



## For Esthetic Dentistry by Women Dentists Creating the Smile with Dental Implants

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### Abstract

The management of the peri-implant tissues is very much responsible for a natural outcome of the smile. This article shows a treatment workflow used in 120 cases in the last 4 years with totally 963 implants using immediate implant placement/immediate loading for full-arch reconstructions. Different implant systems were used: Nobel Biocare, MIS, Bredent, C-tech.

**Keywords:** Implant Dentistry; Esthetic Dentistry

Implant dentistry is a symbiosis between art and science. It is a great challenge to put together the biological, biomechanical, anatomical, esthetical and gnathological knowledge into a treatment plan, which offers the patient a satisfying, stable and functional outcome over the years.

We have to work in a way that we can give a lifelong guarantee for the surgical work, and a 20-years guarantee for the prosthetical restoration which has a certain "material fatigue".

In the daily work, but also in the teaching activities, we must stick to a reliable clinical workflow including certain predictable parameters and coordinates which are known to lead us to success.

However, every case is specific and individual. The challenge is to be able to incorporate into our treatment the techniques and procedures which make it predictable and to proceed in a fast, effective and minimally invasive way. The target is to find a treatment plan with benefits concerning minimal invasivity and high end esthetics at the same time.

### Philosophy of treatment

#### Parameters of extraction of a periodontally compromised tooth

When do we declare a tooth as periodontally so compromised that it needs to be extracted? When do we stop treating a tooth periodontally and decide to insert an implant?

Nowadays, there are many articles proving the high success rate (and no radiographic changes) of immediate placement of implants in fresh extraction sockets of periodontally compromised teeth [1,2]. Although controversial systemic antibiotics should be used perioperatively, until contrary trials prove otherwise [3].

Immediate implant placement and loading are proven as clinically reliable procedures with a high success rate in maxilla -97% and mandible -98% [4-6]. Concluding from the present literature [1,7,8] and based on experience we can affirm that:

- The success rate of the implant supported reconstructions in full-arch cases is 97% in the upper jaw, 98% in the lower jaw [9-12].
- The rate of periimplantitis is higher when the prosthetic reconstruction includes residual teeth with periodontal problems [13-16].

If the periodontally treated tooth is still mobile and infected after 1 year of periodontal treatment, and the residual bone height is less than 10 mm, we extract the tooth and insert an implant.

The treatment is minimally invasive preventing subsequent vertical grafting, in order to be able to give the patient a fixed construction.

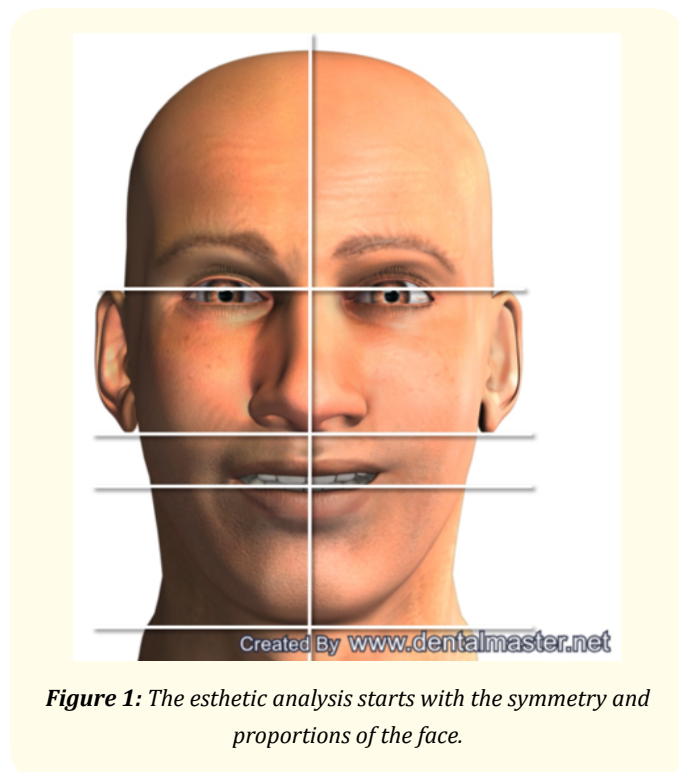
Integration of teeth into an implant supported construction will be performed under the following conditions:

