The Foundation of Knowledge

Statement of the International Implant Foundation (IF)
Concerning Probing Around Basal Implants (2021, Version 3)

Strength of evidence: S3 (evidence-based, systematically developed consensus guideline).

Other applicable rules and documents:

- General rules for treatments in the field of traumatology and orthopaedic surgery, in particular on partially extra-orally attached devices for distraction osteogenesis
- Indications and Treatment Modalities for Corticobasal Jaw Implants. IF consensus paper 2019. Ann Maxillofac Surg 2019; 9: 379-86

I. Probing As a Diagnostic Procedure Around Natural Teeth and Crestal Implants

Probing is one of the recognised diagnostic procedures for determining the pocket depths in teeth. For this reason, numerous examiners have also described depth probing as a diagnostic measure in the area of crestal implants and have used it as an important criterion for evaluating treatment success.

The probing depth (pocket depth) is the distance between the edge of the gingiva and the depth to which a probe can be inserted at a given pressure. The relative attachment level is the distance between the deepest point in the pocket that can be reached with the probe and a defined point on the tooth. To determine the relative attachment level, the easily recognisable cementoenamel junction is usually used as the upper reference point[i].

Probing around teeth aims to determine the clinically measurable attachment, which is considered a measure of periodontal health. In this context, one needs to bear in mind that the condition of the gingiva itself[ii], the probing force as well as examiner-dependent parameters[iii] [iv], type and shape of the probe as well as obstructions (crowns, calculus; macro-design of an implant, multiple abutments[v]) during probing can decisively influence the result of the measurement. With periodontal probes, it is often not possible to determine the level of actual bone. The reproducibility of probing is limited: one needs to allow for variations of +- 1 mm under clinical conditions. Probing is therefore popular for checking the function and condition of crestal implant bodies[1] because X-ray examination is only of limited diagnostic value due to it being restricted to two dimensions and the time lag associated with it[vi] and because only significant destructions of hard tissues can be recognised on it[vii] [viii] [ix].

1 *The term crestal implant body covers those implants which have the essential force transmission surfaces in the area of the vertical implant axis, which are introduced into the jaw from the crista alveolaris, and which are used according to the osseointegration method or as compression screws. The term therefore includes screw implants, cylindrical and conical implants and disc implants. The bicortical screw does not belong in this group: Although this implant is inserted from the crestal point of view, it is not inserted in a congruent bone and is anchored by osseous fixation in the 2nd/3rd cortex. This implant therefore represents functionally (also due to the intended lateral and cortical support) rather a basal implant with a crestal method of insertion.*

The term „normal biological width“ in the context of crestal implants describes the fact that above the bony attachment, there is initially a connective tissue zone of approx. 1.5-2 mm, above which lies a zone with epithelial contact measuring another 2-2.5 mm. Probing in this area therefore has the aim of showing that only this desirable probing depth of no more than 3-4 mm is reached. In this context, screw threads and roughness on the implant surface influence the probability of obtaining a correct measurement result[x]. For crestal implant bodies, varying information about the damage that may be caused by probing at the implant site can be found. As with real teeth, the healing of probing injuries around these implants generally takes place within a fortnight[xi]. With crestal implants, probing should not be undertaken within three months after the abutments have been fitted in order not to disrupt the normal healing process.

While depth probing should not cause any damage on healthy crestal implants[xii], microbiological studies have shown that pockets with a depth of more than 5 mm can potentially provide a protective biological environment for pathogenic germs[xiii xiv]. In the case of crestal implants, probing depths of 6 mm and more indicate a more critical course of treatment[xv], which can be caused by periimplantitis among other things.

Probing around crestal implants aims to measure the level of bone that can still be considered to be „attached“. Given the resistance of tissues in the depth of the pocket, one may assume that for crestal implants, the real level of bone can never be probed. In this context, Lang and Bragger state that inflammation of the marginal periodontium strongly influences the results of probing: around healthy implants, it was possible to approach the actual bone margin to approx. 0.8 mm by probing, while probing to a proximity of 0.2 mm was possible in an infected area[xvi]. Osteolytic pockets may be present for crestal implants in the infected transition area from bone to connective issue.

At any rate, measurement errors are comparatively larger around implants than around teeth[xvii xviii].

