Rehabilitation of atrophic: Mandible using short 6 mm implants: A case report

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Abstract

“No one should die with their teeth in a glass of water” – Per Ingvar Branemark. The quote by the father of modern implantology revolutionized the field of dentistry. The introduction of implants provided with a promise of better lifestyle to the geriatric patients with a boon of fixed prosthesis in edentulous arches. Loose and unstable lower complete dentures due to the resorbed alveolar ridge are the most common scenario with edentulous patients. In contrast to rehabilitation with grafting the ridge and improving the dimensions, which would be time-consuming as well as costly for the patient, short implants would provide a better alternative. The case report focuses on rehabilitation of mandibular arch using short implants of 6 mm length.

Keywords: Atrophic ridge, implant rehabilitation, periodontology, short implants

Introduction

The main aim of implant dentistry is the replacement of missing teeth. The sole purpose of replacement of function is difficult to achieve in cases of inadequate dimensions of the alveolar bone height. This is seen in both maxilla and mandible due to resorption of alveolar bone due to periodontitis, pneumatization of maxillary sinuses, and the presence of anatomical structures (e.g., inferior alveolar nerve). These conditions place the clinician in a dilemma whether to go forward with an augmentation procedure to improve the dimensions or the use of short implants. Predictable ridge augmentation is still a difficult task to achieve that it requires considerable skill and time to achieve. The socioeconomic status, oral hygiene status, and patients dexterity to maintain proper oral health during the maintenance phase are to be considered before undertaking of any ridge augmentation.

Short dental implants can be considered an alternative to grafting procedures as they present similar osseointegration capability as long implants; an implant is considered as a short implant when the length of the implant is smaller than 10 mm. Short implants can be used in case of severely resorbed mandibular ridges, maxillary resorbed posterior ridges. Short implants offer several advantages over grafting, such as low cost, shorter treatment period, simple procedure, and less risk of complications. Long implants were earlier considered to have better survival rates as compared to that of short implants, this understanding has been changed after several studies quoting similar survival rates of short implants (<10 mm) and long implants (≥10 mm).

The present case report focuses on rehabilitation of the mandibular arch using both short and long implants.

Case Report

A 70-year-old female patient with Stage 1 hypertension (140/90 mm Hg) for 20 years (under medication for the same) and in good general health presented with the complaint of an ill-fitting removable prosthesis in the mandibular arch for 3 years and wanted a fixed replacement for the same. A detailed case history was recorded. In dental history, the patient gives a history of periodontal treatment 30 years ago, in which the tooth with poor prognosis in the mandibular arch is extracted. On clinical examination, it was found that patients had reduced mandibular ridge height and severe attrition of the remaining teeth in the mandibular arch. A radiograph was advised to evaluate the condition
of the alveolar bone [Figure 1]. On radiographic examination, the edentulous area was seen to be resorbed significantly, and 1:1 crown-to-root ratio was observed in the remaining tooth except 35 and 17, which showed 2:1 crown-to-root ratio.

A proper treatment plan was formulated for the patient. A routine oral prophylaxis was carried out and the patient was put under maintenance care. The old removable prosthesis was relined for the patient. The patient was satisfied with the maxillary removable prosthesis but still had complaints for the mandibular prosthesis. Hence, it was considered to go for implant rehabilitation with the mandibular arch. During the treatment planning, the remaining dentition in the mandibular arch had a poor prognosis and the patient was advised for extraction and replacement with implants.

**Pre-operative measures**

Cone-beam computed tomography (CBCT) for the mandibular arch was done to formulate a surgical plan for the patient. During the evaluation of the CBCT, it was found reduced arch height in the posterior molar region. Augmentation procedures were planned, but were later on ruled out due to risk factors such as patient’s age and medical history. Hence, an alternative to augmentation short implants was decided to be placed in the molar region. A molar to molar (36–46) occlusion with fixed prosthesis was planned using six implants (two short implants of 6mm length and four long implants three of 11 mm and one of 13 mm) [Figure 2].

Diagnostic cast and occlusal rims in the area of the missing tooth were fabricated and jaw relations were recorded; teeth arrangement according to the planned molar to molar occlusion was done on an articulator.

