Understanding Implant Overdentures: A Review

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Abstract

Aim: The aim of this literature review is to evaluate the various studies and systemic reviews conducted on maxillary and mandibular implant-supported overdentures. Background: Conventional complete dentures were the common treatment modality for edentulous patients. However, the advent of implant-supported overdentures has replaced conventional dentures as a better standard for rehabilitation. Due to increased patient satisfaction and quality of life, implant-supported overdentures is gaining a wider acceptance than conventional protocols. Review results: Mandibular implant-supported overdentures have a higher success rate than maxillary implant-supported overdentures. Maxillary implant-supported overdentures tend to be a form of "rescue treatment," than being the first modality of treatment for edentulous patients. Conclusion: To improve the success rate of implant-supported overdentures, careful case selection is an important criteria. Further research needs to be conducted to improve the success for maxillary implant-supported overdentures. Clinical Significance: Implant-supported overdenture have improved the masticatory efficiency and the quality of life of patients. Therefore, this treatment modality should be considered as a primary treatment option for edentulousness in future.

Key words: Review, overdenture, implant, retention, residual ridge resorption, prosthodonitcs.

Background

Conventional complete dentures were the common treatment modality for edentulism. However, they present with unavoidable complications, including residual ridge resorption and intrinsic loss of retention. Factors leading to residual ridge resorption vary greatly between individuals, and can include age, gender, facial morphology, nutrition and general health, medications, systemic diseases and oral hygiene.

The implant-supported overdenture can overcome these disadvantages, and as a result are gaining wider acceptance due to positive patient satisfaction. Patients with implant-supported prosthesis show less bone loss than patients with conventional dentures, probably due to more adequate functional stimulus to the bone. Thus, the addition of implant support for complete dentures, especially for the mandible, helps to improve patients' overall health and quality of life.

Review Results

Mandibular implant-supported overdenture:

Sadowsky[1] as early as 2001 reviewed studies published by multiple authors, which stated a 100% success for implant-supported overdentures after 5 years.[1] He found that the anterior mandibular bone under an implant ovedenture may resorb as little as 0.5 mm over a 5-year period, and long-term resorption may remain at 0.1 mm annually.[1] There is a lack of evidence concerning the impact of mandibular implant overdentures on perceived general health; this criteria must be further researched.[2]

Two implants to support the mandibular overdenture has been regarded as the gold standard (**Figure 1**); furthermore, to gain a mechanical advantage and distribute forces across multiple implants, dentures can be splinted using an interconnecting bar and a retentive clip.[3]

Figure 1: Implant placement with ball attachment

Maxillary implant-supported overdenture:

Maxillary overdenture implant survival rates have been reported as low as 71% at five years.[4] The mean implant loss in maxillary implant overdentures was 19% (206 of 1103 implants), and the mean mandibular implant loss was 4% (242 of 5643 implants).[5] Systematic reviews concluded that maxillary overdentures on 4 or more implants in a splinted construction provided high survival (> 95% for the first year) both for implants and overdenture.[6]

In relation to implant placement, Cavallaro and Tarnow[7] proclaimed one- to three-year success with five cases of partial palatal coverage maxillary overdentures retained by a minimum of four implants with unsplinted attachments. Narhi et al[8] reported a 90% cumulative implant survival rate for maxillary overdentures over 6 years, when placing implants at least 12 mm long, and Engquist et al[9] documented 2 to 3 times the failure rate when shorter implants of 7 and 10 mm were placed. Moreover, when bone quantity and quality were satisfactory, overdenture and fixed prostheses both achieved a 92% implant survival over 5 years.[10]

Discussion

Implant-supported overdentures for the mandible:

Mandibular implant-supported over-dentures is gaining a wider acceptance, due to positive patient satisfaction.[11] The addition of implant support for mandibular dentures have also been proven to improve the patients' overall health quality of life.[2] For these reasons, mandibular implant overdentures are a more effective treatment for edentulous individuals than conventional dentures.

Bone loss which occurs due to mandibular implant-supported overdentures can potentially be reduced by avoiding extraction of all the teeth, and using the roots to support the overdentures. A systematic review by Schimmel et al[12] concluded that although immediate, early and conventional protocols provide high implant survival rates, early and conventional loading protocols provide fewer implant failures. According to the systematic reviews done by Alsheeba[13], mandibular implants which are conventionally placed showed a lower risk of implant failure than those implants which were early loading, but the difference in failures was not statistically significant. Factors influencing survival and success of early loaded implants are: careful case selection, bone quality, implant dimensions and surface, proper treatment plan, meticulous surgery and proper design of prosthesis.

