All on Four Implant Supported Denture -A zippy solution for complete edentulism

Lamichhane S,[1] Humagain M,[1] Rijal AH,[1] Rupakhety P[2]

[1]Department of Periodontology and Oral Implantology, Kathmandu University School of Medical Sciences, Dhulikhel, Kavrepalanchowk, Nepal.

[2]Chandragiri Dental Home and Implant Center Pvt. Ltd. Kausaltar, Bhaktapur, Nepal.

Corresponding Author

Simant Lamichhane

Department of Periodontology and Oral Implantology, Kathmandu University School of Medical Sciences, Dhulikhel, Kavrepalanchowk, Nepal.

E-mail: drsimant@kusms.edu.np

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ABSTRACT

Edentulism is increasing with the increasing life expectancy of people worldwide. Edentulism whether it is partial or complete can have both social and psychological impacts to the patients. All on four is a technique initially introduced for the treatment of complete edentulism in a severely resorbed ridge. Lack of retention and self-confidence are the main issues with tissue supported conventional denture whereas the need for hard and soft augmentation of severely resorbed ridges but with uncertainty of success, morbidity and time spent before loading don't favor full mouth implant supported fixed prosthesis. All on four treatment concepts can provide a fast single day solution with no fancy hard and soft bone augmentation which will enhance patient self confidence and trust for dental solutions. There are more tangible (visible) changes with this treatment options as patients wish to have teeth that can have good masticatory efficiency rather than conventional implants with intangible benefits for a certain period spent for osseointegration.

KEY WORDS

All on four concepts, Bone resorption, Dental implants, Tangible benefits

INTRODUCTION

The pre-requisite for placement of dental implants is availability of good volume of hard and soft tissues. The most common causes of tooth extraction are dental caries and periodontal diseases.[1] Grossly decayed tooth with periapical lesions or need for surgical disimpaction will cause either perforation or fracture of buccal bone which is vital for implant placement. Periodontal disease on the other hand is a progressive disease affecting the supporting structures usually result in three-dimensional bone loss around the tooth. Next important factor is the time elapsed between the tooth extraction and patient visiting to implantologists as various scientific studies have confirmed a bone loss around healing extraction socket in both horizontal and vertical dimensions.[2] Thus, in real clinical scenarios finding a sound healed edentulous site for placement of straight implants with standard length and diameter are only incidental.

The modern day All on four or All on X technique followed is based on Malo et al. technique which they performed first in 1998.[3] They used two straight implants and two tilted implants to hold a fixed dentures that are immediately loaded. The advantages of using two tilted implants served for the various purposes like not requiring any bone augmentation procedures, use of dense cortical bone, good anteroposterior spread thus minimizing the cantilever effects of denture, etc.[4] This technique is also referred to as interforaminal approach in mandible as all the implants are placed in between the vital structure i.e., mental foramen in mandible whereas all the implants are placed in pre-maxillary regions of upper jaw.[5] This treatment method bypass the vital structures and distal tilted implant allows for placement of maximum length implants, achieving primary stability and loading the implant immediately is not a problem. Patient who primarily visit us for teeth

not for implants are highly satisfied with this treatment approach as they can go back to their place with smiling face on the same day of treatment. Here, in our case report we have presented the successful management of complete edentulism with fast and fixed implant supported denture using all on four concepts.

CASE REPORT

A 60 years old male was referred to Department of Periodontology and Oral Implantology, Kathmandu University School of Medical Sciences, Kavrepalanchowk, Nepal with a chief complaint of missing teeth for 10 years (Fig. 1). He has been seeking treatment since a long but didn't find a solution which could provide both function and esthetics. The referring dentist extracted the remaining teeth 2 weeks back and patient was with complete denture when we attended the patient. Patient was counselled about all on four implant supported prosthesis. As, necessary two-dimensional orthopantomography and three-dimensional cone beam computed tomography (CBCT) was already done for implant planning by the referring dentist two weeks back we evaluated those radiographs. The CBCT findings showed the limited amount of bone in the posterior areas of both maxilla and mandible wherein standard-length implants were difficult to be placed as they required bone augmentation and sinus lift procedures (Fig. 2).

