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Implant prosthetic rehabilitation of a complex case of mandibular partial edentulism with severe anterior crowding and deficient bone width in the edentulous region: A multi-disciplinary case report

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Abstract

Now a days, prosthetic rehabilitation of partially edentulous arches through dental implant placements is becoming the most sought and accepted treatment modality among the patients and is gradually replacing the conventional treatment approaches comprising of removable partial dentures (RPDs) and tooth-supported fixed partial dentures (FPDs). However, patients often present with complex cases of partial edentulism where the arches may exhibit mal-alignment problems requiring orthodontic treatment and situations of bone inadequacy demanding bone graft procedures before implant placement. A multi-disciplinary approach could be the best way to manage such challenging cases. This article describes a similar case that was managed efficiently and systematically by adopting a multidisciplinary approach comprising of multiple dental specialities.

Keywords: Lingual bonded retainer, De-cortication, Emergence profile, Autogenous block graft, Chin graft, Cortico - cancellous graft

Introduction

In the last few decades, prosthetic rehabilitation of partially edentulous arches through dental implant placement has emerged as a promising treatment protocol providing high predictability in results and increase patients' overall satisfaction. The dental implant treatment modality has also been considered superior to conventional approaches of rehabilitation of partially edentulous arches through removable partial dentures (RPDs) and tooth-supported fixed partial denture (FPDs) as it prevents bone loss and helps to maintain bone volume at edentulous sites, restores the patient's bite force which is always greater than the bite force more effectively and provide far better aesthetics. An additional advantage gained in case of implant prosthetic rehabilitation is that quite unlike the conventional approaches, they do not require any abutment tooth preparation. This becomes of particular significance in young patients who generally have wide pulp chambers and chances of developing hypersensitivity become maximum following extensive tooth preparations.

Nevertheless, treatment planning for prosthetic rehabilitation of partially edentulous arches through dental implant placement is not always straight and simple. Patients often present with complex situations where cases of partial edentulism are further complicated by mal-aligned or rotated teeth in the arch, instances of anterior arch crowding, disturbed occlusion, insufficient space for pontic placement, inadequate bone volume for implant placement, etc. A multi-disciplinary approach comprising of referrals, consultations and collaboration with other specialist departments can help to chalk out a comprehensive treatment plan. And in accordance with the treatment plan, synchronization of the various treatment steps and procedures can help to manage such challenging cases and bring best results. This article describes a case of several missing teeth in the lower arch which was complicated by the presence of severe anterior crowding and deficient bucco-lingual bone width for implant placement in the edentulous region. The case was effectively managed by adopting a multi-disciplinary approach comprising of multiple dental specialities and the missing teeth were replaced by placement of three implants in the edentulous regions.

Case report

A 20yrs old patient reported to the Department of Prosthodontics, Dr. Z.A. Dental College, AMU with chief complaint of missing teeth of the lower arch and wanted restorations of the same. Intra-oral examination revealed a case of missing 32, 33 and 35 teeth, severe crowding in the anterior region of lower arch and a palatally locked tooth 22 [Figure 1a,1b]. Personal history revealed that the patient had traumatic injury of 32, 33 and 35 teeth two months back following which they have to be extracted



Fig 1a: Mirror view of the maxillary arch showing palatally locked 22



Fig 1b: Mirror view of the mandibular arch showing missing 32, 33 & 35 and severe crowding in the anterior region

The patient was referred to the Department of Orthodontics for the alignment of upper and lower arch as pre-prosthetic Orthodontic treatment. Orthodontic treatment plan included extraction of palatally locked tooth 22 & lingually placed 45. Following extraction, fixed orthodontic treatment was initiated with 022 x 028 MBT brackets. Alignment and levelling of maxillary & mandibular arches was started with 016 NiTi wires. Wires were progressed up to 019 x 025 stainless steel to achieve space closure in upper arch where canine was substituted for lateral Incisor. In mandibular arch re-distribution of space was done with levelling. Within time span of 9 months, the desired results were achieved. Retention for lower arch was achieved in the form of lingual bonded retention wire & Hawley retention appliance was given in maxillary arch.

After the completion of the targeted orthodontic correction, the patient was referred back to the Prosthodontics department for prosthetic rehabilitation. The patient was explained the

various treatment options available and the pros and cons of each. The patient expressed his willingness for implant supported prosthesis to replace the missing teeth. Diagnostic casts were made and diagnostic wax up was done. No significant findings were found from radiographic and blood investigations. Measurement of the bucco-lingual bone width in the edentulous regions at sites selected for implant placement was made using a bone gauge at a vertical distance of about 2mm, 5mm and 7mm from the ridge crest. Bone width in the edentulous region 32, 33 was found to be deficient [Figure 2] as the readings in this region were 3.5mm, 5mm and 6mm at vertical distance of 2 mm, 5 mm and 6 mm from crest respectively. To confirm the defect, CBCT scanning was done which also revealed the existence of buccal bone defect in this region. So preparation of the implant site by bone grafting procedure to attain the required bone volume prior to implant placement became mandatory.



