase the level of endogenous GcMAF (group compound macrophage activating factor), to strengthen the immune system overall, and much more. An elevated LDL level is indicative of an increased susceptibility to infection, a condition that obviously needs to be avoided in connection with implants, bone grafting and sinus augmentation.

The aforementioned studies point to the significant influence that the actual D3 and LDL levels have on bone formation. The author's practical experience has also shown that even the most complex procedures will encounter fewer complications if these values are within the stipulated range. Patients experience negligible swelling and pain is kept to a low level. Complications and failures most usually occur among patients with levels outside of the stipulated range (vitamin D3 level below 70 ng/ml and

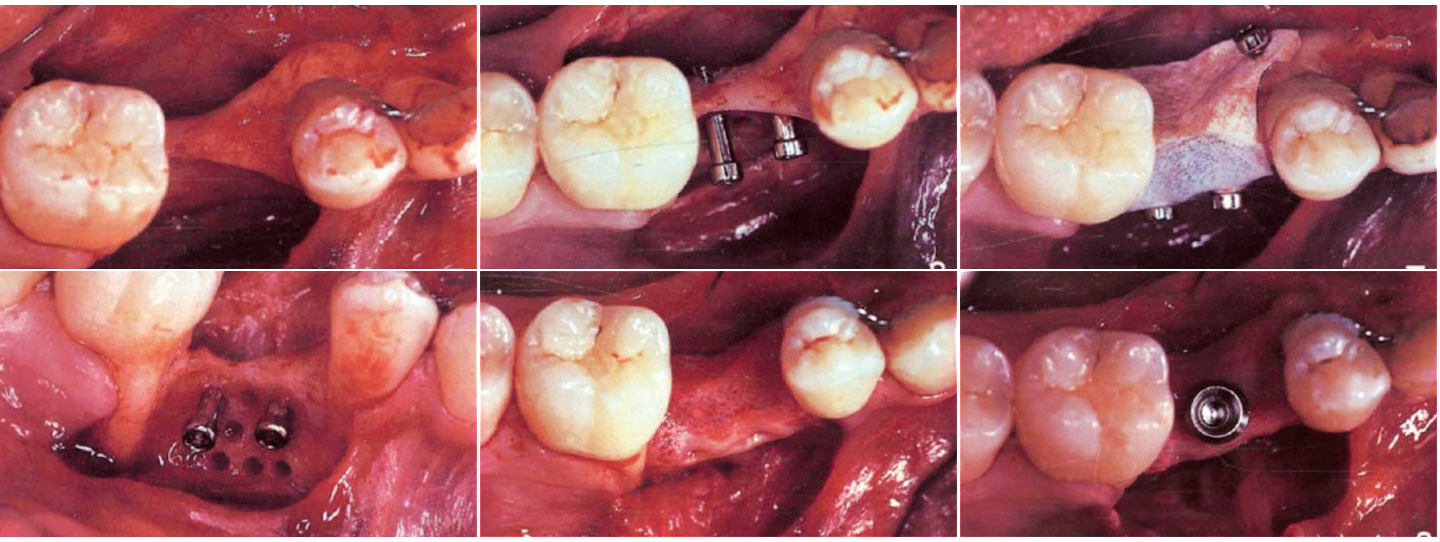


Fig. 1: The Memfix system by Straumann demonstrated that bone can be created by cavity formation alone.

LDL level above 1.4 g/l). Moreover, the author holds that outliers in these two metrics are causative in periodontal diseases, and that the consequent inflammation of the gingiva and the associated pain are the reasons why the patient invests less in dental care, instead of the poor care itself leading to gingivitis or periodontitis. This proposal is substantiated by the fact that even severe periodontal diseases improve in line with a normalisation of these levels, which is induced by a change in dietary habits and the introduction of supplements. Additional research will be necessary to clarify with greater certainty whether a deficient supply of vitamins and minerals may encourage the emergence of periodontal diseases.