Figure 1. Pre-operative photograph

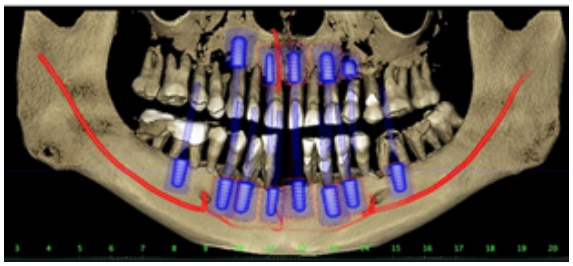

Figure 2. CBCT image

Written informed consent was obtained for the planned surgery. Complete blood examination was done to rule out any bleeding and clotting disorders. Patient was devoid of systemic diseases that may affect wound healing after implant placement. All on four implant system Slimline® series from Dentium Co., Ltd. (South Korea) were planned for both maxilla and mandible and immediate loading was done.

On the day of surgery, pre-procedural mouth rinsing with 0.2% chlorhexidine was done by the patient. Local infiltration anesthesia (2% Lignocaine with epinephrine 1:2,00,000) was used during the whole procedure. Full thickness mucoperiosteal flap was elevated. On flap, elevation the ridges were irregular which could jeopardize the long-term stability of both denture and implant. So, some regional osteoplasty was done using round bur in a slow speed handpiece with normal saline irrigation. Soft tissue curettage was performed at the extraction sites as well. The implants were then placed in a desired position with four posterior implants being tilted at 30-40 degrees and non-angulated anterior implants (Fig. 3). All implants achieved a desired > 35 Ncm torque for immediate loading.

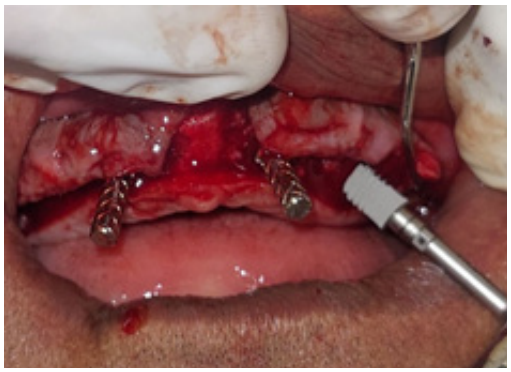

Figure 3. Implant fixture placement

30 degree angulated base abutment were used for the posterior implant such that all the overlying titanium cylinders attain parallelism. Furthermore, screw caps were attached to the base abutments before connecting the titanium cylinders to it. The surgical area was sutured with 4-0 monofilament prolene sutures (ETHILON®, Ethicon Inc., Johnson & Johnson, Piscataway, NJ, USA) (Figure 4a and 4b). Indexing was done with light body addition silicone impression material for knowing the relative position of implant before denture trimming (Fig. 5). Temporary titanium cylinders were then connected to the implant system and acrylic interim complete denture was attached using flowable bis-acrylic composite (Fig. 6). The patient was sent for orthopantomograph with the interim prosthesis which showed the implant placement in the interforaminal region in mandible and in premaxillary region (Fig. 7).

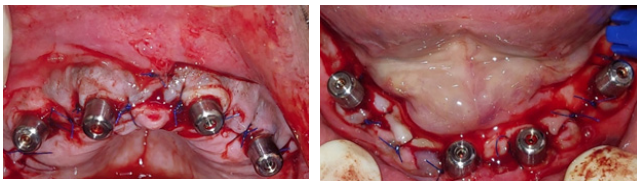

Figure 4a and 4b. Suturing with comfort caps in maxilla and mandible

Patient was sent back with prescription of non-steroidal anti-inflammatory drugs combination (Flexon Tablet, Ibuprofen 400mg + Paracetamol 325 mg, Aristo Pharmaceuticals Pvt. Ltd., 23-A, Shah Industrial Estate, Off Veera Desai Road, Andheri (West), Mumbai – 400 053,

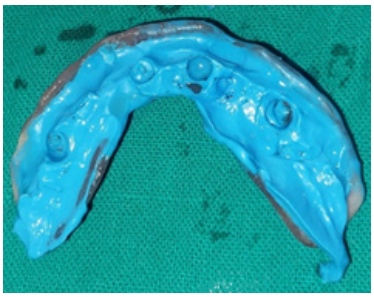

Figure 5. Indexing the denture for attachment of Titanium cylinders

Figure 6. Final post-operative photograph with all on four implant supported immediate denture

