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Short implants: are they beneficial?

Implant dentistry is an everyday treatment modality today. With a strong evidence base and growing popularity of implants, there is little doubt over why implants are always the preferred choice of treatment for replacing missing tooth or teeth. Advent of newer designs also paved way for newer dimensions in implants which led to usage of short implants in atrophied jaws which were earlier not recommended to be replaced with implants. Short implants are manufactured for use in atrophic regions of the jaws. Although many studies report on short implants as ≤10 mm length with considerable success, not much evidence is available regarding ultra-short implants of < 8mm length and their long term clinical success. Owing to the need for rehabilitation of such increasing number of atrophic jaws, the 7-mm standard implant was introduced in 1979. From the beginning, this implant was used either alone or in conjunction with longer implants in edentulous jaws, but, eventually, it was used in the treatment of partial edentulism as well. When considering these implants in function, the 1-, 3-, 5- and 10-year results showed a lot of failures among the short implants. In addition, to facilitate the replacement of a failing standard implant and to improve the success rate in compromised situations, wide-diameter implants were introduced. The wide-diameter implant was first introduced to fulfill two indications: poor bone quality and/or quantity and replacement of a failing standard implant. Some authors have found that wide-diameter implants were successful when the length of the implant was compromised for situations where residual alveolar height was less. Therefore, there was a relationship for shorter and wide-diameter implants. Reconstruction of the atrophic mandible using short implants without augmentation procedures yielded, after more than 10 years of follow-up, a cumulative implant survival rate of 92.3. A systematic review and metaanalysis on short implants conducted in 2014 provided robust analysis of using short implants (6mm) as a viable treatment option with predictable success rates. The study also pointed out that the failures that were reported were early failures and also had a better survival rates in the mandible compared to the maxilla. Short implants are currently available in a multitude of systems and are backed up by considerable success rates in clinical scenario.
ABSTRACT
To rehabilitate the edentulous arches or partially edentulous arches, various treatment options have been available for the clinicians. Since the last few years, an implant has been the most acceptable treatment with a success rate of 95-99%. Though the success rate is high but it is inevitable to avoid the complications. Knowledge regarding the types of complications that can occur with dental procedures is an important aspect of treatment planning, dentist patient communication and post treatment care. Various complications may be encountered that includes mechanical, biological, esthetical or prosthetic causes for the failure of an osseo-integrated implants.

INTRODUCTION
Modern dentistry aims to restore the patient to normal function, comfort, aesthetics and health regardless of the atrophy, disease or injury to the stomatognathic system. Continued researches in treatment planning, implant designs, materials and techniques has enabled clinicians to predict a good outcome for treatment\(^1\)\(^2\).

Rehabilitating completely edentulous and partially edentulous arches using dental implants have been used as treatment modality since long. Though the success rate is 95%, complications are unavoidable\(^3\)\(^4\).

As the time elapsed the implant complications increased. Connection related complications increased from 4.3% to 26.4% in 10 years, loss of retention of restorations have increased to 24.9% from 6.2% in 10 years\(^5\).

The National Institutes of Health, Consensus Development Conference Statement in 1978 on Dental Implant: Benefits and Risk concluded that, “Thousands of patients have been treated with dental implants for years and there is no question that many received long-term benefits”. However, the report further stated that, “some implants, fail in patients within six months; and some have resulted in extensive bone loss and produced irreversible defects and complications\(^6\).

Lack of primary stability, surgical trauma, and contamination through microorganisms, occlusal load, improper diagnosis and treatment plan, improperly fabricated prosthesis may cause implant failure\(^7\).

High Success rate has been reported for dental implants that support crown and fixed bridgework\(^8\)\(^-\)\(^13\). Complications regarding the implants have also been
reported, if, encountered may lead to the complete failure.\(^\text{14}\)

**IMPLANT PROSTHODONTICS**
The selection, planning, development, and placement, replacement of missing teeth and/or associated structures, and maintenance of restoration with dental implants (GPT-9).

**AILING AND FAILING IMPLANT**

An implant that may demonstrate bone loss with deeper clinical probing depths but appears to be stable when evaluated at 3-4 months interval.\(^\text{15}\)

Shows radiographic bone loss without clinical signs of mobility and inflammation.\(^\text{16}\)

An implant is said to be failed when signs of inflammation, bleeding on probing and suppuration is also seen.\(^\text{15, 16, and 17}\)

**FAILED IMPLANT**

Failed implants are those which are associated with progressive bone loss, clinical mobility, peri implant radiolucency, dull sound on percussion and are non-functional as intended.\(^\text{16}\)

**IMPLANT FAILURE**

It is defined as the total failure of the implant to fulfil its purpose (functional, aesthetic or phonetic) because of mechanical or biological reasons in the first instance at which the implant performance is measured quantitatively and or inadequacy of the host tissue to establish or maintain osseo-integration.\(^\text{18, 19, and 20}\)

**CLASSIFICATION**
REVIEW OF LITERATURE

Jemt et al.\textsuperscript{29} conducted a study on peri-implantitis surgery prevalence and delayed implant failures in a large number of patients. “Early implant failures,” was significantly associated with the five factors mainly to the “surgeon” (HR 5.13), followed by “absence of prosthetic treatment” (HR 2.71). The risk for an early failure was found to be 7.0% and 0.1% when all the significant factors were present and absent respectively. So the role of dentists is strongly associated with the early failure of the implant.