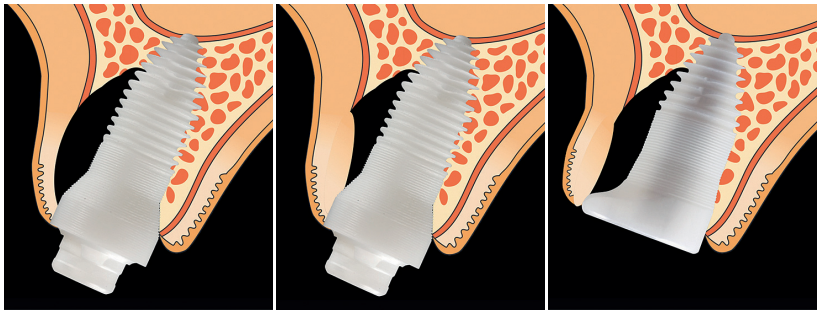


Fig. 2: The broad tulip supports the soft tissue, which grows onto the zirconium oxide inside of a few days. There would be a sufficiently large cavity for bone to grow, even if the soft tissue collapses slightly.

Positive side effects

Patients in the author's clinic are given extremely high-dosage vitamin and mineral supplements from four weeks before, until four weeks after their surgical procedure. The composition of these supplements has positive effects on bone formation and the immune system. Moreover, these patients observe a special diet that is also designed to strengthen the immune system and curtail susceptibility to inflammation. This pre-operative prepping of the immune system for the operation ensures that almost all patients experience an improvement in their general well-being once the harmful interference fields (ishaemic osteonecrosis, displaced wisdom teeth, infected root canal-treated teeth, foreign bodies, etc.) have been eliminated. Photographic records from before and after surgery, measurements of heart rate variability and the validated Medical Symptoms Questionnaire are used to substantiate this subjective perception.

The combination with special ceramic implants, designed for immediate fitting (SDS, Swiss Dental Solutions),

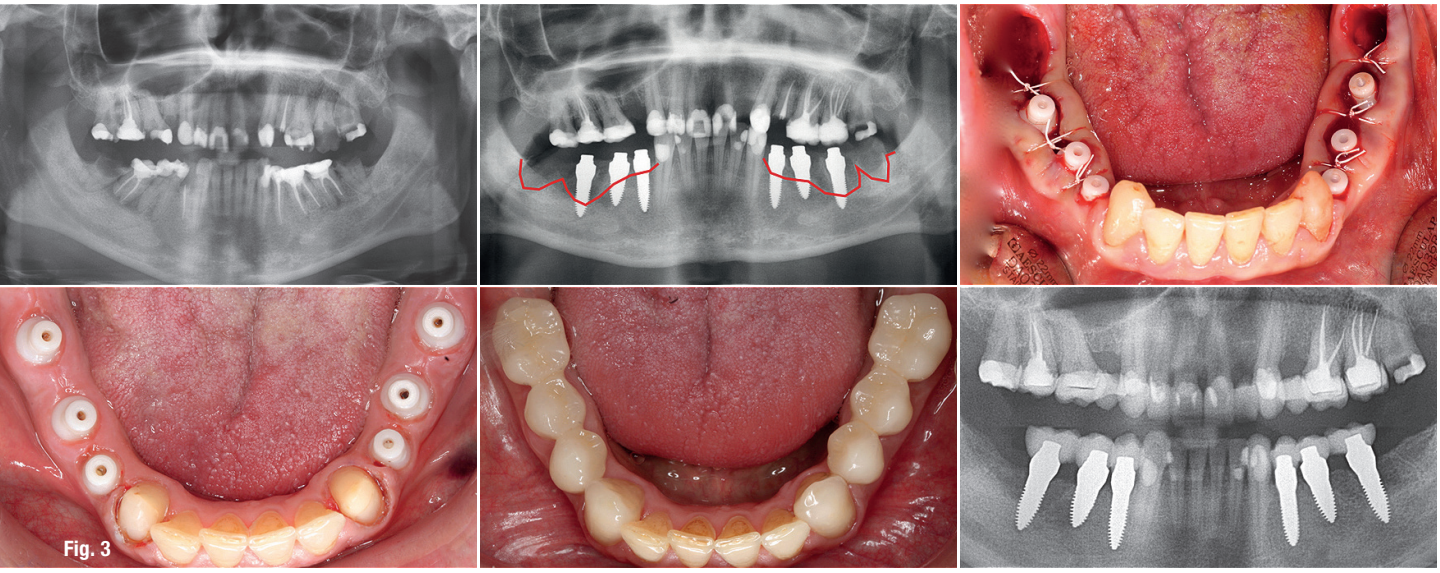
allows complete restoration of the patient's dental situation and even final prosthetics inside of just three appointments and with a high degree of predictability (all-in-one concept).