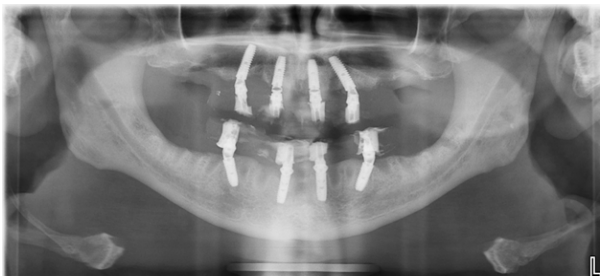

Figure 7. Post-operative Orthopantomograph

India.) to reduce postoperative pain and inflammation. Chlorhexidine mouthrinse (0.2% CHX oral rinse—100 ml mouth wash, Asian Pharmaceuticals, Bhairahawa, Nepal) two times a day for 4 weeks was prescribed to reduce plaque deposition and postoperative inflammation and serratopeptidase (Pepsa 10 mg, Lomus Pharmaceuticals Pvt. Ltd., Kathmandu, Nepal) two times a day for one week was prescribed to reduce postoperative swelling. He was asked to refrain from having hard and hot foods for the first 48 hours. He was also counselled about the possibility of post-operative swelling and pain. Patient was demonstrated with the proper way of using the interproximal brush and was provided with oral irrigator for peri-implant health maintenance.

Patient followed up after 10 days for suture removal and has been recalled after four months for fabrication of final dentures. Apart from our clinical work, we also recorded the oral health related quality of patient before and after the treatment which reflected the satisfaction level of patient with all on four treatment concepts (Table 1a and 1b).

Table 1. Oral health related quality of patient before treatment.

Question	0	1	2	3	4
Have you had trouble pronouncing any words because of problems with your teeth or mouth?			×		
Have you felt that your sense of taste has worsened because of problems with your teeth or mouth?	×				
Have you had painful aching in your mouth?					×
Have you found it uncomfortable to eat any foods because of problems with your teeth or mouth?					×
Have you been self-conscious because of your teeth or mouth?					×
Have you felt tense because of problems with your teeth or mouth?				×	
Has been your diet been unsatisfactory because of problems with your teeth of mouth?					×
Have you had to interrupt meals because of problems with your teeth or mouth?					×
Have you found it difficult to relax because of problems with your teeth or mouth?		×			
Have you been a bit embarrassed because of problems with your teeth or mouth				×	
Have you been a bit irritable with other people because of problems with your teeth or mouth				×	
Have you had difficulty doing your usual jobs because of problems with your teeth or mouth					×
Have you felt that life in general was less satisfying because of problems with your teeth or mouth?					×
Have you been totally unable to function because of problems with your teeth or mouth?					×
Total	**44**				

**(1) Never, (2) Hardly, (3) Occasionally, (4) Fairly often, (5) Very often

DISCUSSION

The search for fixed and fast, zippy solution for complete edentulism was continuous. Straight implants in the interforaminal areas and premaxilla with long distal extension cantilevers were tried but the success rate was not upto the mark (80% success rate) in the late 1970s. Mattsson et al. in 1999 tried with four premaxillary implants which were slightly tilted to retain a maxillary denture having 12 teeth. Malo et al. started performing all on four procedures in 1998 in mandible in Lisbon, Portugal in his private setup and the first literature was published in 2003.[3] The implant system for All on four used by Malo et al. was manufactured by Nobel Biocare company. Bo Rangert- a mechanical engineer of Nobel Biocare company was closely working with Dr. Malo, Dr. Krekmanov and colleagues. Krekmanov et al. suggested the use of tilted implants in 2000. They found that stress distribution of splinted tilted implants and single implants were similar. It was concluded that though tilted implants were subjected to increased bending and marginal bone stress, spread of implants and rigidity of the prosthesis can resolve the stress.[6] However, all on four procedure on maxilla was performed in 2001 and scientific literature came in 2005.[7]

Table 2. Oral health related quality of patient after treatment.

Question	0	1	2	3	4
Have you had trouble pronouncing any words because of problems with your teeth or mouth?	×				
Have you felt that your sense of taste has worsened because of problems with your teeth or mouth?			×		
Have you had painful aching in your mouth?		×			
Have you found it uncomfortable to eat any foods because of problems with your teeth or mouth?			×		
Have you been self-conscious because of your teeth or mouth?		×			
Have you felt tense because of problems with your teeth or mouth?		×			
Has been your diet been unsatisfactory because of problems with your teeth of mouth?			×		
Have you had to interrupt meals because of problems with your teeth or mouth?	×				
Have you found it difficult to relax because of problems with your teeth or mouth?	×				
Have you been a bit embarrassed because of problems with your teeth or mouth		×			
Have you been a bit irritable with other people because of problems with your teeth or mouth	×				
Have you had difficulty doing your usual jobs because of problems with your teeth or mouth	×				
Have you felt that life in general was less satisfying because of problems with your teeth or mouth?			×		
Have you been totally unable to function because of problems with your teeth or mouth?	×				
Total	**12**				

**(1) Never, (2) Hardly, (3) Occasionally, (4) Fairly often, (5) Very often

Since then, the protocol for all on four or all on six have revolved around the scientific literatures largely from Malo et al.[3] Few variations like all on four: zygoma and quad zygoma, V-4 concept, all on four shelf or M-technique, all on four transsinus techniques, etc. have been proposed and performed depending upon the availability of bone.[4]

There are lots of queries regarding the drilling protocol, insertion torque of different components, number, diameter and length of implants, implant angulations, surgical difficulties, incision techniques, loading protocols, prosthesis, post-operative complications, success rate, etc.

