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Guided Surgery in All on 4 Concept - A Case Report

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Abstract

All-on-four dental implant is the finest choice for the patient with atrophic jaws. This treatment requires less appointments compared to other treatment modalities. It shows success rate of over 95% for patients with good oral hygiene. Other techniques with bone graft and maxillary sinus elevation are not easily accepted by patients because of their invasive procedure, postsurgical morbidity and high cost. As this procedure is less invasive, reduces patient discomfort and results in fast recovery time. It is not recommended for patients with severe bone loss or patients with systemic disease and insufficient bone mass. The present clinical report elucidates a method to restore an atrophic maxilla with ALL-ON-FOUR technique using fully limiting surgical stent thereby increasing the accuracy of implant placement and reduces the duration of post-operative healing.

Keyword: All-on- four, immediate denture, guided implant surgery, Malo crowns, open tray impression

Introduction

"All-on-four" treatment scheme optimizes bone use in severely atrophic jaws, facilitating immediate function, bypassing regenerative procedures, eliminates bone grafting, reducing recovery time and treatment cost.1Paulo Malo's group developed the All-on-4 immediate loading technique in 2003, which combines two vertical and two angled implants for immediate bone utilization and function.[1]

The prosthesis is angulated in such a way to avoid the maxillary sinus, minimize cantilever length, enhance bone anchoring, and increase polygonal area for prosthesis support for better load distribution.[2]

Surgical stents were also used which aids in radiographic evaluation of bone height and width during treatment planning to ensure optimal implant placement. A surgical implant stent allows clinicians to virtually predetermine implant locations and place them without revealing a tissue flap.[3]

This case report aims to highlight the application of the All-on-Four technique in a specific patient scenario, detailing the clinical protocols followed by the challenges encountered, and the outcomes achieved.

Case report

A 45-year-old female, presented to the Department of prosthodontics, Sathyabama University Dental College and Hospital, Semmancheri, Chennai with pain in existing fixed prosthesis.

On clinical and radiographic examination in maxilla patient was wearing a fixed partial denture with 14 and 15 and 23 as abutments replacing 11,12,13,21,22 and root stumps in relation to 17,24,25 and 27. In mandible full arch fixed rehabilitation was done using 6 implants. On further examination after removing the fixed prosthesis grade 2 mobility was seen in 14 and 15 with severe bone loss and grossly decayed 23. Considering the current scenario of the patient, a full arch rehabilitation of maxilla was planned with four implants using tilted implant concept. The treatment plan was explained to the patient and diagnostic impression was made using irreversible hydrocolloid alginate and cast was poured with type 3 dental stone. Later patient was advised for extraction followed by maxillary removable immediate complete denture as the patient was very much concerned about the aesthetics.

After 3 months patient was advised for CT scan of maxilla. The report was analysed, height and width of bone was evaluated, implant site was decided virtually and later fully limiting surgical stent was fabricated.

Surgical Phase

Under local anaesthesia, Surgical stents were stabilized with anchoring pins. Tissue punch was made in the implant site to remove the gingival tissue followed by sequential drilling till the desired length and width was achieved. Four noble active implants were placed, two implants in the anterior region [11 and 21 region of size 3.75 x 11.5 mm] and two implants in the posterior region [16 and 26 region of size 4.2 x 13 mm] with angulation of 30 degree and adequate torque was achieved. 3-0 black silk braided suture material was used and simple interpreted suture was made in the implant site. Patient was asked to report after 3 months with OPG.

Prosthetic Phase

Definitive prosthesis fabrication occurred 3months after implant placement, ensuring secondary stability. OPG was evaluated, sufficient osseointegration was observed with good bone implant interface. During the 2nd stage surgery, Implant sites were re-opened followed by multi-unit abutment placement with appropriate height and width.17 degrees multi-unit abutment was in the anterior region and 30 degrees in the posterior region. Healing collar for the multi-unit abutment was placed.