Maria Herrero et al.\textsuperscript{30} studied the success rate of implant retained prosthesis placed by prosthodontics residents. With a mean prosthesis age of 4.5 years, a success rate of 71% in implants and 81% was seen with the implants restored with single crown. Most commonly porcelain fracture in FDP (15%), lack of stability (31%) and retention (29%) in RPD were observed. Thus success rate of implant retained prosthesis was observed to be lower as compared to previous studies.

Flanagan\textsuperscript{31} reported that forces of occlusion may result in implant failure, when acted cyclically and off-axially in range of 50-400N, leading to micro-moment of Osseointegrated implant. Vasile et al.\textsuperscript{32} reported that peri-implantitis is the most common complication encountered leading to total bone loss around an Osseointegrated implant. According to Joan Pi-Anfruns\textsuperscript{33}, 2014, implant complications can be divided into:

Bryce et al.\textsuperscript{34} reported that causes for early failure of implants can be local or general factors which includes various systemic and medical conditions of the patient. Vere j. et al.\textsuperscript{14}, reported the incidence of mechanical complications of implant.

Vere J. et al, Pjetursson et al.\textsuperscript{8} and in Berglundh et al.\textsuperscript{10} reported that in period of 5 years and 10 years, the survival
rates for implant supporting crowns and fixed partial dentures exceeds to 95% and 93% respectively. In 55% of implant cases, the loss of implant occurs before functional loading. Pjetursson et al.\textsuperscript{35} conducted a study on implant supported fixed dental prosthesis. Survival rate increased to 97.2% after 5 years when rough surface implants were used. 95.4% and 80.1% are the rate of implant survival after 5 and 10 years of function. Metal–ceramic implant supported FDPs had survival rate of 96.4% after 5 years and 93.9% after 10 years. Fractures of the veneering material (13.5%), peri-implantitis and soft tissue complications (8.5%), loss of access hole restoration (5.4%), abutment or screw loosening (5.3%), and loss of retention of cemented FDPs (4.7%) were complications observed after 5 years. It was concluded that implant supported FDPs are the good options of treatment though technical and biological complications were frequent (33.6%).

Heasman\textsuperscript{36} et al. and Heitz\textsuperscript{37} et al. concluded that peri-implantitis is similar to periodontal disease. Bashutski\textsuperscript{38, 39}, D'Silva NJ, Wang HL reported that overcompression of the bone during placement leads to unusual failure of the implants. Abt\textsuperscript{40} in 2009 reported that dental implant failure after bone augmentation was on higher side in smokers than in non-smokers. Levin L Schwartz-Araz et al.\textsuperscript{41} in 2008 studied the difference in success rate of implant in current smokers, non-past smokers and smokers and compared the long term marginal loss, survival and success of single placed implants using radiographs. Concluding that past smokers had more marginal bone loss than non-smokers. W. Chee et al.\textsuperscript{42} in 2007 reported proper patient selection and treatment planning can avoid complications. Claudia Cristina Montes\textsuperscript{43}, in 2007 reported that there is no clinical cause for failure of implant. Men (4.5 %) had more failure rate than women (3.1%). 88.2% of the implants were failed before loading. 58.5 % implants failed in posterior jaw. No reason for the failure of 75% of the implants was reported. Identified causes were 17.5% iatrogenic conditions, poor bone quality and quantity (3%), peri-implantitis (1%), and 3.5% missing data. Results suggested that host factor, not identified clinically, contribute to an increased risk for implant loss. In 2007, Streitzeletal\textsuperscript{44} compared the effect of smoking on the implant with or without bone augmentation procedures. It concluded that biological complications were common amongst smokers. In 2006, Shelemay et al.\textsuperscript{45} reported that cause of peri-implant mucositis is same as that of gingivitis and shift of micro-organisms takes place from gram positive to gram negative anaerobes. In 2006, Ardekian et al.\textsuperscript{46}, reported that sinus membrane perforation is seen where alveolar bone is less than 5mm but overall success remains unaffected. In 2006, Jung et al.\textsuperscript{47} reported that maxillary sinus penetration in which the implant penetrated the sinus membrane and the bone at 2, 4 and 8 mm. Pathologic and radiographic changes were not seen in the study of 8 dogs. Hence, concluded that sinus lift procedure is not a contraindication and protrusion of implants into sinus cavity will not lead to sinus complications in canines. Stephelynn DeLuca et al.\textsuperscript{48} in 2006 reported at the time of implant surgery, non-smoker (13.33%) had a significant lower implant failure rate than smokers (23.8%), concluding that smoking is not an absolute contraindication.