Malo followed the standard implant drilling procedure but suggested the under preparation of the osteotomy site and no use of countersink drill to prevent the integrity of marginal bone.[3] Some amount of osteotomy or osteoplasty is generally done to achieve a flat architecture of alveolar ridge to allow the implant and prosthetic connections emerging at the same level which in turn provides the long term stability.[4] Immediate loading of implants are done when a final torque of around 30-50 Ncm is achieved.[8] Multi-unit posterior abutments are torqued to 15 Ncm and anterior abutments are suggested to torque at 30 Ncm (Nobel Biocare).[4] But this might vary and one should follow the guidelines suggested by implant component manufacturing company. For example: Dentium Co., Ltd. (South Korea) multiunit abutment are suggested to use a uniform torque of 20 Ncm.

The number of implants can be increased to six in maxilla with a poor bone quality, patient with parafunction habits, opposing natural dentition, etc. The two anterior implants are placed in a straight manner whereas the posterior implants are tilted at an angle of 30-45 degrees.[3,9] Posterior implants are later made appear to as straight with the use of angled multi-unit abutments to facilitate proper, easy pathway of insertion. The average length of implants used in all on four concepts are 10 mm with a minimum length being 7mm and maximum length is 18 mm. The diameter ranges from 3.3 to 5 mm in various studies.[8]

The available bone height, width and volume are important parameters for any implant therapy. Lopes et al. in 2015 classified the patients as being low to high surgical difficulty depending upon the width of residual ridge.[10] Patients with alveolar ridge width > 5 mm wide, 4-5 mm wide and < 4 mm wide were categorized as low surgical difficulty, moderate surgical difficulty and high surgical difficulty respectively.

All on four procedures are normally performed under infiltration local anesthesia. Crestal incision approach is generally used with the extension of flap from distal line angle of first molar to similar area of contralateral side.[8] Proper care should be given at the area of maxillary sinus and mental foramen as the distal implants are placed in inclined position anterior to these landmarks.

Immediately loading protocols vary in various studies ranging from the same day loading to loading after 24 hours or 48 hours of surgery. Definitive prosthetic loading are commonly performed after 4-6 months of initial surgery.[4,8]

Choice of prosthesis is dependent upon the available lip support and smile line. If the lip support is inadequate, prosthesis with teeth only can't serve for the purpose and requires the acrylic extensions for lip support. Hence, fixed hybrid prosthesis is chosen when alveolar ridge is not visible upon smiling whereas a fixed removable prosthesis (Marius bridge) is given when alveolar ridge is visible upon smiling. Hybrid prosthesis can be of basic type like milled/casted metal framework with acrylic teeth and gingiva or of premium type wherein milled titanium/zirconia framework is used with individual porcelain, E-max or zirconia crowns cemented to it. Marius bridge consists of a bar systems like Hader bar or free form milled bar holding a denture.[4]

Every surgical procedure can have certain complications. The common early complications during and after surgery are bleeding, swelling, bruising, pain and sometimes transient paresthesia. The late complications that can be encountered following all on four treatment procedures are biological (peri-implant mucositis, peri-implantitis) and technical (screw loosening, screw fracture, detachment of tooth from provisional prosthesis, fracture of final prosthesis, implant fracture, etc).[4]

Success rate of implants might vary dependent largely dependent upon case selection and the efficiency of operator. In general, the success rate of short implants and long implants are around 96% and 98% success rate as suggested by recent literature.[11] Babbush et al. in 2013 found the overall implant survival rate of 98.7% and 100% prosthetic survival rate even when all on four implants used were of narrow diameters.[12] Similar sort of success rate was reported by Malo et al. in 2011.[9]

This case report depicts a management of complete edentulism in a sequential manner using all on four implant protocol. The psychological aspect of complete edentulism was very much resolved in a single day a solution maintaining the self-confidence of patient and improving the quality of life. All on four treatment is basically a graftless solution permitting the immediate loading of implants along with achieving function and providing esthetics.

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