Patient was recalled after 1 week for implant level open tray impression. Open tray multi-unit impression coping was attached on to the multi-unit. The copings were splinted with pattern resin (low -shrinkage auto-polymerizing resin) and allowed to set, and later the set pattern resin was sectioned and reconnected to compensate for the shrinkage. Subsequently open tray impression was made using addition silicone putty and light body. The Position of the implants was reassessed using a jig fabricated on the cast which was later verified with an orthopantomogram for proper fitting. Followed by recording of jaw relation, wax trial and metal trial. Malo crown was given in relation to 12

Discussion

On intra-oral examination, abutments of the existing tooth were not periodontally sound, total extraction in maxillary arch was planned.[4] After extraction, since patient was concerned about the aesthetics, immediate denture was planned. It serves as guard to prevent

surgical wounds and plays an important role in phonetics and function.[5] CT scan was advised to the patient as this provides accurate details of the bone and also shows the abnormalities present in it.[6] In this case, all on four treatment concept with guided implant placement was planned over the traditional concept because there is minimal number of implants placed with the help of stents which ensures less invasive procedure and avoids unnecessary soft tissue reflection .[7,8] In All on four concept, four implants were placed, out of which 2 implants are placed axially in the anterior region whereas the other two implants are placed in the posterior region angulated. By angulating the posterior implant, cantilever length is decreased and proper stress distribution resulting in good anchorage and stability [2]. Stabilization of stents were done using anchoring pins as this guides the exact implant site. This guides the implant drill thereby helping the implant placement in a proper angulation and reducing unnecessary osteotomy. This provides exact design as planned by the implantologist. In this case completely limiting stent is used. This stent is designed in such a way that the instruments which is used for drilling the bone is restricted in both buccolingual and mesiodistal plane. Drill stops have also been included to achieve the desired osteotomy length. [9]

Followed by sequential drilling along with copious irrigation with saline was done. According to the bone density, drilling must be done in an ascending way from minimum 2-mm to 3.6-mm; if the density of the bone is high, drilling can be done up to 4.2-mm. This sequential drilling is done to avoid fracture of bone and proper bone implant interface. In copious irrigation, an enormous amount of saline is used to prevent necrosis of bone. [10] Insertion torque is very significant during implant placement since adequate torque results in good stability of the implant. High torque can cause bone necrosis, while low torque affects stability and mobility. [11] Various studies have been undergone to estimate ideal torque insertion values. Neugebauer and associates said that 35 Ncm was the optimum torque insertion value. [12] Duyck and co-workers reported that an insertion torque value above 50 Ncm would result in peri-implant bone loss. [13], Ottoni et al. recommended a torque insertion value of at least 32 Ncm is needed for the implant to achieve adequate osseointegration. [14] To achieve adequate osseointegration, delayed loading was done in this case. Therefore, it has fewer chances of failure. [15]

The multi-unit abutment was used since it is designed to rehabilitate both edentulous and partially edentulous arches, particularly when using the all-on-4 treatment concept. Multi-unit abutment is also used to correct implant height disparities and implant angulation. MUAs are distinct from other abutments due to their short cone, which provides limited interocclusal space, and wide shoulder, which facilitates easy prosthetic restoration positioning. Tilting of the posterior implants ensure there is no complication to the anatomical structures and it also reduces the need for bone augmentation.[16] In this case open tray impression technique was used where the impression coping remains in the impression itself there by reducing the effect of implant angulation, damage to the impression upon recovery from the mouth and also removes the concern of replacing the coping carefully into the made impression.[17] In case of multi-implant impression, the impression copings are aligned at different angles and are more prone to rotational movements while making impression to prevent this splinting was done giving an accurate impression when compared to non-splinted technique.[17] Sectioning of the splint connection in centre with the help of a

diamond disc to create a thin space of 0.2mm which is later rejoined with minimal amount of the same material with brush bead technique prior to impression making thereby minimizing the polymerization shrinkage.[17] Polyvinyl silicones are widely used due to their excellent elastic recovery, dimensional accuracy, multiple cast production, and moderately short working and setting times.[18]

Addition silicones are first choice of material for completely edentulous multi-implant impression, because of their rigidity, resistance to an incidental displacement of the impression copings, thereby reducing the chance of deformation caused by the stress between impression material and the copings.[19]Precise and Passive fit of a prosthesis is a key element for its success which requires jig-verification of the master cast before fabrication of the framework to prevent unfavourable stress on the implant component and the surrounding bone.[20]Malo crowns are successful when used by a combination of tilted and axially placed implants in completely edentulous anterior and posterior part of resorbed maxillae.[21] Malo crown offers advantages such as eliminating screw access openings, allowing for easy removal and repair of fractured porcelain, enhancing masticatory function, psychological satisfaction, excellent precision, high aesthetic restoration, avoids casting error and saves time in the future correction. [22]

Conclusion

Every patient is different and needs a unique treatment plan based on the prognosis. The treatment plan opted in this case for the rehabilitation of edentulous patient ensures accurately fitted, aesthetic and functionally efficient prosthesis. Therefore, for this patient use of All-on-Four implant with Malo crown prosthesis provided the best option for a prosthetic solution.

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