Park et al.\textsuperscript{49} reported the aesthetic complications of the implants may be
visibility of titanium abutment through gingiva, lack of papillae and malposition implant. Kalpidis and Konstantinidis et al, reported a case in which lingual cortical plate was perforated during osteotomy preparation in mandibular premolar region. Critical haemorrhage and multiple hematomas were observed and verified by CT scan. Peter K. Moy et al in 2005 reported that the risk of implant failure is significantly aged (60 – 79 years) than in young patients (40 years). Proussaefs et al, reported that survival and success rate of implants at second stage surgery was 100% in cases of non-perforated membranes than with the perforated sites 69.6. Tiwani et al, found that over a period of 10 years retrospective institutional study, 1 case of aspiration and 36 cases of ingestion were reported. Ercolietal reported that mechanical complications may arise if bone is continuously drilled or if the drill reaches beyond 15 mm in 5 osteotomies. John C. Keller reported that osteoporosis affects Osseointegration of implant, but under the forces of mastication long term biomechanical stability is yet unknown. Leonhardt et al reported that the incidence of peri-implantitis has been increased gradually to 16%. Goodacre et al reported that incidence of bleeding as a complication is about 24%. Fistulae have been reported in 1% of cases associated with loose abutment screws or ill-fitting frameworks. Soft tissue hyperplasia affects to 20% of fixed prosthesis over an observation period of 9 years. Goodacre et al, reported the incidence of various prosthetic complications in implant therapy.

- Overdenture loss of retention (30%)
- Resin veneer fracture (22%)
- Overdenture relines (19%)
- Overdenture clip/attachment fracture (17%)
- Porcelain veneer fracture (14%)
- Overdenture fracture (12%)
- Opposing prosthesis fracture (12%)
- Acrylic prosthesis fracture (12%)
- Prosthesis/abutment screw loosening (7%/6%)
- Prosthesis screw fracture (4%)
- Metal framework fracture (3%)
- Abutment screw fractures (2%)
- Implant fractures (1%)

Charles J. Goodacre et al, reported loosening of over denture retentive mechanism, implant loss in irradiated mandible and maxillary overdentures, haemorrhage related complications, resin and veneer fracture, and over denture clip / attachment fracture are the common complication associated with implant supported prosthesis.

Robert L. Simon concluded that the implant failure rate was 4.6% with complications of abutments screw loosening (7%) and loss of cement bond(22%). Sharawy et al reported osseous damage may be reduced if implant site is prepared at a speed of 2500 rpm. Niamatu reported a case of airway obstruction after an implant was paced and was secondary to sublingual hematoma and sublingual bleeding. Quirynen et al reported that an active or inactive retrograde peri-implantitis may result in cases with over prepared or overheated osteotomies observed as periapical radiolucencies radiographically. Bartling et al checked the incidence of the variation in the sensation using the standard neurological tests in 94 patients. At first post-operative
appointment incidence of 8.5% was found. Complete anaesthesia was seen only in one patient for 2 months and resolved later in 4 months. No permanent altered sensation was found over 6 months.

Hofshneider et al and Bavitz et al reported that sublingual and submental arteries course finally to lingual cortical plate from floor of the mouth. It must be taken into consideration that edentulous mandible is shorter and perforations occur deeper in the floor of the mouth and the sublingual haemorrhage has been iatrogenic in nature.

Charles J. Goodacre et al concluded greater implant loss occurred with over dentures. Greater loss was observed in maxilla than mandible with fixed complete dentures and over dentures. Mechanical complications were screw loosening / fracture, implant fracture; framework, resin base and veneering material fracture, opposing prostheses fractures and over denture mechanical retention problems.

Esposito et al told that anatomic conditions and the surgical trauma are two main aetiologies responsible for early implant failure in Branemark implant (3.63 %) due to peri-implantitis.

Ann M. Parein et al evaluated long term outcome, the type and prevalence of prosthetic complications. Significantly fewer complications were found in prostheses supported by one or more implants in premolar than in molar region. Cemented restorations showed fewer complications than screw retained while restoring single tooth.

Robert Hass et al reported that most common complication observed was abutment screw loosening. William Becker et al reported bone quality, quantity, length of implant, and minimized occlusal contacts are the factors contributing for success.

Zarb et al reported that inadequate availability of superior cortical bone, improper drilling and incorrect use of equipment may lead to failure of Osseo-integration in the first stage surgery. Albrektsson reported mucosal perforations and fistulae were the gingival complications. An occurrence of 3 – 5 % was found for mechanical complications such as fracture of abutment screw, fixture, or prosthesis. Ericsson and Albrektsson stated, bone resorption was seen when drilling was done at 47°C for 1 minute in rabbits. It concluded that an increase in temperature or duration while drilling may lead to bone necrosis.

CONCLUSION

In the recent times, the dental implant therapy for rehabilitation of the occlusion has been the most accepted and successful treatment if the principles are followed. For the implant treatment to be successful, the stability of the implant should be considered as the main factor. The implant must be stable in the jaw bone after the healing phase is completed.