Splinting is also done to provide cross-arch stabilization and avoid potential overloading of single implants.[6] Retention systems are also available using ball attachments, bars and magnets (**Figure 2**). There is no strong evidence for the superiority of one system over the others regarding patient satisfaction, survival, peri-implant bone loss and relevant clinical factors. A systematic literature review found no significant difference in implant survival between a variety of splinted and unsplinted mandibular prosthesis designs even though different attachment types, numbers of implants, implant types and implant lengths were compared.[14]

Figure 2: Overdenture with metal housing.

The primary disadvantage in implant-supported overdentures is the higher cost of treatment; in order to reduce this cost, a treatment alternative using a single implant placed in the midline to retain a mandibular overdenture has been proposed, but long-term observations are required for definitive conclusions regarding the clinical efficacy of this option.[15]

Conventional dentures are still a good choice for patients who can adapt to these devices; thus, implant overdentures may be more beneficial to patients who have advanced alveolar bone resorption and those with several denture problems.[16] Therefore, implant supported dentures should be given as a priority to those patients with whom conventional denture therapy has failed.

Implant-supported overdentures for the maxilla:

Implant overdentures in the maxilla have in general not been as successful as in the mandible, but this might be because maxillary implants are often placed as a "rescue treatment" upon the failure of a fixed prosthesis.[3] The benefits of maxillary implant overdentures compared with traditional mucosa-borne prostheses have been established.[6] In the maxilla, the most important factors include the degrees of jaw atrophy, bone quality, potential implant locations, aesthetics, function and phonetics. Survival rate of implant overdentures is higher in the mandible than the maxilla, which serves as an important factor when planning the treatment.[17]

Maxillary implant overdentures (MIOs) have been documented with a high implant loss relative to other endosseous implant treatment modalities.[18] In comparison to the edentulous mandible, implant overdenture therapy for the maxilla is often compromised by reduced bone quality.[19] Unlike the hinge-like mandible, with its shock absorbing effect and buttressing lingual bone, the thin buccal bone of the rigid maxilla may not tolerate the applied forces as well.[20] Since there are limitations relating to implant placement in the maxilla, owing to potentially destructive forces, and resorptive patterns, planning and design considerations may be vital for maxillary implant overdenture success.[21]

Palatal coverage also improves implant prognosis when there are risk factors such as compromised quality/quantity of bone, off-ridge relations, or high applied forces.[22] Slot et al.[6] reported in a systemic review that maxillary overdentures supported by six connected implants resulted in the greatest implant and overdenture success, followed by four connected implants. The total length of supporting implants has not been related to implant loss during overdenture function.[19] In order to overcome compromised maxillary jaw volume limitations, grafting procedures have been done.[23] If grafting procedures are not feasible, then placement of implants in an angulated position has been proposed, given that the implants are splinted.[24] The use of the zygomatic[25] or

pterygomaxillary implants[26] has also been reported with favorable results in the atrophied maxilla with the use of fixed restorations. Palatal placement of zygomatic implants may cause bulky contours and unorthodox substructure designs for overdenture patients, possibly necessitating the use of angled abutments and/or placing the connecting bar the buccal side of the abutment.[27]

Maxillary implant overdentures have a high number of complications and may require more post-insertion maintenance than implant-supported fixed prosthesis.[21] The major complications of implants are divided into surgical complications, implant loss, bone loss, peri-implant soft tissue complications, mechanical complications, and esthetic/phonetic complications. Surgical complications include hemorrhage, neurosensory disturbance, adjacent tooth damage and devitalization, mandibular fractures, implant displacement into the mandibular canal. Smoking, radiation therapy, and diabetes are systemic factors that are associated with implant loss. Soft tissue complications associated with implants include fenestration and dehiscence, gingival inflammation and proliferation and fistulas. The mechanical complications include overdenture retention and adjustment, resin veneer fracture, need for relining, attachment fracture, fracture of opposing prosthesis, prosthesis screw loosening, metal framework fracture, and abutment screw fracture.[5]

Conclusion

Mandibular implant-supported overdentures have a greater success rate than maxillary implant-supported overdentures (**Figure 3**). To improve patient quality of life, careful case selection should be incorporated for the success of both maxillary and mandibular implant-supported overdentures. Further research needs to be conducted to improve the success for maxillary implant-supported overdentures.

Figure 3: Intra-oral picture of overdenture

Clinial Signature

Implant-supported overdenture have improved the masticatory efficiency and the quality of life of patients. Therefore, this treatment modality should be considered as a primary treatment option for edentulousness in future

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