1. If the tooth has, according to contemporary studies, statistics and experience, a prognosis of 20 years, then it will be integrated into the construction.
2. If the tooth has a prognosis of 10 years and the prosthetic reconstruction allows the extraction of the tooth, and the prosthetic reconstruction can be sustained with a small modification, then we include the tooth in the reconstruction.
3. If the tooth has prognosis below 5 years, it won't be included into the reconstruction.

Under these conditions, the prognosis of our restorations on implants will be 20 years, provided that the patient will get an occlusion and hygiene control as well as a professional cleaning every 4 month.

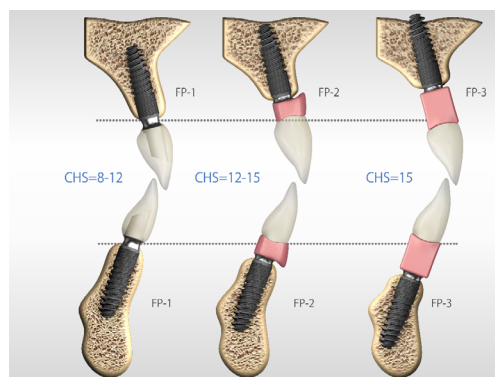
With these parameters, we start the individual diagnosis and planning.

### Esthetic analysis and planning



**Figure 1:** The esthetic analysis starts with the symmetry and proportions of the face.

The esthetic analysis will give us a vertical dimension versus a crown height space (CHS) of (Table 1 – Carl Misch Contemporary implant Dentistry) (Table 1).



**Table 1:** The planning of the reconstructions in full-arch rehabilitation, taking into consideration the vertical bone loss.

1. **CHS = 8 - 12 mm:** In this case, an immediate implant placement/immediate loading will be possible, with a high predictability of a natural outcome of the pink and white esthetics.
2. **CHS = 12 - 15 mm:** In this case, the teeth will be more inclined. So maybe, individually, will have to add a pink component to the restoration. That means the technician will have to work with a suitable interdental brush in order to allow an appropriate cleaning of the prosthesis, which can be cemented or screw-retained.
3. **CHS > 15 mm:** In this case, the patient will have a considerable pink component. That means, that the restoration will have to be removable or screw retained. Today the tendency of the patients is a fixed construction.

### Functional analysis

The functional analysis, instrumental or manual, will be able to diagnose a dysfunction of the cranio-mandibular and muscular system. It is well known, that edentulous or partially edentulous patients might have muscular discoordinations even if no symptoms can be found at present.

The discoordination will be drastic if the arch will be restored on implants, zirconia or titanium abutments and e.max crowns, which have no tolerance, resilience or elasticity. The bite situation has to be thoroughly balanced. Therefore, it is understood that the occlusion has to be perfect in centric, habitual or laterality movements.

### Radiologic analysis

A 3D diagnosis is a condition not for a precise work, especially if we are dealing with bone defects. It is necessary to know the exact 3D shape and architecture of the defect, in order to know the design of the flap.

**Photo and video analysis**

Modern photo and video analysis will make the communication with the patient easier by illustrating which parameters are essential for the harmonious integration of the teeth in the orofacial system. The patient is also a 3-dimensional, parameter whose charisma can be implemented and improved by a nice white support of the teeth [17].

**Planning**

The planning starts with the digital creation of the golden ratio of the teeth, transposition to the model and creation of an esthetic wax-up, which will be approved by the patient.

In full-arch rehabilitation, there are some dimensions which have to be respected. As the implants in the upper jaw will be

inserted in the palatal part of the sockets, the technician has to measure the interpremolar distance, to be able to receive the dimensions of the initial dental crowns (Figure 2).