Intelligent Bone Management: Building and preserving bone

There are clearly defined and reproducible rules on the formation of bones and their lifelong preservation.

1. Systemic conditions
   a. Strengthen the immune system
   b. Strengthen the capacity to form bone
   c. Activate the parasympathetic nervous system, inhibit the sympathetic nervous system
2. Local conditions
   a. Reduce bad inflammation (giant cells)
   b. Activate good inflammation (monocytes, granulocytes, macrophages)
   c. Reduce contamination (breath, saliva, etc.)
   d. Stimulate bone formation
   e. Improve the extracellular matrix
   f. Preserve blood flow (Mammoto's Law)

A reasonable summary might be: Besides a robust immune system that is compatible with bone formation, we require a stable and hermetic cavity that fills with blood in order to produce osseous material. Whether the bone goes on to survive a lifetime will depend exclusively on whether it is supplied with sufficient blood and whether this supply can be maintained (Mammoto's



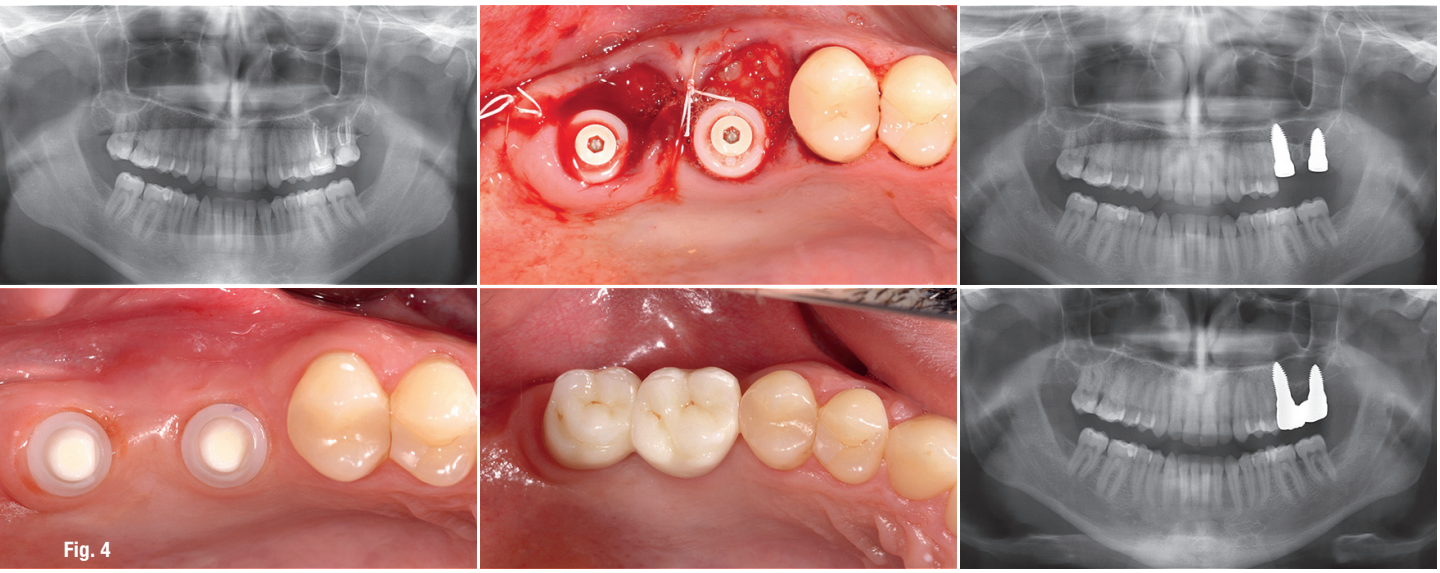


Fig. 3: Removal of the destroyed teeth 34–38 and 44–48, immediate implants 36–34 and 44–46, stabilisation of the attached gingiva onto the implant tulip using the "tent pole" technique. Crown treatment after just three months. Complete vertical bone regeneration. **Fig. 4:** Typical vestibular bone loss with immediate implantation in the palatal root.

