Implants should only be inserted when periodontal conditions are stable

By Dr Jan H. Koch, Germany

Biofilm is the most significant cause of inflammatory bone loss around teeth and implants. Diagnostics, biofilm management, and where necessary, treatment help in patients with this problem. The W&H No Implantology without Periodontol- ogy workflow should provide stable tissue prior to implantation through prevention, and implant success in the long term through aftercare – something that is advantageous to both the patient and the treatment team.

Implant treatment can significantly improve quality of life after tooth loss.1,2 The long-term prognosis is generally good, but biological com- plications are common.3 Peri-implantitis and its preliminary stage, mucositis, occur in a substantial pro- portion of patients.3 As is the case for periodontitis and gingivitis, oral biofilm is the main cause.4 This micro- bial bioerosion can also encourage the development of severe systemic disease in the event of pathological changes, such as endocarditis and inflammatory bowel disease.5

The only difference in the micro-bial flora in periodontitis and peri-implantitis is the detail.6 Compared with healthy conditions, the quantity and aggressiveness of the pathogenic microorganisms change in both diseases.6 Bone loss around implants is generally more rapid and leads to more extensive defects than when it occurs around teeth.7

Accordingly, preventative care is advised even before implant treat- ment. Determining risks and pro- viding periodontal treatment Periodontitis is a key risk factor for peri-implant inflammation. This means untreated periodontitis pa- tients have an increased risk of peri-implant inflammation through to implant loss.8 The risk is also higher when patients who are initially treat- ed are not included in a supportive periodontal treatment/recall pro- gramme.8

Leading periodontists therefore recom- mend carrying out a screening procedure before implant treatment using, for example, the periodon- tal screening index or periodontal recording.9 Blending on probing and pocket depths are determined at selected positions. An extensive check of the periodontal status should be carried out if the re- sults are abnormal.9

Taking a careful medical history, in- cluding previous systemic exposure, is also important.10 This provides im- portant information about increased risk of inflammation, for example in patients with diabetes that is not being optimally managed.11,12 Further- more, patients should be informed of the risks relating to implants.10,12

Where necessary, initial periodontal treatment is carried out. First, pro- fessional tooth cleaning establishes healthy gingival conditions. In this procedure, calculus (Fig. 1) and bio- film (Fig. 2) are removed as far as the gingival sulcus. In combination with careful instruction on oral hygiene, this gives the patient the basis for the long-term freedoms from inflamma- tion.11

Removal of subgingival coatings (de- bridement) is carried out using sonic or ultrasonic devices and special periodontal tips as initial periodon- tal treatment (Fig. 3). Manual instru- ments can also be used. Further sur- gical and/or regenerative measures may be necessary, depending on the situation.

Periodontal aftercare for long-term success In the periodontal aftercare sub- sequent to implantation, soft (bio- film) and hard coatings are regularly professionally and mechanically removed.13 In the subgingival and supragingival areas, ultrasonic de- vices are generally used for this (Fig. 4), in combination with manual in- struments where necessary. Alterna- tively, subgingival air polishing can be used in combination with peri- odontal attachments and powders.14

Checking for individual risk factors, such as smoking and diabetes, and working towards a healthy lifestyle are also recommended for a good long-term prognosis after periodon- tal treatment.15 If the patient had severe periodontitis before the initial treatment, the recall frequency will

alternatively, the im- plant bed can be pre- pared with piezo-surgi- cal systems, for which special instru- ments are available.16 Bone can be worked on in a gentle yet highly effective manner us- ing other special in- struments. Indications include alveolar ridge splitting, surgical tooth removal, and the prep- aration of bone blocks or lateral windows for augmentations.17 Highly advanced piezo-surgical devices are also mini- mally invasive in soft tissue.