One should also point out that overload associated with vertical osteolysis (culminating in loosening of the implant) does not lead to deeper probing, as is found for plaque-associated bone fractures[xix]. This may be due to the fact that the per se (at least initially) sterile bone remodelling reaction is less space-demanding and intense in mechanical overload and penetration by the probe is therefore more difficult. The overload osteolysis in Corticobasal® implants can therefore not be probed. At best, sterile overload osteolysis can be converted into infected overload osteolysis (in the sense of bodily harm by the examiner) by (pointless) probing. Cases have also been documented in which the „oro-antral seal“[xx] was destroyed by probing along the polished vertical implant parts in the direction of the maxillary sinus, after which sinusitis maxillaris was triggered by the probing. The performance of probing for Corticobasal® and lateral basal implants therefore does not meet the specialist standard and is always malpractice.

Apart from the result of depth measurement, the bleeding tendency of teeth is used to evaluate periodontal health. Probing can therefore yield two results: if there is no bleeding, then periodontal health, i.e. stable conditions, is assumed. This experience cannot simply be transferred to implants: with the same probing force, bleeding occurs more frequently for „healthy“ implants than for healthy teeth in dentitions with comparable oral health[xxi xxii].

Different authors have come to divergent conclusions regarding the relationship between bleeding and periimplant collapse:

Natert et al.[xxiii] and Salcett et al[xxiv] found no correlation between bleeding after probing and marginal bone loss. Smithloff and Fritz, on the other hand, state (for blade implants) that bleeding during probing and bone loss detected by X-ray are the most reliable parameters for detection of periimplant collapse[xxv].

Initial probes around a crestal implant thus have some diagnostic value. However, if other parameters as indicators of disease are absent, they are hardly usable. It is crucial to observe the course of the disease over a longer period of time – about every 3-6 months.

For crestal implants, the following can be summarised for probing:

1. For probing to be of any value, a reliable and reproducible reference point on the implant or superstructure is necessary. This point must be used for each probing.
2. Probing is not expected to cause damage, as long as a probing depth of approx. 5 mm is not exceeded and as long as the surface of the implant is not irreversibly damaged or contaminated.
3. With the same probing force, deeper probing is possible near crestal implants than near teeth. This is due to the different structures of the periimplant tissues. When the bone level is identical, probes will penetrate more deeply under inflammatory periimplant conditions than in the absence of inflammation.
4. The probing depth is one of several parameters that need to be considered when evaluating crestal implants.

II. Probing Near Basal and Cortical Implants

All crestal implants share the feature that force transmission and attachment to the bone are only achieved along the vertical axis of the implant. This is because these implants lack further components, such as a force-transmitting disc. In contrast, very different circumstances exist for basal implants: depending on the structure of the surface, conventional osseointegration along the vertical implant axis is not intended. Basal implants possess a design-related resilience and nearly isoelastic properties in relation to the bone[xxvi].

These special features preclude the transfer of experience from crestal implants to the conditions for basal implants:

- In contrast to crestal implants, basal and cortical (Corticobasal®) implants do not show systemic progressive bone loss, i.e. periimplantitis does not occur. Lack of vertical bone or a decrease in vertical bone is not a parameter for determining the condition or prognosis of the implant. Probing depths of more than 6 mm (e.g. immediately after tooth extractions) also do not indicate a critical course of treatment.
- The amount of vertical bone present near the implant does not matter as long as the „oro-antral“ seal in the maxillary sinus is maintained and the „open bone wound“[xxvii]

does not become infected.