Fig 2: Deficient bucco-lingual bone width in 32,33 region

In collaboration with the oral surgery department, an autogenous block bone grafting procedure was planned using mandibular symphysis as the donor site. Pre-operative antibiotics were prescribed and the patient was prepared in the sterile environment. Local infiltration of lignocaine with adrenaline was done and bilateral inferior alveolar nerve block was given to secure complete nerve block bilaterally. Trapezoidal incision was given to expose the donor site and a full thickness muco-periosteal flap is reflected up to the inferior border. The crestal incision of the edentulous span was continued with the sulcular incision [Figure 3a]. A 702 L tapered fissure carbide bur in a straight hand piece is used to penetrate the symphysis cortex via a series of holes that outline the graft [Figure 3b]. All holes are connected to a depth of at least full extent of bur flutes (7mm), and the graft is harvested using bone spreaders and curved osteotomes. The graft is placed in normal saline before contouring and fixation. The recipient bed is perforated with small round burs to add bleeding points (de-cortication) and the block graft harvested was carefully trimmed, sectioned and shaped for better adaptation to the recipient site. After ensuring the proper adaptation of the graft to the recipient bed, they were stabilized with fixation screws [Figure 3c].



Fig 3a: Trapezoidal incision was given to expose the mandibular symphysis donor site and this incision was made continuous with the crestal incision in the region 32,33



Fig 3b: Outline of the block graft



Fig 3c: Graft immobilized at recipient bed

3-0 black braided silk suture was given to close the incision. Medications were prescribed and post operative instructions were given to the patient. The patient was recalled after 1 week for suture removal subsequently at regular intervals for follow ups. After 6 months, bone mapping was again

performed with the help of a bone gauge and a net gain of 4 mm in the bucco-lingual dimension of the alveolar ridge was found in 32,33 regions making the sites suitable for implant placements [Figure 4].



Fig 4: Gain in bucco-lingual width obtained after 6 months at the recipient site.

Crestal incision was given in the edentulous regions 32,33 and 35 followed by vertical release incisions to reflect the full thickness muco-periosteal flap [Figure 5].

angulations [Figure 6].



Fig 5: Surgical exposure of grafted site for removal of fixation screws and implants placement.



Fig 6: OPG showing placement of three dental implants in edentulous regions 32, 33 and 35

Fixation screws which were used to stabilize block grafts were removed and three ADIN implants (Touarag™) – two of dimensions 3.5 D x 13 L each were placed in 32 and 33 regions and one of dimension 3.5 D x 11.5 L were placed in 35 region with the help of a surgical stent. Cover screws were placed and the incisions were sutured. An Orthopantomograph (OPG) was done to verify implant

Medications were prescribed and post operative instructions were given to the patient. The patient was recalled after one week for suture removal and subsequently for follow ups. After 4 months of healing phase, 2nd stage surgery was performed and cover screws were replaced with gingival formers [Figure 7a]. Two weeks thereafter, gingival formers were removed [Figure 7b]. Open tray impression copings were screwed on implants and an open tray impression was made in elastomeric impression material [Figure 7c, 7d].



Fig 7a: Placement of gingival formers



Fig 7b: Emergence profile achieved after 12 days



Fig 7c: Open tray impression copings in position



Fig 7d: Open tray elastomeric impression of mandibular arch

Gingival formers were again placed in their positions and the impression was sent to lab for fabrication of the prosthesis. Cement retained crowns were given for implants in locations

32, 33 and a screw retained crown was given for implant at location 35 [Figure 8a,8b,8c].



Fig 8a: Post-operative mirror view of mandibular arch



Fig 8b: Post-operative mirror view of mandibular arch



Fig 8c: Post-operative frontal view view of maxillary arch with implant retained prosthesis in occlusion

Discussion

An autogenous bone graft has all three characteristics required for bone growth – osteogenic nature, osteoinductive properties and osteoconductive behaviour; hence is regarded as “gold standard” in bone grafting and bone augmentation procedures ^[1]. Vascularization of the graft and the maintenance of this graft space until new bone is formed at the graft site are the two keys to successful bone grafting. Cancellous bone vascularize fast but can also resorb fast and may result in decrease in graft volume while the cortical bone vascularize slowly and resorb slowly and hence can maintain graft volume during the healing phase ^[2, 3]. A cortico-cancellous graft harness the distinct advantages of both of these bone types in terms of graft consolidation.

Mandibular symphysis offers a good volume of cortico-cancellous autograft and easy accessibility among all other intra-oral sites ^[4]. The dimensional range of this cortico-cancellous block graft harvested from mandibular symphysis region is 3 to 11, with most sites providing blocks in the size range of 5 to 8mm and can be used for predictable bone augmentation up to 6mm in horizontal and vertical dimensions ^[5]. These factors account for our preference to mandibular symphysis region as the donor site. An additional advantage gained specifically from using mandibular symphysis region as a donor site in this case was due to its close proximity to recipient site which allowed merging of the sulcular incision given at the donor site with the crestal incision given in the recipient area (32,33 region) making it a single continuous incision.

We chose to give cement-retained crowns for implants placed in 32, 33 regions as these implants lie in aesthetic zone of oral cavity and cement retained crowns are more aesthetic than screw-retained crowns ^[6, 7]. Also, cases involving narrow diameter crowns such as mandibular lateral incisors and canines such as this, the screw access hole of implant retained crowns may compromise the crown's integrity and hence they are best cement-retained ^[8].

Conclusions

A multi-disciplinary approach is the best way to meet functional and aesthetics demands in complex clinical cases where the dental arch in addition to the missing teeth also present complications such as mal-alignments of teeth, insufficient space for pontic, inadequate bone volume for dental implant placement, etc. These problems need to be addressed and treated first as a part of pre-prosthetic procedures before the prosthetic rehabilitation of the missing teeth can be performed. A well structured collaboration between multiple dental specialities in deciding a comprehensive treatment plan targeted towards achieving a common goal, followed by their step by step execution can bring out the most efficient results in such cases.

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