The overjet and overbite should be reduced to the physiologic dimensions (2 - 4 mm) (Figure 3). Big modifications compared to the initial dimensions will cause less space for the tongue, phonetic problems, much too big black spaces and a narrower jaw dimension as initially. Considering all these parameters, which ensure a common language and workflow with the technician, he will be able to create a wax up and a mock-up in the ideal situation.

**Presurgical prosthetics**

A try-in of the mock-up will be done if possible. In full-arch rehabilitations, on implants the technician will prepare a provisional bridge in advance in „shell technique” (Figure 4).



**Figure 2:** The measurement of the interpremolar distance at the level of their buccal cusps will help to give the patient the same arch dimensions, despite of the palatal position of the implants.



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**Figure 3:** The original overjet and overbite dimensions will be measured, slightly corrected, and reproduced in the new rehabilitation.



**Figure 4:** The provisional restoration, created according to a wax-up in a shell technique.

### General health and premedication

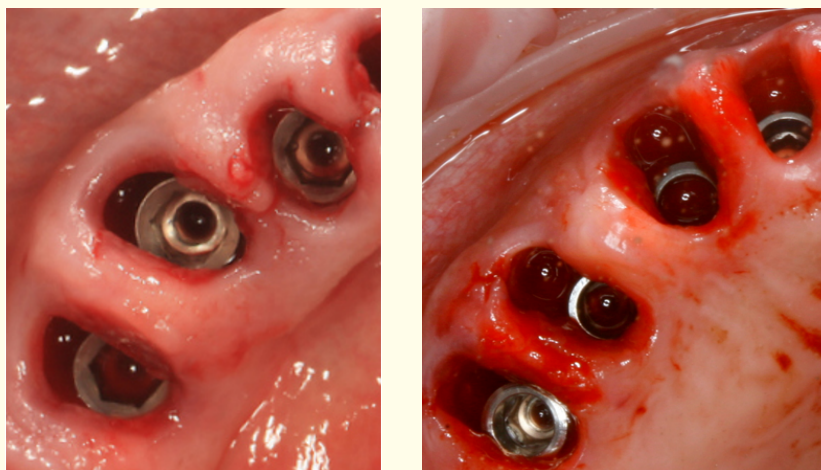
General health and premedication of the patient is an important issue. The absolute contraindications will be excluded. In bone grafting procedures the vitamin D values should be controlled. Current research leads to the following results [18]: "Vitamin D is a hormone essential for calcium metabolism that shows immunomodulatory properties. The majority of the patients have vitamin D deficiency due to poor nutritional status and limited sun exposure. High-dose early replacement of vitamin D might attenuate autoimmune reactions and decrease severity of graft versus host disease. Histomorphometrical analysis revealed that the bone implant contact (BIC) ratio and bone volume (BV/TV) around the implant were significantly increased in the vitamin D supplementation group. In addition, resistance of the implant, as measured by a push-in method, was significantly improved compared to that in the vehicle group. These results demonstrate

that vitamin D supplementation is an effective approach to improve the fixation of titanium implants. An advised doses is 20.000 IU administered in a unique daily doses for 2 weeks preoperatively and then take care to maintain a level of 4000 IU daily [19-22]. Another factor with negative influence on the osseointegration is the high level of the LDL or low level of the HDL [22].

### Implant placement

Implant placement will be performed following the right positioning of the implants:

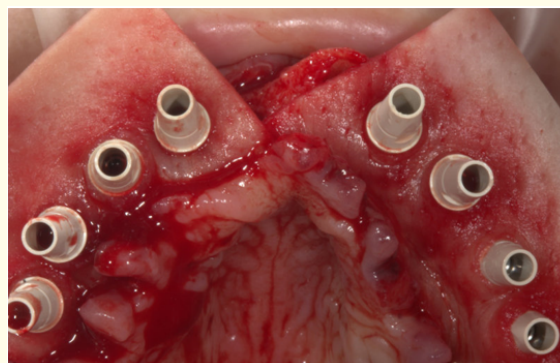
- A 4 mm distance to the buccal contour;
- 1 mm below the bone level,
- 3 - 4 mm from the free gingival margin that we want to achieve (Figure 5a-5c).