A simple surgical stent was fabricated using a clear acrylic night guard sheet as a positional guide for implant placement. For fabrication of the stent impression of the teeth, arrangement was made and a dental stone case was made. The cast was then used for creating the stent in a vacuum press.

**Surgical procedure**

After proper anesthetization was achieved that the stent was used to mark the positions of the implant. Mid crestal incision was given following the marked region and a full-thickness flap was reflected. Step by Step, telescopic drilling was performed at the sites of implant placement guiding pins that were used to check for orientation of the implant direction. MIS® Implant system was used for this case. Short implants 5 × 6 mm [Figure 3] dimension were used in the molar region, i.e., 46, which was followed by placement of 3.8 × 13 mm in the canine region, i.e., 43 and 3.3 × 11 mm in the lateral incisor region, i.e., 42.

The remaining dentitions in the third quadrant were extracted atraumatically; an alveoplasty was performed to remove any sharp bone edges. Autograft chips were harvested during the alveoplasty. Immediate placement of implants (3.8 × 11 mm) was done in relation to 35 and 34. In the molar region, i.e., 36, a short implant was placed (5 × 6 mm) [Figure 4].

The autograft harvested was mixed with demineralized freeze-dried bone allografts and was packed in the jumping
distance, and a collagen membrane was placed over the implant and the grafts. Releasing incision in the periosteum was made to obtain a primary closure. The patient was prescribed antibiotics and analgesics for the week. A recall for maintenance was done every 1–2 months to assess the patient’s hygiene and general health status.

**Restorative procedure**

After following a strict maintenance protocol for 4 months, gingival formers were placed under local infiltration, an impression of the mandibular arch was made to fabricate a custom tray. At recall on the 10th day, impression posts were attached to the implants and the custom was tried for any adjustments. An open tray implant level, the impression was made using polyether impression material [Figure 5]. A jig trial was fabricated and tried.

The prosthetic super structure was made in two sections pertaining to the two quadrants being restored. A cement-retained fixed prosthesis was fabricated after proper jaw relation. A bisque trial was done to check for any final adjustments which were later on converted to the final prosthesis [Figure 6].

The 24-month follow-up (1–2 months for the 1st year and every 3 months following the 1st year) showed no clinically significant findings. The patient’s function and esthetics were satisfactory.

**Discussion**

Crown-to-root ratio has always been a prime factor in the determination of the prognosis of the tooth. Similar conditions were applied to the short implants, i.e., crown-to-implant ratio, bearing similar for risk of biomechanical complications.[8] In the present report, short implants were used in the case of the atrophic ridge in the mandibular posterior region due to proximity to the inferior alveolar nerve.

In cases of short implants, the crown-to-implant ratio was usually 1:1 or 2:1 both this ratio however does not affect the success rate of the implant if proper osseointegration is achieved. The crown height is measured from the crest of the alveolar bone in contact with the implant to the tip of the crown and the implant length was measured from the apical extent of the fixture to the coronal tip of the crestal bone in contact with the implant that this ratio is termed as “clinical” crown-to-implant ratio. Similarly, the “anatomic” crown-to-implant ratio was measured from the bottom of the fixture to the implant-abutment connection and then from that point to the tip of the crown.[8]

Two-staged delayed loading approach was used in the rehabilitation of the edentulous mandibular arch. The staged approach was preferred as the restoration was to be done of completely edentulous arch even though there is no significant difference in the success rates of either single-stage or two-stage approach.[9] Yi et al. 2011 in his study suggested a better success rate of the short implant in avoiding complications such as inferior alveolar canal perforations which are crucial in patients with reduced alveolar ridge height.[9]

Several randomized controlled trials have suggested the use of short implants over the more aggressive ridge augmentation procedure. The significant disadvantage in those studies is the duration of follow-up; a better study design with a longer follow-up regime is to be undertaken to provide a better understanding of the success of short implants in case of reduced alveolar ridge height in both mandible and maxilla.[10]
Conclusion

The present case report focused on the use of the short and wide implant in the rehabilitation of edentulous mandibular ridge as an alternative to vertical ridge augmentation. In the case discussed, two short implants (5 × 6 mm) were used in association with long implants for rehabilitation of the edentulous mandibular arch.

The case is still being kept under a strict follow-up regime to evaluate the success of short implants in collaboration with long implants.

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