Awareness and knowledge of various risks involved during the whole procedure, adequate experience of the clinician is needed.

Four essential steps: proper and careful selection of the patient, correct selection of the implant, proper surgical technique and the precise prosthetic replacement have to be considered strictly and followed to prevent or reduce the number of complications.
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REHABILITATION OF EDENTULOUS RIDGES WITH LOCATOR OVERDENTURE AND IMPLANT SUPPORTED FIXED DENTAL PROSTHESIS-A CASE REPORT

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Abstract:
Edentulism is poorly received among the young as well as in the old. Various implant supported treatments have not only improved the chewing efficiency but also aids in psycho social well being. Removable implant supported dentures provide good prosthetic outcome with regard to economic and time saving aspects, esthetics and ease of cleanliness. Fixed treatment provides high retention and stability with high predictable outcome. The selection of the treatment depends on factors such as bone quality, interarch distance, patient systemic conditions, cost factor, etc. In this case report we have presented a case with edentulism which was rehabilitated with a locator overdenture and subsequently rehabilitated with implant supported fixed prosthesis.

Keywords: locator, Fixed treatment, Ankylos, Full mouth rehabilitation

Key Message: When removable implant supported dentures provide good prosthetic rehabilitation with regard to economic and time saving standards, fixed treatment provides predictable outcome. Removable implant dentures provide cleaning efficiency and esthetics whereas fixed prosthesis provides retention and stability. The choice between the two depends on the patient expectations and the doctor interpretation of the best possible treatment.
Introduction:
This is the era where people seek a full functional limitless life. Their biological age no longer follows their mental age. People want a well-rounded life may it be at their 20s, 30s or their late 80s and now tooth loss is no longer a barrier. Dental implants have fulfilled this purpose for a few decades now. Various treatments that include removable and fixed options are evolving to benefit various clinical situations.
Implant supported prosthesis has improved patients’ ability to look better, eat better and thus live better. Clinical studies have shown better improved life conditions in fixed option than removable treatment options. Although fixed prosthesis shows higher rate of patient acceptance, all clinical scenarios don’t allow a fixed option. The patient must be rehabilitated with atleast 4-6 implants for fixed prosthesis \(^1\) so patients with insufficient bone height or poor quality of bone will have to proceed with removable options such as ball, bar or locator attachments.
Simrahan et al concluded that Locator attachment to be more advantageous to ball and bar systems, regarding the rate of complications in clinical practice.\(^2\)
In this case report we have presented a treatment of an 82 year old patient with edentulism who had expressed his strong desire for a fixed treatment.

Case History:
An 82 year old male patient reported to the Department of Oral Implantology with a chief complaint of missing upper teeth and lower teeth. On dental examination it was found he was a partially dentate patient with failing existing dentition with a grade III mobility.
On clinical examination it was found that he was in prime of health with no debilitating disorders. Medical investigations such as routine blood checkups, vital signs were carried out. No medical history was reported that contradicted the implant treatment.

Psychosocial status: the patient was philosophical and expressed a strong desire for a fixed prosthesis.

Diagnosis:
Clinical study models were fabricated and surgical measurements and radiographic examination (panoramic Rx) of maxillary and Mandibular area was done.

Radiological assessment:
Pre operative OPG: (Figure 1) On radiographic analysis we found sinus pneumatisation in the maxilla with reduced bone height in the posterior region. The mandible had adequate bone height of 10-11mm anteriorly.
Since we had enough data with the existing study models and xrays a CBCT was avoided.

Figure 1: Preoperative OPG
Treatment planning:
- Extraction of the remaining teeth and immediate implant placement.
- Placement of Ankylos C/X implant (B-8mm) in 35 and 45 region.
- Maxillary and Mandibular ridges with metal ceramic prosthesis.
- Patient recall and check up every 6 months

The treatment plan was explained to the patient, and informed consent was obtained thereof as he agreed with the proposed prosthetic solution.

Pharmacological management:
Patient was prescribed antibiotics (Amoxicillin 500 mg) one day before surgery and one hour before surgery as prophylaxis.
Patient would be later advised to continue the antibiotics thrice daily for a week post surgery.
Analgesics (Diclofenac Sodium 50 mg) were also prescribed post treatment. Antibacterial mouth rinse (Chlorhexidinegluconate) was also prescribed.

Case report:
Surgical phase:
The patient was prepared and sterilized surgical instruments were arranged for the surgery. Extractions were carried out with respect to maxillary and mandibular anterior teeth under local anaesthesia.(figure 2),(figure 3) The sockets were curetted and irrigated with antibacterial solution (chlorhexidine).

Fig.2 Extraction of mandibular teeth

Fig.3 Extraction of maxillary teeth

Fig.4 Flap elevation

Midcrestal incisions were carried out and full thickness flap was elevated (figure 4). Septal bone was removed to ensure flap repositioning and tissue closure in the maxillary region.
Implant osteotomies were carried out with recommended sequence of drills (Ankylos c/x) with copious irrigation. Linderman drill was
used initiate the sequential osteotomy. Trispade drill A & B were used to extend the osteotomy site according to the selection of the implants .(figure 5a & 5b).

