ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2024; 10(2): 315-318

www.oraljournal.com
Received: 06-04-2024
Accepted: 08-05-2024

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Rehabilitation of dental implants, complications and factors to consider: A literature review

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DOI: https://doi.org/10.22271/oral.2024.v10.i2e.1955

Abstract
Introduction: The general 10-year survival rate of implants supporting dental crowns was found to be outstanding, reaching 95.2%, regardless of the material used. Nonetheless, the overall 10-year survival rate of the crowns themselves was slightly reduced, standing at 89.4%.
Objective: Analyze the literature about rehabilitation of dental implants, complications and factors to consider. The esthetic complications, problems with the prosthetic implant screw, ceramic chipping and available prosthetic space will be analyzed.
Methodology: An electronic search of articles published in the last 5 years was carried out through PubMed and Google Scholar, using the terms “esthetic complications”, “implant screw”, “ceramic chipping”, “implant prosthetic space”.
Results: When rehabilitating dental implants, it should be considered: esthetic complications, ensuring a minimum soft tissue thickness of 2 mm is essential to maximize overall implant success. Problems with the prosthetic implant screw: factors like bruxism, framework support, and screw loosening significantly impact the longevity of implant-supported prostheses. Ceramic chipping: is less frequent in monolithic or partially veneered fixed dental prostheses compared to those with complete veneers. Implant prosthetic space: impacts the mechanical stability of restorations, with both increased and reduced heights presenting specific challenges.
Conclusions: Achieving peri-implant tissue architectures that mimic natural periodontal tissues is crucial. Proper implant placement and management of soft tissue quality are essential for optimal outcomes. Comprehensive planning, including occlusal force management and ensuring adequate vertical space, is vital for implant prostheses' success. Monolithic reconstructions, present fewer complications and are promising alternatives to veneered ceramics.

Keywords: Esthetic complications, implant screw, ceramic chipping, implant prosthetic space

1. Introduction
The general 10-year survival rate of implants supporting dental crowns was found to be outstanding, reaching 95.2%, regardless of the material used. Nonetheless, the overall 10-year survival rate of the crowns themselves was slightly reduced, standing at 89.4% [1].
Dental implants provided an alternative to traditional dentures and bridges, offering a solution based on osseointegration. Dental implants enable the restoration of functionality to nearly normal levels in both partially and completely edentulous arches [2].
The successful diagnosis and treatment planning of single restorations and partial fixed prostheses supported by dental implants demand thorough scientific understanding and a well-defined strategy for final restorations prior to initiating treatment. A critical aspect in reducing the incident of biomechanical complications in single implant restorations and partial fixed implant-supported prostheses is to mitigate resistance against adverse leverage forces during functional use [3].
Implant-supported fixed dental prostheses have demonstrated enhancements in masticatory function and higher patient satisfaction levels compared to removable partial dentures. Patients often base their treatment preference on perceived efficacy, cost considerations, and maintenance requirements. Despite the proven safety and predictability of implant-supported fixed dental prostheses, complications are still common incidents [4].

To restore a missing tooth, there are several treatment options available, and dental implants are an excellent choice, boasting success rates above 90%. Nevertheless, it is crucial to research and communicate the potential complications that may occur so that both the clinician and the patient are informed and can take steps to prevent and/or address them. Therefore, this article analyzes the literature about rehabilitation of dental implants, complications and factors to consider. The esthetic complications, problems with the prosthetic implant screw, ceramic chipping and implant prosthetic space will be analyzed.

2. Methodology

An electronic search of articles published in the last 5 years was carried out through PubMed and Google Scholar. Abstracts and full texts were identified that included information about rehabilitation of dental implants, complications and factors to consider: esthetic complications, problems with the prosthetic implant screw, ceramic chipping and implant prosthetic space. Within the keywords used for the electronic search: “esthetic complications”, “implant screw”, “ceramic chipping”, “implant prosthetic space”.

3. Results

Esthetic complications

During implant therapy, our objective should be to replicate peri-implant tissue architectures resembling contralateral periodontal tissues, thus restoring the traditional concept of "biologic width." To achieve this, implants should ideally be positioned approximately 1.5 mm away from adjacent teeth in the mesiodistal direction, 3-4 mm apical to the anticipated mucosal margin in the corono-apical direction, and at least 3 mm palatal to the facial arch curvature in an orofacial direction. Additionally, implants should be placed at the level of the mucosal margin, considering 2 mm bone thickness and 1 mm mucosal thickness, or alternatively at a cingulum position [5].

The quality and quantity of peri-implant soft tissues play pivotal roles and have a substantial impact on both biological and aesthetic outcomes in implant dentistry. Therefore, conducting a thorough risk assessment and implementing appropriate management strategies for the soft tissues at the intended implant site are essential prerequisites before undertaking any implant-related surgical procedures [6]. A crucial soft tissue thickness of 2 mm was established, with a noticeable grayish shine-through of metallic implant components observed in cases with thin, soft tissues measuring less than 2 mm. However, the color of tissues with thicknesses exceeding 2 mm remained unaffected by the type of abutment or restorative materials used [7].

The completeness of papilla fill adjacent to a single dental implant seems to correlate with the clinical attachment level of the neighboring tooth. Elements such as a vertical gap surpassing 5 mm from the interproximal bone crest to the contact point of the restoration, a horizontal distance narrower than 1.5 mm between the implant and the neighboring tooth, a thin gingival phenotype, and the existence of periodontitis can negatively impact the filling of interproximal soft tissues surrounding single dental implants [8].