Stability measurement and bone surgery Once the implant has been screwed into its final position, the primary stability can be safely and precisely determined using resonance fre- quency analysis. The technology is available either separately or as an optional module in an implantology motor. If the ISQ (Implant Stability Quotient) value measured is 66 or higher, early intervention is possible, and if it is over 70, treatment must be provided immediately.18

An exposure protocol based on the ISQ value improves the prognosis of treatment. Simply measuring the torque resistance, however, does not provide the same level of clinical safety.19 If reduced ISQ values are measured after the implant has been inserted, a two-phase protocol is generally chosen. After exposure, a new measurement can then be used to determine whether osseointegra- tion has been successful (secondary stability) and loading will be predict- able at this point.20

Hygiene-friendly prostheses The emergence region should be de- signed to ensure that it isatraumatic to the tissue for long-lasting implant reconstructions. The implant–abutment connection, material, surface and emergence profile must be bacterio- palleable and mechanically resilient over the long term. The transgin-
Case report: Prosthetic procedure with Atlantis

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Case
36-year-old patient with a vertical fracture of tooth 46. The treatment plan was to extract the tooth and replace it with a deep implant using a conventional installation and loading protocol. The challenge was to restore the position of the gingival contour and the inter-proximal papilla, as for a natural tooth. In order to achieve a long-term natural result, an Atlantis Abutment was selected to achieve a long-term natural result, as for a natural tooth. In order to achieve a long-term natural result, an Atlantis Abutment was selected to achieve a long-term natural result, as for a natural tooth.

Mechanically preventing mucositis
As for periodontitis patients, peri-implant care includes regular screening with a clinical check of both periodontal and peri-implant tissue for symptoms of inflammation, probing and, where necessary, radiographic diagnosis. A frequency of two to four times a year has proved to be effective. Deep probing values and bleeding occur more commonly in patients with peri-implantitis than in those with mucositis, pus secretion only occurs in patients with peri-implantitis.

If a patient has mucositis, professional supra-gingival and sub-gingival biofilm removal reduce the risk of the inflammation advancing to peri-implantitis. Local and systemic antibiotics used as supportive measures or air polishing, however, show no additional benefit.

Treating peri-implantitis
Peri-implant bone loss can develop even if good preventative care is provided, for example if the patient’s oral hygiene is not sufficient. Most minimal defects should be treated in a non-surgical manner using peri-implant debridement. Mechanical removal of coatings using suitable ultrasonic systems, supported by Er:YAG lasers, antibacterial photo-dynamic treatment, air polishing, or treatment with local or systemic antibiotics, where appropriate, has shown promising results.

If closed treatment is no longer possible, the defect must be surgically exposed and carefully decontaminated. This is carried out after flap preparation by removing inflamed tissue and cleaning the surface of the implant using, for example, ultrasonic or piezo-surgical systems. Measures designed to regenerate the bone carried out after this procedure have been successful. Special peri-implant surgical instruments are available for the surgical treatment of peri-implant defects.

After treatment, the patient is once again intensively instructed on oral hygiene and made aware of the need for continual recall. If necessary, the frequency can be selected to be higher than previously in line with periodontal aftercare. If biofilm management is carried out consistently, the implantological results can remain stable for several years even after the periodontitis, mucositis or peri-implantitis has healed.

Fig. 1: A vertical fracture of tooth 46. When probing, a distal narrow isolated pocket measuring more than 15 mm was detected.

Fig. 2: In the radiograph, a radiosclerous along the distal wall of the dental root with the typical “V” shape seen in vertical root fractures could be observed.

Fig. 3: Tooth extraction was performed without damaging the alveolar wall. The socket was grafted and sutured without using grafting material.

Fig. 4: After 8 weeks of healing, the soft tissue over the extraction area was completely healed.

Fig. 5: After 8 weeks, the amount of bone formation into the socket allowed for implant placement.

Fig. 6: Using a surgical stent, the osteotomy could be performed in an adequate position in 3 dimensions, using the zenith of the cervical contour of the planned restoration as a reference point.
Fig. 7: The implant was placed 3 mm apical to the cervical contour of the planned restoration, symmetrically from mesial to distal, and 2 mm to the lingual in order to preserve the buccal bone that will support the soft tissue.

Fig. 8: A 7 mm healing abutment was placed to guide the soft tissue to an optimal healing situation.

Fig. 9: The healing abutment was removed after 6 weeks and a final impression of the implant position and the shape of the soft tissue was sent together with the opposing model to the dental laboratory.

Fig. 10: The Atlantis Abutment was virtually designed with the emergence width of the replaced molar and manufactured in titanium with a titanium nitride coating.

