EDITORIAL

Evidence on How Prosthetic Materials Can Influence the Stability of the Implant Rehabilitation Supporting Tissues

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The clinical decision whether to rehabilitate the patient with a fixed prosthesis on implants depends on the tooth prognosis or on aspects that include a particularly complex therapeutic plan.[1] In the case of single-tooth gaps or partially edentulous areas framed by healthy neighboring teeth, fixed implant prostheses are usually indicated.[1,2] In edentulous situations, however, the choice of fixed or removable implant prostheses depends on several factors and is therefore more complicated. If a treatment plan that includes a fixed implant-prosthetic solution is chosen, the possibilities are different: it is possible to select fixed screw-retained or cement-retained rehabilitations.[2] Each of the two choices, also considering the possibility of choosing hybrid solutions, has pros and cons, which can lead toward one or the other. Both can be made with similar materials, which naturally trigger different tissue responses.[2–6]

Metal-ceramic crowns, particularly cement-retained on implants, were the gold standard for decades, yet today all-ceramic implant crowns manufactured in lithium disilicate or zirconia ceramics are successfully used. In addition, leucite-reinforced glass ceramics, alumina ceramics, or resin-matrix ceramics can be considered for the fabrication of single implant-retained crowns.[2,7] Regardless of the prosthetic material used for the final crown, 95.2% of the rehabilitations were excellent at 10 years, speaking of survival rate, which can however also include conditions in which the implant has had significant bone loss.[2] However, the overall 10-year survival rate of the crowns was slightly lower at 89.4%. At the crown level, the survival rate was influenced by the materials used for their fabrication, as shown in a more recent review.[2,8] Furthermore, from this point of view, knowing whether that material has the potential to affect implant health, which is more difficult to maintain, can have profound clinical significance. The 5-year survival rate of veneered alumina crowns was 96.8%; for veneered zirconia crowns, it was 91.6%, while for monolithic lithium disilicate, it was 91%. Hybrid resin-matrix ceramic crowns only survived in 67.8% of cases. By comparison, metal-ceramic, implant-retained crowns exhibited a 5-year survival rate of 98.3%.[2,9]

Each of these solutions has pros and cons that guide the choice of whether to use them in the specific clinical case, and among these, the following should be considered:

- Fracture or loosening of retaining abutment/prosthetic screws
- Loss of crown retention (decementation in particular)
- Screw loosening
- Fracture of zirconia frameworks
- Fractures of ceramic abutments

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To then move on to the problems of aesthetic coverings:

- Chipping or fracture of the veneering material (on metal or zirconia framework)
- Chipping of the crown[4,8,9]

Naturally, to maintain a stable implant result over time, it is necessary to have an abundance of tissues around it, very often regenerating the soft tissues and, less frequently, the hard tissues.[10] However, these tissues must be kept noninflamed and healthy, and therefore the materials that come into intimate contact with them must not represent a constant irritant in the context of rehabilitation.[10,11]

Although we know, as imaginable, that the implant environment is more inflamed than the periodontal tissues of teeth in the same conditions, it is necessary to underline how these evaluations, if evident from a clinical/radiographic point of view, often represent a point of no return, which makes the regeneration of these tissues extremely complex. For this reason, the existence of methods for sampling peri-implant fluids or periodontal fluid, which allows clinicians to anticipate radiographic/clinical damage before it is evident or difficult to resolve, represents an extreme advantage in the prognosis of current implant rehabilitations that are performed.[12,13] From this point of view, further improvements can be obtained by also considering analyzing the different responses to the materials that are used starting from the implant connection, to understand if there is one that is protective with respect to some conditions compared to others.[14,15]

Although the possibility of considering genetic aspects regarding implant rehabilitation and possible failures related to a genetic predisposition has also been introduced in recent years, it has also been the subject of investigation how a prosthetic/implant material can interact as a modifier of gene expression at the peri-implant tissues level.[16,17] It is also interesting to

underline how the presence of pro-inflammatory cytokines, infiltration of inflammatory response cells, and activation of osteoclast activity are stimulated in peri-implant tissues in the presence of metal particles and ions.[18] What the authors are now investigating is whether the prosthetic material of which the abutments/crowns are made, in contact with the peri-implant tissues, can represent a factor capable of modifying the stability of the tissues around the implant.[19–21] It is now common opinion that the soft tissue integration of dental implants can be improved through different surface modifications, but little is known about the answer to other materials that can be used in this regard.[22] In the Barwacz et al. study, comparing titanium abutments with zirconia abutments, they found differences for the bone mediator leptin, with titanium abutments demonstrating significantly elevated levels in comparison with zirconia after 6 months.[23] Despite gingival tissue health and scarce plaque accumulation, the profile of inflammatory cytokines in implant crevicular fluid was distinctive of an innate immune response and in higher concentration than in teeth, and this must represent the stimulus to the search for prosthetic materials of both the components and the prosthetic crown that reduce the levels of tissue inflammation.[24]

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