- With these implants, force transmission is effected via one or more base plates or spiked cutting threads, which are inserted bi- or multicortically in areas that tend to be infection-proof, far away from the mucosal penetration site. During insertion, the bone is opened by means of a lateral T-shaped osteotomy for lateral basal implants. In the lower jaw, the bone tends to quickly fill the vertical and horizontal osteotomy slots with woven bone, which then takes part in the remodelling. Due to the stress-induced tension, a smooth, continuous and mineralised bone closure can be expected in this area after only a few months. The stimulus for bone regeneration comes from the jaw itself, which is subject to functional torsion which in turn stimulates bony regeneration. In the upper jaw, these stress-related stimuli are not present to the same extent. The bony osteotomy thus closes more slowly and mainly from the periosteum.
- Lateral basal implants: The position of the vertical osteotomy cannot be determined postoperatively by the examiner who did not perform the implant placement himself. Since the implant can be inserted from the side or obliquely, and in the mandible from the lingual or vestibular side, and as the implant may also have been inserted longitudinally through the jaw, the vertical osteotomy may be present at any point in the jaw. Only the surgeon knows the insertion path he has chosen. Since, due to the flexion of the jaw and any minimal mobility of the implant-prosthetic system, osseoadaptation in the area of the abutment carrier cannot be expected, there is a risk of uncontrolled slipping off into the depths with every probing, even on absolutely healthy implants, which yields a non-reproducible, diagnostically worthless incidental finding and can introduce infections into the depths of the bone.
- During depth probing, the mechanically smoothed surface of the thread-bearing element of basal implants can easily be damaged and roughened. Rough surface regions promote subsequent accumulation of plaque. Particularly in combination with the design-related resilience of these implants, this can pave the way for the establishment of infections in deeper areas of the jawbone.
- It is well known from crestal implantology literature that pathogenic germs can survive in niche areas from a pocket depth of approx. 5 mm. Especially when probing reaches the crestal plate of laterally basal implants, there is a risk of infections becoming established near the plate and beneath it. These can spread horizontally along the plate and irreversibly damage the osseointegration of the discs. Clinically, one can only gain control of this situation by removing the disc in question from the implant in a timely manner, i.e. before further penetration of the infection in the direction of lower discs-and cleaning the site thoroughly as part of a surgical intervention.
- If probing is undertaken in the upper jaw in the area of the sinus, there is always a risk of penetrating all the way into the sinus. This is because during probing, the examiner is looking for a bony resistance, which is found rather rarely in the delicate bone structures in this area. While it not normally possible for an infection ascending into the sinus to become established even under the most cramped conditions between oral cavity, implant and maxillary sinus, clinical experience shows that probing as such may very quickly trigger such infections. Apparently, penetrating probing deposits pathogenic germs directly into the maxillary sinus or into the extraction socket that is being remodelled. The bacteria are introduced in an unnatural way, which is not primarily opposed by an anatomical-structural defence.
- Even when clinically manifest sinusitis is already present, probing is futile: because the presence of the infection and its extent cannot be established by means of probing, this requires X-ray or a CT scan. On the other hand, probing will result in an undesirable transplantation of germs and / or mixing of germs if the cause of the sinusitis lies

not in the area of the implant and when probing in search of bony support may injure soft tissue anatomical structures.
- The condition of lateral basal (Diskimplant®, BOI®) and cortical (Corticobasal®/Strategic Implant®) implants cannot be diagnosed by means of depth probings.

Summary

In general, any invasive medical procedure must be weighed up in terms of benefit and risk. Probing around teeth and implants is to be considered as such invasive procedures. To justify probing, the obtainable measurement needs to be reproducible on the one hand and clinically meaningful on the other. As there is always a risk of uncontrolled depth probing with basal implants, and as the marginal bone level and the lateral bone adaptation in the region of the thread-bearing element are irrelevant for the prognosis of the implant at any rate, any probing around lateral basal implants (e. g. Corticobasal®/Strategic Implant®) presents a futile and potentially dangerous procedure that may harm the physical integrity of the patient. If infections occur on cortical/lateral-basal implants after such probing, it can be assumed that the probing itself triggered or worsened the damage. The counter-evidence should not be feasible. The potential damage associated with probing is completely disproportionate to the achievable diagnostic benefit. Depth probing for evaluating the condition and prognosis of a basal implant rightly does not get mentioned in the „Consensus on BOI“[xxviii].

The recommendations and standards from crestal implantology literature are not transferable to lateral basal (Corticobasal®/Strategic Implant®) implants, as the latter possess different principles of function and integration, and as with crestal implants there is no longer an „open bone wound“ after osseointegration has taken place (even after the uncovering procedure), but bone resorption (e.g. in periimplantitis) occurs opportunistically (and favoured by underfunction / too large endosseous implant surfaces) after colonisation of the rough implant surfaces occurs.

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