Fig. 11: The Atlantis Abutment in gold-shaded titanium, together with the Atlantis abutment screw, was sent to the dental laboratory.

Fig. 12: The subgingival portion of the abutment will give the anatomical shape, support and color to the surrounding soft tissue. The final crown restoration in zirconia was fabricated.

Fig. 13: Final implant restoration with the finishing line close to the gingival margin, allowing for easy removal of excess cement in the subgingival area. The restoration was ready to be delivered to the patient.

Fig. 14: The Atlantis Abutment was placed with some pressure of the soft tissue. After a few minutes, the ischemia disappeared and the abutment was seated in the correct position.

Fig. 15: Verification of correct seating of the abutment using a radiographic image. Note that the transitional portion of the abutment follows the contour of the bone.

Fig. 16: The Atlantis Abutment in gold-shaded titanium was torqued according to the implant manufacturer’s recommendation of 25 Nm. The screw head was covered and the crown was later cemented to the abutment.

Fig. 17: After 8 years, radiograph is showing a perfect fit of the restoration, the spaces created for the inter-proximal papillae, and the position of the bone at the level of the implant.

Fig. 18: After 8 years, a perfect adjustment of soft tissue around the restoration (buccal view) was observed, filling the space for the inter-proximal papillae and giving a natural position of the soft tissue contour.

The evolution of the Neoss implant system: A retrospective follow-up of three patient cohorts treated with three types of Neoss implants

This article reports on three patient cohorts with three types of Neoss implants. The retrospective analysis shows excellent long-term results with the Neoss implant system. The results also indicate that the introduction of the ProActive implant surface led to improved clinical outcomes in difficult cases.

By Dr Thomas Zumstein, Switzerland & Dr Herman Sahlin, Sweden

Introduction
The effect of dental implant design changes on the clinical outcome is usually difficult to study in a structured way. When comparing study data from different studies, several factors change together with the change of implant design. Here we have a clinical material where the same surgical protocol has been used by the same surgeon at the same clinic but with three generations of Neoss implants. That gives us a unique opportunity to study the effect of implant design changes in a more controlled manner.

For each new generation of Neoss implants - i.e. Bimodal Straight, ProActive Straight and ProActive Tapered - the clinical outcome of the first 50 consecutive patients treated in one private office has been retrospectively analysed. Data on the Bimodal and the ProActive Straight patient groups have been published earlier.1-3

Materials and methods
Patients
This retrospective study analyses three patient cohorts consisting of the first 50 consecutive patients treated with three types of Neoss dental implants (Neoss Ltd, Harrogate, UK): Bimodal Straight implants, ProActive Straight implants, and ProActive Tapered implants.
The Bimodal implant had a straight implant body with a blasted surface. The ProActive straight implant has exactly the same implant geometries as the Bimodal implant, but with the blasted and etched hydrophilic ProActive implant surface. The ProActive Tapered implant has the same ProActive surface, the same prosthetic connection and cutting features as the ProActive Straight implant but with a tapered implant body.

The patients were examined clinically and radiographically before treatment. They were thoroughly informed of the surgical and follow-up procedures and gave their written consent before treatment. All treatment steps were part of the routine practice at the clinic, and no extra measures were taken for the course of the study. The study was conducted in accordance with ethical principles, including the World Medical Association Declaration of Helsinki.

Surgical protocol
Patients were given antibiotics (Isoniazid, 300 mg, Pfizer AG, Zurich, Switzerland) 30 min before the procedure, and the implant surgery was performed under local anaesthesia (Ultracon D-5 Forte, Forte-Atins, Geneva, Switzerland).

In cases of localized horizontal and vertical defects, a guided bone regeneration (GBR) procedure using BioOss and a resorbable BioGide membrane (Geistl, Switzerland) was performed simultaneously with implant placement. Larger defects were treated using a staged GBR procedure. First, either an autologous bone block and a resorbable membrane (BioGide) or a bone substitute material (BioOss) and a non-resorbable ePTFE membrane (Gore-Tex Regenerative Membrane, Gore Medical, Flagstaff, AZ, USA) were used. Implants were placed after a 6-month healing period. ePTFE membranes were removed in the same operation. In some cases, sinus floor augmentations were made simultaneous with implant placement either by the use of a series of osteotomes or by using a lateral window technique.