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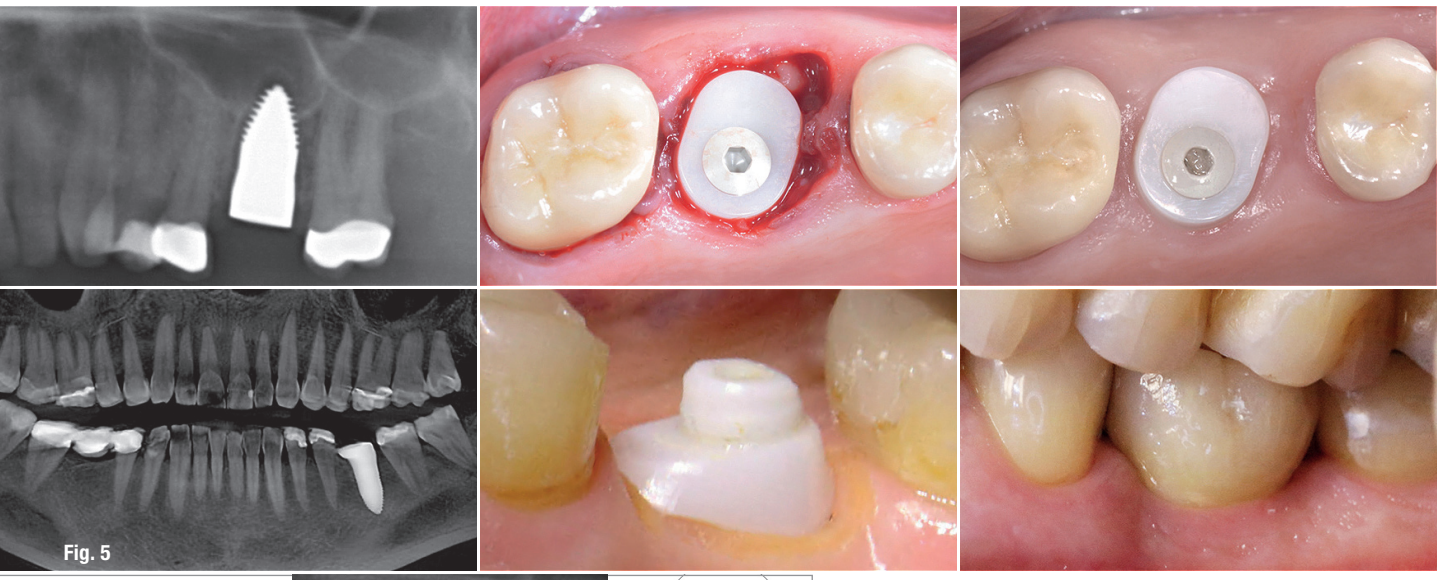


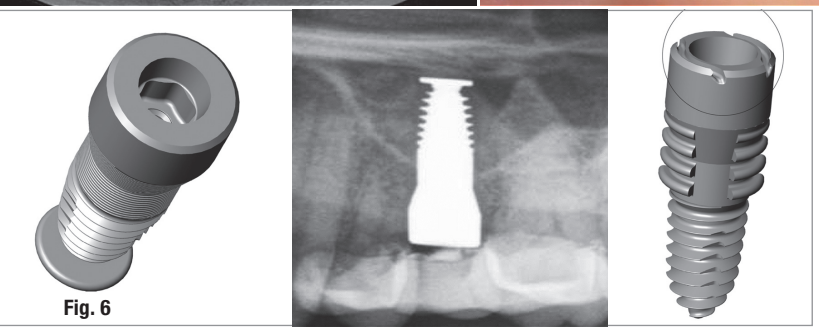


Fig. 5: The use of balcony implants can also preserve the volume in the region of the non-implanted root of the lower jaw. **Fig. 6:** Sinus implant with the "parasol effect". The disc implant is on the far right.