**Figure 5a and 5b:** Correct positioning of the implants in the extraction sockets.

Intact sockets will be treated without raising the flap. The gap will be grafted with a non-resorbable material. Thin tissue biotype will be change with connective tissue graft when the socket is intact. When a buccal bone defect is present, the grafting of the

socket will be performed with a non-resorbable material and protected (covered with a collagen membrane type III-IV, with long resorption time and, if possible, a matrix able to implement at the same time the tissue biotype (Figure 6).



**Figure 6:** Use and fixation of a collagen membrane (matrix) for soft and hard tissue grafting.

### Implant design

Esthetic rehabilitation is achieved more predictably if implants with polished collar, set below the bone level, and with a platform switching design are used. Platform switching design is proved to prevent bone loss (in average 0,6 mm instead of 1,4 or 1,6 mm) [23-25]. A concave profile of the running room will contribute to a better represented peri-implantary tissue [26,27].

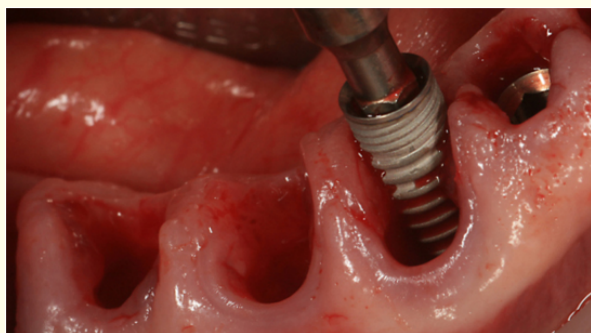
### Immediate implant placement, immediate loading

The preconditions of immediate functional loading in full-arch restoration were mentioned in the consensus conference in Baden-Baden [28]. The condition not for loading an implant inserted in an extraction socket is: primary stability, ¾ of the surface of the implant should be covered by bone, and the gap should be grafted [29,30].

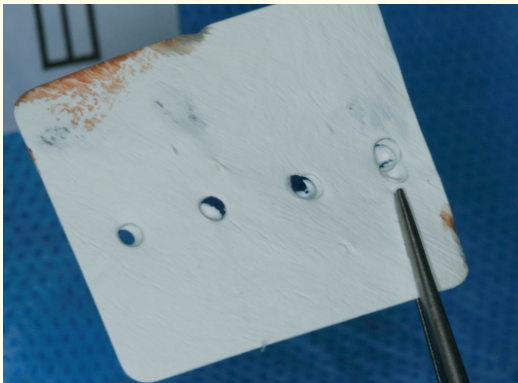
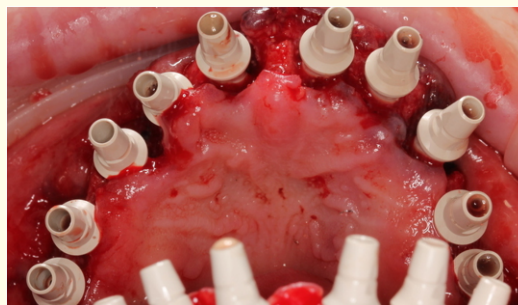
### Surgery

The surgery will be performed in full anesthesia. In full-arch reconstructions the rules are similar to the ones concerning single tooth replacement.