Fig. 5a: Trispade drill A for Ankylos c/x A implants.
Fig. 5b: Trispade drill B for Ankylos c/x B implants

Guide pins were placed in each osteotomy to indicate the direction and ensure parallelism between implant osteotomy sites.(figure 6a & 6b).

Fig. 6a: Paralleling pins placed in the maxillary ostetomies.
Fig. 6b: Paralleling pins placed in the mandibular ostetomies

In the mandibular region, Implants (Ankylos c/x wrt 35,33,43,45 ) (figure 7a) were placed carefully, keeping a safe distance from the mental foramen. In the maxilla Implants (Ankylos c/x wrt 15,13,23,25) were placed at a maximum angulation of 20 degrees, avoiding the sinus floor.(figure 7b).

Fig. 7a: completion of implant placement in maxilla.
Fig. 7b: completion of implant placement in mandible

Primary stability of 35 Ncm was achieved. Cover screws were then placed in. Interrupted sutures were placed for primary closure. Immediate post operative OPG was then ordered(Figure 8).

Fig.8 Post operative OPG

Patient was placed on post operative antibiotic regimen and on analgesics along with instructions on maintenance of oral hygiene and was recalled after one week, one month.
and three months, six months and 1 year for follow up.

**Prosthetic phase** (three months post implant placement):

Patient was recalled for second stage surgery after three months of implant placement. On radiographic analysis significant crestal bone loss was seen with respect to 45 (fig 9a). Cover screws were retrieved non invasively under local anaesthesia.

![Image 9a: implant failure wrt 45 – IOPA](image)

There was failure of the implant placed in the 45 region as suspected (figure 9b). This may be attributed to residual infection in the extraction socket. Implant level impressions were made and casts were poured (figure 10a & 10b).

![Image 10a: final casts showing impression post- maxilla](image)

![Image 10b: final casts showing impression post- mandible](image)

Abutments were selected (regular abutments for the maxillary arch and LOCATOR abutments for the mandibular arch). Maxillomandibular relations were recorded and transferred to a semi adjustable articulator. Trial of the metal framework and the denture was carried out. The maxillary arch was then rehabilitated with implant supported fixed dental prosthesis. A LOCATOR attachment denture was planned for the Mandibular ridge due to the loss of an abutment for the fixed prosthesis. For the delivery of the prosthesis following steps were done. The LOCATOR abutments were screwed in with the driver and block out spacers were placed on the heads of the abutments. Female attachments were positioned with the processing inserts (which will later be replaced with the retentive inserts). The Mandibular denture was ground in the region of the subsequent females so that it could be cemented with cold cure acrylic resin. The denture was then finished and polished. An OPG was then ordered for ensuring proper fit (figure 11).

![Image 11: OPG showing locator attachments](image)
After three months of wearing removable prosthesis with locator attachment, patient expressed the need for a fixed prosthesis. Ankylos c/x implant was placed in the healed site (45) (figure 12) The patient was then recalled after three months for rehabilitation of the Mandibular ridge with fixed prosthesis. The locator abutments were replaced with regular abutments and implant supported fixed dental prosthesis was cemented in the Mandibular arch.(fig 13 a,13b,13c).

The 18 month follow up OPG was then taken and sustained level of crestal bone was seen.(figure 14)

**Discussion:**

Implant supported overdentures provides retention and good support with the help of the mucosa as well as the implant. Although overdentures have proven to be a successful treatment option which is economic and time saving, multiple pulls of the removable prosthesis can hinder the retentive values of the attachments which would require replacements and multiple visits.\(^3,4,5\) Fixed prosthesis has shown higher stability, the fixed treatment received a higher rating on the ability to chew.\(^6\)

The most common reason for choosing a dental implant prosthesis was to improve eating ability. Most studies reported improved eating ability after a fixed treatment. Patient tend to report function and chewing ability to be more important than esthetics.

In this case, a fixed full mouth rehabilitation was planned so four implants were placed in each arch. Unfortunately the implant in the 45 region failed (extraction placement). This may be due to the fact that there was remnants of
infective tissue remaining in the extraction socket.\textsuperscript{7,8} Thus a thorough curettage with local antibiotic treatment or planning a different site of implant placement would have been another option.\textsuperscript{9} Since we deprived the final fixed prosthesis of one abutment support, the patient was treated with locator overdenture. Locators have shown excellent patient compliance with good retentive and resilient properties. Locator attachments are in different colors (clear, pink, blue, green, orange, red) and each has a different retention value.\textsuperscript{9} Since the patient was insistent on fixed treatment we placed a new implant in the region 45 (after 4 months of healing)\textsuperscript{10,11}

Patient was then rehabilitated with fixed shortened dental arch implant supported prosthesis.

While some patients are comfortable with overdentures, some patients expect a more stable retentive option such as a fixed dental prosthesis. Treatment options can vary from person to person, a thorough knowledge of the patient history and also, in this case, the patients expectations will help a practitioner to provide the best possible result.

