Prosthetics as a predisposing factor for peri-implantitis

It has been conceived that peri-implantitis is a biofilm-mediated inflammatory condition that leads to progressive bone loss[1]. Interestingly, epidemiological reports have pointed towards a higher prevalence at the implant-level, when compared to evaluation at the patient-level. This indicates that besides the presence of plaque in a susceptible host, local factors involving the design of the implant-supported prosthesis play a pivotal role in the occurrence and perpetuation of this disorder[2,3].

The clinician's first line of defence for plaque accumulation in the natural dentition is individualised oral hygiene instruction. However, when restorations and prosthetics are introduced into the dentition, it becomes the responsibility of the provider to ensure there is access for adequate oral hygiene. There have been a number of characteristics identified that compromise oral hygiene access and allow for increased plaque accumulation around dental implants. Among them, emergence angle and profile of the implant crown have recently become a trending topic in the literature. For instance, recent findings have suggested that an implant-supported crown with an emergence angle of > 30 degrees and a convex emergence profile places bone-level implants at risk for developing peri-implantitis[4]. In this sense, it is remarkable to highlight that these characteristics are dictated by implant position. Therefore, if the implant is placed rather shallowly, these scenarios will likely occur when the prosthodontist restores the implant. If apico-coronal position is set due to the proximity of an anatomical boundary (i.e., maxillary sinus or inferior alveolar nerve), rather than dictate the use of a poor prosthetic design the clinician should opt to use a shorter-length implant with slightly submerged placement, or to use a tissue-level implant to promote a concave-shaped prosthesis design. Likewise, if the implant is placed too lingually, over-contoured restorations towards the labial aspect are often designed to compensate for non-ideal placement. This scenario may be avoided by means of a prosthetically driven implant placement accompanied with simultaneous or staged guided bone regeneration. Finally, if an implant is placed in an inadequate mesio-distal position, food impaction may presumably occur, thus increasing the risk of peri-implantitis.

Taking this into consideration, it is clear that an implant should always be restored with a hygienic prosthesis. However, this is an especially arduous task when splinted crowns are used. In the case of three consecutive implants restored with splinted crowns, the central implant is nearly inaccessible for oral hygiene measures. As a consequence, the central implant of a splinted prosthesis has a nearly six-fold higher probability of developing peri-implantitis than the central implant under a non-splinted prosthesis[5]. Keeping in mind the plaque-mediated nature of this condition, it would be prudent when splinting multiple crowns to design the prosthesis in a way that suits long-term maintenance. It may, therefore, be judicious to consider a two-implant-supported removable partial denture in these circumstances with the goal of enhancing access for self-performed oral hygiene measures. This may further contribute toward patient satisfaction, from a financial perspective.

The influence of occlusion on implant stability remains controversial. From an implant prosthetics standpoint, it has been agreed that excessive lateral forces may increase prosthetic complications. These forces in particular generate a bending moment force that decreases pre-load on the abutment screw and results in screw loosening[6]. This may generate a micro-gap that places the implant at an increased risk to have pathogenic bacteria colonizing the peri-implant sulcus. While the impact of occlusion on marginal bone loss has been largely dismissed by recent research, a complete loss of osseointegration has been noted as a possible complication of excessive loading[7,8]. Parafunctional habits have also been noted for their detrimental effect on implant longevity. In fact, failure rates may be as high as ~40% in the presence of untreated parafunction[9]. Hence, a bite-splint therapy is often recommended for these patients. Nonetheless, a meta-analysis concluded that due to a limited number of published studies and low level of specificity, the effect of bruxism or parafunctional habit on the implant failure rates remains to be determined[10]. However, a patient who has a parafunctional habit may have more technical complications (screw loosening, screw fracture, implant fracture) that may also contribute to biologic complications from the connection. The ethical issues surrounding human studies on the impact of excessive occlusion create controversy with this topic; however, it is the present authors' belief that clinicians should regularly check the occlusal forces impacting their patient's implants.

The implant's restorative margin has also been evaluated for its impact on the peri-implant tissues. In bone-level

implants, a distance of < 1.5 mm from the restorative margin of the implant-supported prosthesis to the marginal bone crest at the time of restoration has been found to be a risk indicator for developing peri-implantitis[11]. Rather than disease onset, this risk for developing peri-implant bone loss is because it violates the biological width (now termed the supracrestal tissue attachment/height) – a biological dimension that exists around the natural dentition and dental implants[12,13]. In implant dentistry, this term is better described as supracrestal tissue adhesion (STAd) as the term "attachment" is correctly used for natural teeth in reference to their collagen fibre insertion, and the implant equivalent is a hemidesmosomal "adhesion", not a "height"[3]. Regardless of the correct aetiology of this peri-implant bone loss, it can be agreed that clinicians should aim to preserve as much of the supporting tissues as possible. This can predictably be done with the use of a transmucosal abutment that respects the STAd and also allows for abutment-crown margins that are accessible – an important consideration as increasing depth of the crown-abutment margin may increase the prevalence of cement remnants, which might trigger peri-implantitis[14].

All in all, clinicians are liable for the care provided for their patients. In this sense, a comprehensive three-dimensional radiographic analysis and patient's anamnesis are highly recommended. Implants must be placed in a prosthetically driven position to favour adequate prosthesis designs that promote peri-implant health. It is time that the clinicians who place the implants, and those who restore them work together in treatment planning and open themselves to self-criticism aimed at providing orchestrated treatments that satisfy the patients from the aesthetic standpoint without compromising the long-term success of their dental implants. However, as periodontists, the present authors must state that should an implant be placed ideally, and then restored with a non-cleansable contour, splinted to adjacent implant-supported crowns, with excessive occlusal contact, and in violation of the STAd, the term peri-implant prosthodontitis may be more appropriate. A term as inaccurate linguistically as the provider proved to be clinically.

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