Achieving peri-implant tissue architectures resembling natural periodontal tissues is vital for successful implant therapy. Strategic implant placement, considering precise distances and facial arch curvature, is imperative for optimal results. The quality and quantity of peri-implant soft tissues play a crucial role in both biological and aesthetic outcomes. Ensuring a minimum soft tissue thickness of 2 mm is essential to maximize overall implant success.

Problems with the prosthetic implant screw

The durability of implant-supported fixed partial dentures was found to be influenced by factors such as bruxism, thermal expansion coefficient disparities, inadequate framework support, cement selection, titanium abutment shape, and the length of the cantilever extension [9].

In cases where two adjacent splinted implants support a screw-retained fixed dental prosthesis in the posterior region, prosthetic screw loosening emerges as a common biomechanical complication. Interestingly, the height of the prosthesis and the extension of the cantilever, rather than the distance between the implants, were found to have a notable influence on the stress concentration of the prosthetic screws and the occurrence of screw loosening [10].

Several options exist for correcting misaligned implants in screw-retained restorations, such as angled abutments and angled screw channel abutments. However, despite these available solutions to address discrepancies between the surgical and prosthetic axes for dental implant-supported rehabilitations, current evidence does not definitively favor any single approach in minimizing screw loosening [11].

Wider diameter implants demonstrate a lower incidence of screw loosening compared to standard-diameter implants. Furthermore, implant crowns subjected to non-axial occlusal forces show a higher likelihood of screw loosening compared to those loaded with axial occlusal forces. Given these findings, along with the involvement of various other factors in screw loosening, meticulous planning is imperative for ensuring the success of cement-retained implant crowns, with careful consideration of occlusal forces [12].

Factors like bruxism, framework support, and screw loosening significantly impact the longevity of implant-supported prostheses. Angle correction options for misaligned implants show unclear advantages in preventing screw loosening. Wider diameter implants tend to experience less screw loosening, highlighting the importance of careful planning for successful implant crowns.

Ceramic chipping

After mid-term observation, all-ceramic restorations supported by ceramic implants showed encouraging survival rates. Nevertheless, the high incidence of chipping, notably in veneered zirconia single crowns and fixed dental prostheses, affected the overall outcome negatively. Monolithic lithium disilicate exhibited fewer clinical complications, suggesting it as a viable treatment option for ceramic implants [13].

Chipping appears to be less common in monolithic or partially veneered fixed dental prostheses compared to those with complete veneer ceramics [14]. All-ceramic implant-supported fixed dental prostheses with veneered zirconia frameworks exhibited high survival rates, but the fracture rates of the veneering ceramic were clinically unacceptable [15]. Chipping of the veneering ceramic was noted in 8.8% of metal-ceramic implant-fixed dental prostheses. This issue persists even with single-unit zirconia restorations, though monolithic zirconia implant-fixed dental prostheses present a promising alternative [16].

All-ceramic reconstructions supported by ceramic implants show promising mid-term survival rates, though high chipping rates, especially in veneered zirconia crowns and fixed dental prostheses, affect overall outcomes. Monolithic lithium disilicate presents fewer clinical complications and

could be a valid option for ceramic implants. Chipping is less frequent in monolithic or partially veneered fixed dental prostheses compared to those with complete veneers.

Available prosthetic space

In implant dentistry, the measurement of crown height space involves assessing the distance from the bone crest to the occlusal plane in the posterior region and from the incisal edge to the arch in the anterior region. Mechanical complications are more common in implant prostheses than implant failure, with factors like increased crown height space potentially contributing to higher mechanical loads. Conversely, a reduced crown height space can affect the restoration by decreasing abutment retention and increasing the risk of bending fracture resistance of the prosthesis [17].

The minimum vertical space required for various types of implant prostheses is as follows: fixed screw-retained at implant level requires 4 to 5 millimeters, at abutment level requires 7.5 millimeters, fixed cement-retained needs 7 to 8 millimeters, unsplinted over dentures require 7 millimeters, bar over dentures need 11 millimeters, and fixed screw-retained hybrids demand 15 millimeters. These dimensions indicate the minimal vertical rehabilitative space necessary to accommodate the specified implant prostheses [18].

In general, components supporting implant-retained over dentures necessitate more vertical and horizontal prosthetic space compared to implant-supported fixed dental prostheses. When considering implant-retained over dentures as a treatment option, adequate space in the jaws should accommodate the attachment, housings/bar clips, and the thickness of the prosthesis [19]. The natural dentition can generate higher forces, potentially resulting in an elevated need for maintenance and increased complication rates in opposing implant-retained prostheses [1].

Implant-retained over dentures typically need more vertical and horizontal space than fixed dental prostheses to accommodate attachments and prosthetic components. Crown height space, crucial for implant dentistry, impacts the mechanical stability of restorations, with both increased and reduced heights presenting specific challenges. Overall, careful planning of vertical and horizontal space is essential for the success and durability of implant prostheses.

4. Conclusion

In implant therapy, achieving peri-implant tissue architectures that mimic natural periodontal tissues is crucial for reestablishing "biologic width." Proper implant placement and management of soft tissue quality are essential for optimal outcomes. Factors like bruxism, framework support, cement choice, and cantilever length affect the longevity of implant-supported dentures. Comprehensive planning, including occlusal force management and ensuring adequate vertical space, is vital for implant prostheses' success. Monolithic reconstructions, present fewer complications and are promising alternatives to veneered ceramics, which has higher chipping and fracture rates.

Conflict of Interest

Not available.

Financial Support

Not available

5. References

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How to Cite This Article
Bojorquez LE, Cruz-Fierro N, García-Palencia P. Rehabilitation of dental implants, complications and factors to consider: A literature review. International Journal of Applied Dental Sciences. 2024;10(2):315-318.