Further studies have to be conducted so as to provide a reduced time span to rehabilitate the edentulous areas.

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THE NEUTRAL ZONE TECHNIQUE REVISITED

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ABSTRACT: The major aim of treating a completely edentulous patient is restoring the aesthetic, form and function by replacement of the lost structures within the oral cavity. One of the most commonly faced problems among long term denture wearers is the reduction in the denture bearing area due to resorption. Prosthetic Rehabilitation patient with severely resorbed ridge is one of the most challenging task a prosthodontist can undertake. This article describes the use of neutral zone (NZ) technique in an effort to achieve successful complete denture therapy with enhanced stability.

KEYWORDS: Neutral zone, Atrophic mandible, Impression technique, Stability.

INTRODUCTION

Complete dentures are primarily mechanical devices, but since they function in the oral cavity, they must be fashioned so that they are in harmony with normal neuromuscular function. All oral functions, such as speech, mastication, swallowing, smiling, and laughing, involve the synergistic actions of the tongue, lips, cheeks, and floor of the mouth which are very complex and highly individual. Failure to recognize the cardinal importance of tooth position and flange form and contour often results in dentures which are unstable and unsatisfactory, even though they were skilfully designed and expertly constructed. The coordination of complete dentures with neuromuscular function is the foundation of successful, stable dentures.¹
Loss of teeth leaves us with multifactorial changes occurring in the mouth in the form of resorption of alveolar ridge, tongue expansion, laxity of muscles of cheek and face which are unable to counteract tongue forces towards buccal aspect. Hence, leaving crest of residual alveolar ridge, is not an ideal foundation for placement of artificial teeth.²

Many edentulous people can experiencedifficulty in carrying out functional activities when wearing complete dentures. This may be due to a number of factors, one of which is the ability to control the dentures effectively during mastication and speech. For this reason, it is critical when constructing complete dentures to incorporate features in their design which will aid stability in function. Successful treatment of patients with complete dentures depends mainly upon the proper positioning of the teeth on the denture foundation. Neutral zone was defined as “that area in the mouth where the forces of tongue pressing outward are neutralized by forces of cheeks and lips pressing inward”. This concept was followed and prescribed by many since then for e.g.: Russel (1959) who termed it as “Reciprocal space”, Robert (1960) called it the “Potential space”, Heath (1970) as “Denture space” Bates (1984) as “Reciprocal zone”, Mathew (1961) as “Zone of minimum conflict” and Fenn (1986) termed it “Zone of neutral muscular forces”.

Instability in mandibular completedentures may be present due to a number of reasons. The common ones, as described by Jagger & Harrison³ are:

a) Inappropriate extensions of buccal and lingual flanges of a denture;
b) Poorly adapting denture fitting surface;
c) Severely atropic mandibular alveolar ridge;
d) Poorly contoured polished surfaces of a denture;
e) Abnormal denture teeth positions, inappropriate orientation and high level of the occlusal plane and presence of occlusal errors.

The neutral zone is the potential space between the lips and cheeks on one side and the tongue on the other, that area or position where the forces between the tongue and cheeks or lips are equal.⁴

Many materials have been suggested for shaping the neutral zone: modeling plastic impression compound, soft wax, a polymer of dimethyl siloxane filled with calcium silicate, silicone, and tissue conditioners and resilient lining materials. Many techniques have also been suggested using the materials in conjunction with movements including sucking, grinning...
and whistling, and pursing the lips. The swallowing/ modeling plastic impression compound technique located the neutral zone, using swallowing as the principle modeling function.  

**INDICATIONS OF NEUTRAL ZONE:**
It is basically advocated in the following conditions:

- Severly atrophic mandibular ridge
- Patient with high mentalis attachment
- Patient with partial glossectomy
- To facilitate in locating optimal position for implant
- Patient with partial mandibular resection

**ADVANTAGES OF NEUTRAL ZONE:**
- Improved stability
- Better retention
- Posterior teeth will be correctly positioned allowing sufficient tongue space
- Enhanced aesthetics due to facial support
- Improved masticatory function
- Better comfort
- Improved speech

**CASE REPORT:**
A 52 year old female patient reported with the chief complaint of ill-fitting denture associated with discomfort on wearing the dentures. On examination, it was found that both the upper and the lower arches were edentulous and severely resorbed. (Figure 1) The patient gave a history of wearing dentures since past 10 years. On examination of the existing dentures, attrition of the denture teeth was found as well as a reduced vertical dimension was observed. Hence, fabrication of complete dentures with the help of neutral zone technique was planned and the patient was explained about the same.

