EDITORIAL

3Cs of Successful Implant Prosthesis: Connections, Contours, and Contacts

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The long-term success of any implant-supported restoration depends upon multiple factors. The abutment connections, prosthetic contours, and occlusal or proximal contacts are critical parameters for the long-term success of implant-supported prostheses.

Connections

Implant-abutment connections can be of various types, including conical, morse taper, internal hex, external hex, and with any other shaped antirotational feature or without antirotational feature. These connections are designed to provide mechanical retention to the supporting prosthesis with appropriate preloading by the abutment screws. Under the occlusal forces, these connections are the origin of the microgaps and micromovements and usually are potential sites of bacterial colonization leading to peri-implant inflammation, mucositis, and crestal bone loss.[1] The abutment-screw loosening is a common complication of implant-supported prostheses.[2] The implant abutment-screw loosening incidence ranges between 7 and 11%, while the abutment-screw fracture incidence was found to be 0.6%.[2] In another retrospective study, Yang et al.[3] observed a total of 25 (2.65%) cumulative abutment mechanical complications in a total of 945 implants in 495 patients. Misfitting of the superstructure can result in the loosening of screws, reduced preload, and in some cases, significant stress around the implant.[4] Hence it is very important for restorative implant clinicians to select the appropriate implant-abutment connection based on the specific clinical situation and patient requirements.

Contours

The contour of the implant prosthesis refers to the form and shape of the implant abutment and the superstructure. The overall contour of the implant prosthesis is crucial in achieving esthetics, function, and comfort for the patient.[5] The contour of the prosthesis depends upon the number of missing teeth, location of the edentulous ridge, presence of adjacent teeth, soft tissue architecture, esthetic expectations of the patients, prosthesis materials, and the type of a prosthesis (fixed or removable, crown or bridge, short-span or long-span, and partial or complete arch). These contours are named as per their position in the prosthesis, for example, the emergence profile (where it emerges from the soft tissues), the coronal contour (to resemble the natural teeth), the gingival contour (gingival surface of the "pontics"), the occlusal contour (occlusion surface), and the proximal contour (for adjacent teeth/prosthesis contact). Following clinical considerations must be carefully evaluated for the appropriate contour of the implant prosthesis, including vertical available restorative space, interproximal horizontal restorative space, the diameter of the implant, and the vertical and horizontal position of the implant. The implant position is the determining factor for the restorative contour in the transition zone.[6] Different materials, including metal-ceramic, all-ceramic, zirconia, polyetheretherketone, or metal alloys, may influence the contour and esthetics while ensuring strength and longevity. To develop a predictable gingival architecture during the healing process, the contours of the implant-supported fixed interim restoration require careful modification as well.[7] The same gingival contour later should be carefully copied and designed in the final restoration for a better esthetic outcome. The gingival surface of the pontics needs to provide a convex contour to allow easy plaque removal to maintain long-term peri-implant health.[5] The single crown or short-span prosthesis needs to camouflage the restoration with the adjacent teeth, especially in the esthetic zone.

Contacts

The contacts play a crucial role in achieving proper occlusion and proximal tightness for functional harmony and the long-term success of implant-supported prostheses. The occlusal contacts (both centric and eccentric) need to be carefully adjusted in the final prosthesis to ensure proper occlusal harmony. Due to a lack of the periodontal ligament, osseointegrated implants may be more prone to occlusal overloading, which is one of the potential causes of peri-implant bone loss and implant failure.[8] Occlusal overloading may increase the frequency of biomechanical complications, such as marginal bone loss, fracture of layering resin or ceramic, fracture of the retentive attachment or denture base of implant-overdentures, loosening or fracture of abutment screws, and implant failure.[9] Parafunctional habits such as bruxism also contribute to occlusal overloading, and this condition must be addressed with high priority in the implant treatment planning phase. Occlusal refinement based on the patient's specific functional needs is

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crucial to prevent excessive forces on individual implants for long-term success.

The proximal contacts help maintain proper alignment, stability, and functionality during biting and chewing and also facilitate proper distribution of forces and prevent food impaction between teeth.[10] The proximal contact loss (PCL) between implant prostheses and adjacent natural teeth is a frequently observed, inevitable, and progressive complication.[11–13] A systematic review by Abduo and Lau[13] with 19 eligible studies found a PCL prevalence of 11–30% with the short-term studies (years), 13–65% with the medium-term studies (2–5 years), and 29–83.3% with long-term studies (years). Bento et al.[14] reviewed 10 studies and indicated that five of them presented PCL rates higher than 50%. The PCL may occur due to several reasons, including the timespan of a prosthesis in the mouth, discrepancy of tooth and implant movement in the jaw, proximity of implant and a tooth, peri-implant tissue health, and continuous crestal bone loss.[11–13] It is important for implant clinicians to carefully maintain the follow-up appointments to ensure occlusal harmony and proximal contact tightness for long-term success.

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