Law). Here, bone blocks and bone replacement materials are only responsible for keeping the cavity stable. Their disadvantage is that the procedure requires an additional intervention with additional costs, greater morbidity and increased risk. Apart from that, these bone blocks will never be able to acquire the same quality of blood supply as a lamellar bone that has just recently grown into a cavity.

In 1998, Hämmerle and Thorkild published an article about the Memfix system by a company named Straumann, which was able to generate significant quantities of bone simply by forming a stable cavity: It is a mystery why this intelligent system has slipped into obscurity (Fig. 1).

Bone Growing Implants

Using zirconium oxide as an implant material now means that for the first time, we have a material that can

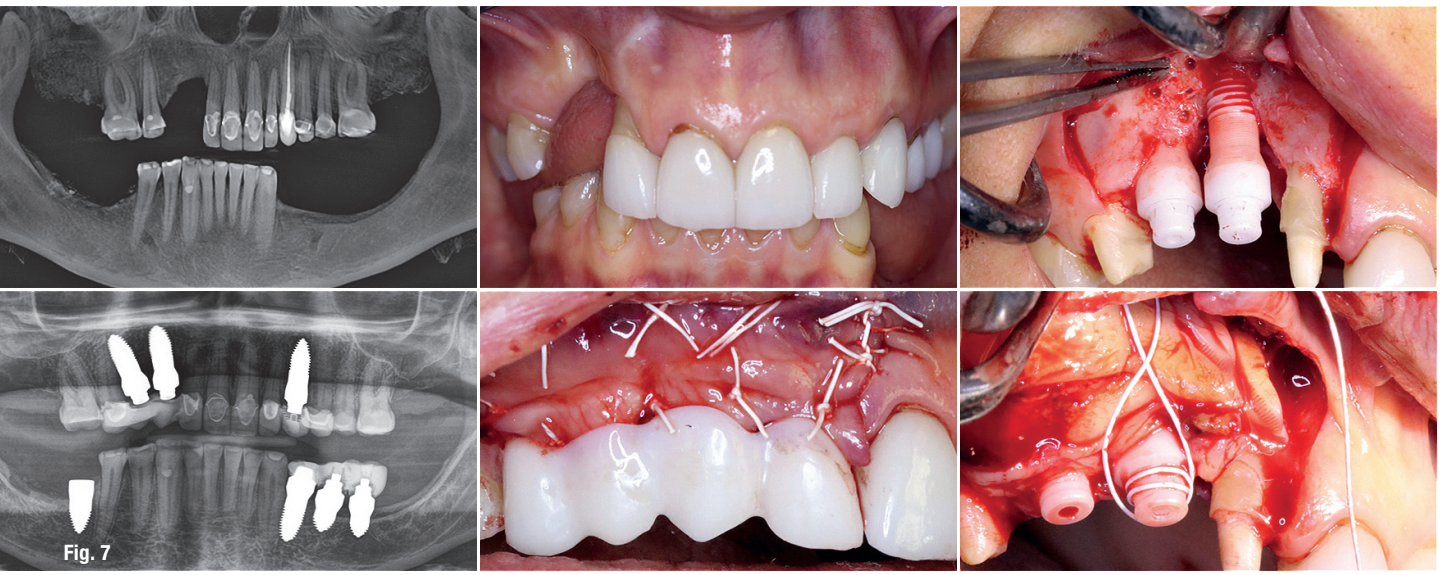
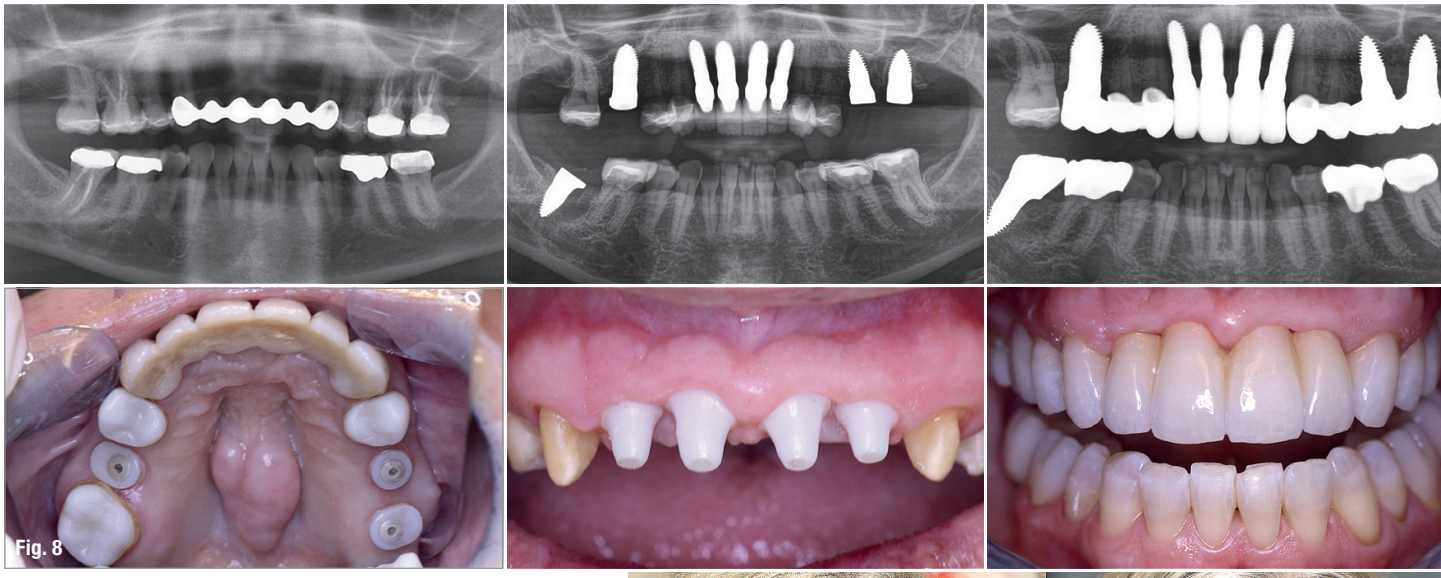