**Fig 1: Resorbed maxillary and mandibular arches**

Primary impressions of the upper and lower jaw were made with impression compound using metal stock trays and the model was poured in dental plaster. Following which closed fitting upper and lower custom trays were fabricated using self-cure acrylic resin. The extensions of the custom trays were evaluated intra-orally border moulding was done with the help of green stick compound and secondary impressions were recorded using zinc-oxide eugenol impression paste. The master casts were poured in dental stone. After obtaining the master cast,
upper and lower base plates were fabricated using acrylic resin. The base plates were trimmed and checked for extensions, retention and stability in the patient’s mouth. For the mandibular cast another base plate was fabricated on which orthodontic wire bent in the form of loops was attached, these spurs were made in order to aid in retention of the admix material while recording the neutral zone (Figure 2). Wax occlusal rims were made over upper and lower base plates and occlusal registration was recorded in a conventional manner. The height of the wax rims were adjusted intraorally to permit an acceptable occlusal vertical dimension (OVD) and a freeway space of 2mm. Centric relation was recorded and articulation was done. (figure.3) An admix ratio of impression compound and green stick compound (7 parts impression compound and 3 parts green stick compound) was softened in water bath at 65°C and moulded into the shape of a rim and adapted on the wire loop, following which it was placed in the patient’s mouth. The patient was then asked to perform various repeated actions likesucking, swallowing and taking frequent sips of water, pursing lips, pronouncing E and O sounds and protruding the tongue to simulate physiological movements. Performing these various oral movements helps in shaping / moulding of the material thereby facilitating the recording of the neutral zone. After 5–10 min, the set impression was removed from the mouth and examined (Figure 4).

Fig 2: Crib placed on denture base

Fig 3: Jaw Relation recorded

Fig 4: neutral zone recorded

The neutral zone impression so obtained was placed on master cast and location grooves were made on the master cast. A silicone putty material was mixed and adapted on both labial and lingual sides around the neutral zone impression to
obtain an index (Figure 5). The compound material along with the wire-loops were removed and were replaced with modelling wax using the putty indices (Figure 6) and the height of the mandibular occlusal rims were adjusted according to the articulated maxillary occlusal rims.

The position of the teeth was verified by placing the index together around the wax try-in (Figure 7). The waxed up dentures were checked in the patient’s mouth for esthetics, phonetics and occlusion. Once the try in was found satisfactory, the dentures were processed, finished and inserted.

Maxillary teeth arrangement was done in a conventional manner and the mandibular teeth were placed exactly following the index. The position of the teeth was verified by placing the index together...
CONCLUSION: Neutral zone technique is one of the best alternative techniques for fabricating a complete denture for patients with highly resorbed ridge, but it is generally not practiced because of the extra clinical step involved. The neutral-zone philosophy is based upon the concept that within the mouth there exists a specific area where forces generated by the tongue and those generated by the lips and cheeks are neutralized by each other, where the function of the musculature will not unseat the denture. The neutral zone technique is considered to be an alternative approach for patients complaining of unstable dentures, especially when it is not feasible to do implant therapy.

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Conflict of interest declared: Nil

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MANAGEMENT OF LAX TISSUES TO IMPROVE POSSESSION BY WINDOW TECHNIQUE.

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Abstract:

The treatment procedure for compromised edentulous ridges in a conventional manner is a very difficult task. To fulfil patient desire such as function and aesthetics the procedure need to be modified. This case report describes one of the impression techniques for completely edentulous patient with localized hyperplastic ridges.

Key words: flabby ridge, window impression technique, floppy tissue.

Introduction:

The compromised ridges can be atrophic ridge, flabby ridge, and knife edge ridge and abused ridges1. Residual ridge resorption is a complex biophysical process, it is a common occurrence following extraction of teeth and the rate of ridge resorption is faster during the first year and at a slower rate as year passes. The impression techniques play a key role for the compromised ridges and a master impression should record the entire functional denture bearing area to ensure maximum support, retention and stability for the denture during use2. For flabby ridges the alveolar mucosa over the ridges is with unusual thickness and mobility. It is thick in some area from 2-4 mm. The mucosa has no bone support when the mucosa is more than 4 mm in some area if the atrophy of alveolar mucosa is rapid. It can be associated with either of the arches but commonly seen in anterior part and tubers of maxilla. If flabby ridges are present may give rise to complaints of pain or looseness when the denture rests on them. The superficial area of mobile soft tissue replaces the alveolar bone due to its resorption and the mobile soft tissue gets displaced due to masticatory force leading to loss of peripheral seal3. This type of ridges must be properly managed with impression techniques otherwise it adversely affects retention, stability and support of complete denture.

The conventional impression techniques compress the flabby ridge and later tend to recoil and dislodge the overlying denture. There are impression principles such as mucostatic impression technique which achieves support from the other firm areas of denture bearing area for maximum retention4. Muco-compressive technique which compress the loose floppy tissue to obtain functional support from it and to replicate the contour of the ridges during
compression of occlusal forces. The prevalence is about 24% of edentulous maxilla and 5% of edentulous mandible in both jaws most frequently in anterior region.

Case report:

An 82 year old patient reported requesting for the new set of dentures (Figure-1). The patient had been completely edentulous for 20 years and had two sets of denture previously. The patient complained that the present denture were ill-fitting and had difficulty in eating and also complains of discomfort for which he wishes to have a new set of denture. Patient does not give any relevant medical history. On examination it was noticed there was a bony protuberance and flabby tissue in the anterior part of maxilla(Figure-2).