Flapped surgery was used. Implant sites were prepared and implants were placed in accordance with the manufacturer’s guidelines. Implant placement depth varied between the different treatment groups. In the Bimodal treatment cohort 95% of the implants were placed with the implant platform at bone level and 4% were placed supracrestal with half of the collar above bone level. In the two Pro-Active cohorts, all implants were placed with the implant-abutment connection at bone level.

Healing protocol
Three different healing protocols were utilized. Two-stage healing, one-stage healing with delayed loading and immediate loading.

Prosthetics
Implants were restored with single crowns, partial bridges, fixed full bridges, or overdentures (Figure 1). All restorations were fabricated using conventional prosthetic techniques on Neoclix abutments (Neoss Ltd). Frameworks were made of titanium or gold, and both porcelain and acrylic were used as veneering materials.

Follow-up
The patients were scheduled for annual check-ups with clinical and radiographic examination. Follow-up data was collected from the third, fifth, and tenth years.

Survival analysis was performed, and marginal bone levels were measured from periapical radiographs. Mesial and distal bone levels were measured and an average was calculated. Baseline measurements were taken at time of implant placement for the ProActive groups and at time of prosthesis delivery for the Bimodal group.

Results
Baseline data, treatment schedule and follow-up status for each treatment group is presented in Figure 1.

In the Bimodal group, all followed patients have attended the 10-year check-up. In the ProActive Straight group, the patients have completed the 5-year follow-up, and in the ProActive Tapered group, the 3-year follow-up is completed (Figure 3). Implant survival is shown in Figure 2. In the Bimodal group, the cumulative survival rate after 10 years was 95.2% for augmented sites (8 implant failures) and 98.2% for non-augmented sites (1 failure). In the ProActive Straight group, the cumulative survival rate after 5 years was 98.5% for augmented sites (3 failures) and 98.9% for non-augmented sites (3 failures). In the ProActive Tapered group, no failures occurred, resulting in cumulative survival rates after 3 years of 99.96% for augmented sites as well as non-augmented sites.

Marginal bone levels over time are shown in Figure 3. In the Bimodal group, the bone resorption from prosthesis delivery to 10 years was 0.4 ± 0.2 mm. In the ProActive Straight group, the bone resorption from implant placement to 5 years was 0.7 ± 0.3 mm. In the ProActive Tapered group, the bone resorption from implant placement to 3 years was 0.5 ± 0.6 mm.

All groups showed stable bone levels after the first year. None of the patients in any of the study groups showed any signs of peri-implantitis.

Discussion
The three patient cohorts were treated according to the same clinical protocol. Hence, the groups were similar in gender distribution and percentage of sites requiring bone grafting. However, as clearly seen in Figure 1, the number of implants decreased for each new group. This most likely reflects the fact in the general implant population over time where the percentage of full arch restorations has decreased and the percentage of single crown restoration has increased over the last 10-15 years.

The results indicate excellent long-term clinical results with the Neoss implant system. The bone levels are maintained on a stable level after one year in all groups with an average long-term bone level change in the Bimodal group between 3 and 10 years is less than 0.3 mm.

The Bimodal implant showed lower survival rate in augmented sites (91.2% vs. 98.2%). No difference in implant survival between augmented and non-augmented sites was seen for the ProActive implants. This indicates that implants with the ProActive surface experience less complications than implants with the Bimodal surface. This finding is in line with earlier studies showing that ProActive implants performed better than Bimodal implants when placed directly after total extraction of remaining teeth and loaded with a fixed bridge within 3 days.

No case of peri-implantitis was recorded in the studied patient population during the 10 years of follow-up. This is an interesting and encouraging finding. However, additional studies and larger patient populations are needed to establish whether this is due to the studied patient population, the surgical and prosthetic protocol, the meticulous follow-up schedule or the implant properties.

In conclusion, the studies show excellent long-term results with the Neoss implant system. The results also indicate that the introduction of the ProActive implant surface led to improved clinical outcomes in different clinical cases.

References

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