Fig. 7: Implant acting as a "tent pole" with "parasol effect" thanks to the broad tulip. "Brace sutures" to fix the soft tissue firmly in place.



Figs. 8 & 9: Finished procedure that demonstrates the complete restoration in just three appointments with two longer residencies according to the all-in-one concept.

be used as a base for the growth of bone and soft tissue as well. The logical consequence—and the challenge—was to build additional "space-makers" onto the implants in the form of balconies or discs in order to then use the implants themselves as "tent poles" (Fig. 2). Implants designed in this way are able to stimulate growth of several millimetres of bone in a vertical direction (Fig. 3). When used with immediate implants, balconies in particular can prevent the otherwise common volume depletion in the alveoli that do not carry implants (Fig. 4), as the "parasol effect" provides support for the volume (Fig. 5).

Lateral support plays an important role, especially for immediate implants in the molar area. Here, the sinus implant serves not only as a "tent pole". The shielding effect of its apical disc also provides a particularly large cavity for bleeding, while simultaneously minimising the risk of perforation of the Schneiderian membrane (Fig. 6). The disc implant shown on the right has discontinuous spacers (discs), which are used to keep the periosteum at the necessary distance so that the bone can grow into the cavity. The implant has grooves on the prosthetic plateau to ensure secure placement of apical mattress sutures according to the "braces" principle, and to hold the attached gingiva firmly in place until it has grown onto the ceramic. Until now, it has been necessary to attach the brace sutures onto the posts of the single-piece implants (Fig. 7).

This method permits the performance of standardised dental restorations based on a recurring algorithm in as little time as possible, with maximum comfort and minimal incidences of complications: removal of ishaemic osteonecrosis, removal of all metals and root canal-treated teeth, integration of metal-free ceramic implants and fixed long-term temporaries (Figs. 8 & 9).

Interested colleagues are warmly invited to attend a procedure and observe the concept in the author's clinic at no cost.

Literature

contact

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