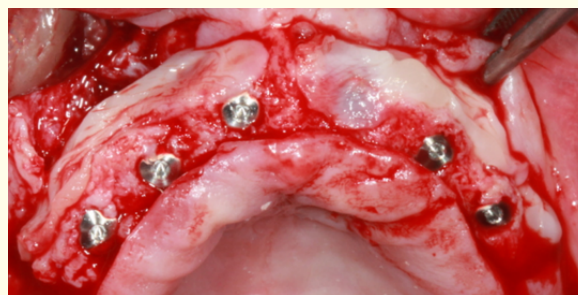
In case the socket is intact, it will be left intact (Figure 7). If the buccal plate is missing, or incomplete, after raising the flap, a grafting of the defect will be performed and a coverage with a collagen membrane as mentioned before (Figure 8a and 8b). The implant will be placed in perfect esthetic driven position. The grafting will follow the rules of defect architecture, and the quality of the host bone. Growth factors (PRF) will be added to the bone material, and the fibrin membrane will be used to cover the collagen membrane (Figure 9). This will contribute to an increased vascularization in the first 2 weeks of the healing, by promoting the VEGF [31].



**Figure 7:** Flapless surgery in the extraction socket.



**Figure 8a and 8b:** Implant placement with flap, bone grafting and membrane.



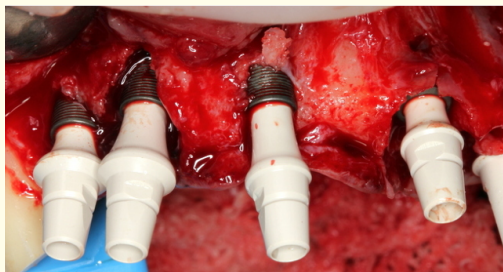
**Figure 9:** PRF Membranes for better soft tissue healing.

After necessary flap advancement, a horizontal mattress suture, set 1 cm off the incision line will be performed in order to assure a tension free closure and flap part. This gingival part will become attached and will be able to heal properly through an optimum of vascularization (Figure 10).



**Figure 10:** Soft tissue result after split mouth suture technique: right side. Horizontal and vertical mattress suture; left side result after a continuous suture with loop.

The prosthetic parts (healing abutments) should be concave, in order to give way to an increased periimplantary structure (Figure 11). We strive to have at the end 3 mm of tissue height, 3 gingival thickness, 3 mm of width of the keratinized gingiva around implants [32,33]. This will assure a longtime esthetic stability and a long-term stability of the bone underneath.



**Figure 11:** Immediate loading with provisional abutments with concave "running room".

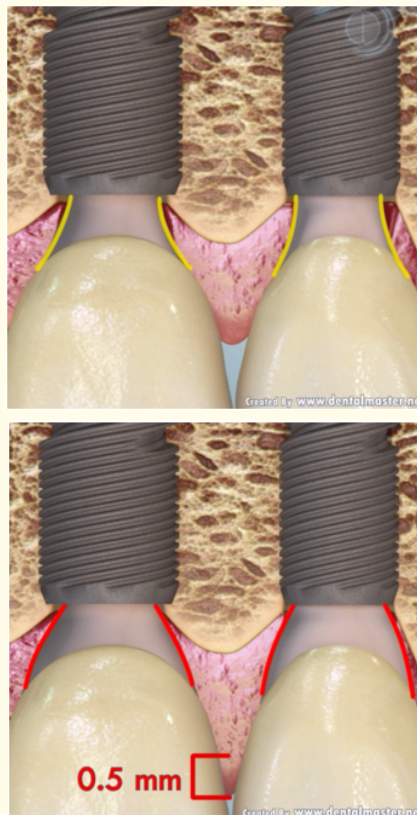
**Prosthetic reconstruction/philosophy for a maximal esthetic outcome**

After the healing, the impression will be performed in a way and with impression parts which reproduce exactly the concave profile of the tissues created, using the provisional abutments as impression copings with the help of an impression cap (Figure 12).



**Figure 12:** Impression taking after healing, with caps on the same provisional abutments.

In the esthetical zone individual abutments with slight convex profile will contribute to a dynamic but tender compression of the papilla into the interimplantary space. In this way we gain ca. 0,5 mm papilla length (Figure 13a and 13b). The abutments will be constructed individually, e.max or zirconia on Titanium base. The preparation limit will be 0,5 mm below the gingival margin (zenith) of the future tooth (Figure 14).



**Figure 13a and 13b:** The concave convex philosophy of the running room is used to increase the interimplantary papilla length.



**Figure 14:** e.max abutments on titanium base fabricated using a CAD/CAM procedure.

In addition, the crowns will be fabricated with the aim to perfectly imitate the natural dentition (Figure 15 and 16). The contact points between the crowns will be 42 - 43% off the interdental space [34]. Single crowns will be made, one by one, in e.max ceramics (Ivoclar Vivadent, Schaan) (Figure 17-19).



**Figure 15:** Natural proportions of the contact points and interdental spaces.



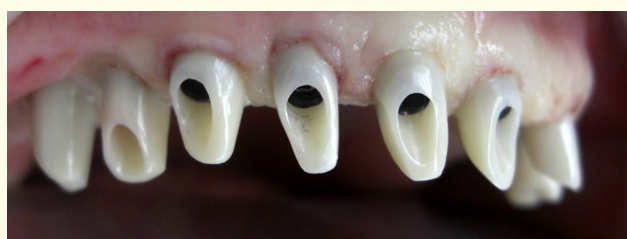
**Figure 16:** Natural profile of the e.max crowns.



**Figure 17:** Zirconia abutments on titanium base: The future crown margin is 0,5 mm below the gingival margin.



**Figure 18:** Natural outcome of the crowns on the implants.



**Figure 19:** The slightly convex running room will result in a dynamic but low compression for 30 seconds on the gingiva.

The cementing will be done with Multilink or Variolink (Ivoclar Vivadent, Schaan) for e.max ceramics. Cords will be inserted before cementation, to prevent cement rests go into the sulcus, which can be the reason for later periimplantitis [35].

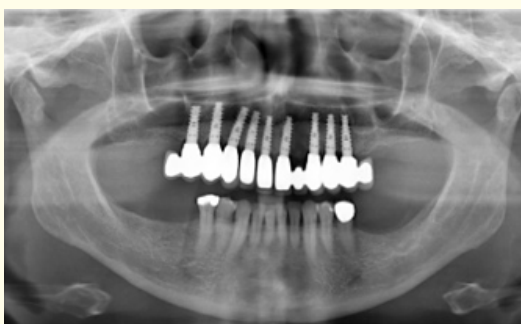
A patient will get a 20-years guarantee on condition that he maintains a strict recall each 4 months for hygiene control including remotivation, occlusion control and professional cleaning.

### Results

All 120 patients treated in the last 4 years with full-arch, fixed restorations using the principles described before showed global satisfaction concerning esthetical outcome, function and stability. This personal impression of the patient (Figure 20 and 22) matches the scientific data such as high scores of PES (Pink Esthetic Score) WES (White Esthetic Score) and no bone loss around all inserted implants (Figure 23 and 24). Scientific data will be published in separate articles.



**Figure 20-22:** Crowns with a natural look-and-feel resulting in absolute patient satisfaction.



**Figure 23 and 24:** Radiographically stable situation after 4 years.

### Conclusion

1. Using the well-known parameters and coordinates of implant placement, will lead to a predictable and reproducible result.
2. The esthetical planning needs a proper communication with the patient and in the team, based on photo and video documentation.

3. Being up to date with the latest technologies, materials and approaches, is beneficial for finding new ways of minimally invasive approaches which provide, at the same time, a maximal esthetic result.

Following a certain protocol of treatment, a satisfying result was achieved independent of the implant system employed. The implant systems had the following features in common:

- Self-cutting threads.
- An insertion protocol with an undersized drilling in order to achieve a good primary stability.
- Platform switching design.

There were slight differences in the esthetic outcome, depending on the different collar design and on the philosophy of the prosthetical parts. When the protocol was used for adjacent implants, the esthetic outcome resulted in a 100% patient satisfaction.

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