Treatment modalities like surgical procedures followed by fixed or removable prosthesis, conventional procedure without surgical excision were the options explained to the patient. Patient however was not interested in surgical procedures so; window impression technique was planned for the patient.

Maxillary arch(Figure-2)

A preliminary impression was made using irreversible hydrocolloid and cast was poured. A spacer was placed, special tray was constructed using auto-polymerizing resin and the area where flabby tissue is present was left uncovered (Figure-3 & 4). Border moulding was carried on the maxillary arch using low fusing compound and the impression was made using ZOE, then the exposed window area is covered using light body polyvinyl siloxane material(Figure-5). The material is placed in a passive manner to prevent distortion of the soft tissues. The impression was removed in a single jerk and the master cast was poured with dental stone once the impression is carefully evaluated. The record base was fabricated and occlusal rims were made (Figure-6). Jaw relation was recorded(figure-7) followed by Try-in (figure-8) and processing of denture was carried.
Primary cast with Spacer (figure 3)

Custom tray (Figure-4)

Secondary impression (Figure-5)

Jaw Relation (Figure-6)

Try -In (Figure-7)
Post-operative view (Figure-8)

Discussion:

The objective of complete denture therapy is restoration of function; enhance aesthetics and maintenance of patient health. If the tissue presents unstable and undesirable denture base foundation it is a challenging task to the clinician to manage this flabby tissue. The treatment regime begins with the elimination of the cause and start the recovery progress. The treatment approach can be surgical excision of flabby tissue followed by conventional dentures or implant retained prosthesis; removable or fixed conventional prosthodontics without surgical intervention.

Alveoloplasty, Surgical excision of flabby tissue followed by denture fabrication on the firm immobile tissue enhances stability and can be one of the treatment options and the patient was not willing for this type of approach. The use of dental implants is also not without difficulty. Therefore the patients for a various reasons such as clinical and financial are unsuited for dental implant treatment.

A treatment was completed for this flabby tissue ridge following window technique. The impression technique which will compress the non-flabby tissue to obtain support and at the same time will not displace flabby tissue providing a good peripheral seal. If the flabby tissue is compressed during conventional procedure it will tend to recoil and dislodge the resulting denture. Other techniques: 1)one part impression technique (Selective perforated tray): used when degree of mucosal displacement is minimal. Primary impression made with alginate and final impression is made using impression plaster or low viscosity silicone. 2) Palatal splitting using a two tray system: 1964 Osborne, palatal tray impression was made with ZOE and for 2nd tray material used was silicone. 3) Selective pressure flame: it is a muco-compressive technique without displacement. The primary impression is made with alginate or impression plaster. The special tray is constructed and the material overlying firm denture bearing area is softened with a flame before tray is seated under heavy force attempts to replicate functional force and functional impression made with ZOE. 4) Two part impression technique: Mucostatic and muco-compressive combined described by Osborne. Primary impression was made and special tray was constructed with flabby tissue uncovered. Border moulding done and impression of firm supported mucosa is recorded with ZOE paste or medium bodied silicone. Impression of displaced area recorded by impression plaster or light bodied silicone. Rim handle design also plays a role.

Few authors states that the Excision of flabby tissue is contraindicated where little or no alveolar bone remains. The prognosis is questionable if bone augmentation is done. There is also other school of thoughts that retaining this
fibrous tissue provides a cushioning effect and reduces trauma to the underlying bone but after removal the retention is adversely affected because of decrease in sulcus depth and also increase the bulk of the denture base which increases the weight of the prosthesis. It is argued that for conventional prosthodontics retaining a tissue and providing a substantial retention for denture base is more desirable than no ridge at all.

For the elderly patient who are not interested in surgical procedures such as excision of flabby tissue and implants the other alternative such as modification in impression technique can be carried out. For the elderly 82 years patient as he was unable to sit on the dental chair for longer time and the dentures was fabricated within short time using window techniques solved his problems and made patient happy. Hence, management of flabby tissue with modification in impression technique can be one of the best treatment approaches. The advantage of this technique is to check for sequester of peripheral seal and its extension into sulcus before recording the displaceable tissue in static condition.

Conclusion:
A sound knowledge and operator skill is mandatory for choosing an impression technique for successful restoration. The selection of technique should be based on location and extent of unsupported tissues.

Reference:

Conflict of Interest declared: Nil
A SIMPLE TECHNIQUE TO LOCATE ABUTMENT ACCESS HOLE IN CEMENT RETAINED IMPLANT CROWNS: A CLINICAL TIP

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ABSTRACT:

This article highlights a simple technique to gain access to abutment screw through the cement retained crown with a high degree of predictability.

Keywords: Access hole, cement retained implant crown, Putty index

INTRODUCTION:

The prosthetic phase of implant therapy involves fabrication of either cement retained or a screw retained prosthesis. Abutment screw loosening is one of the most common technical complications encountered, which necessitates the operator to access the abutment screw through the prosthesis for either removal or replacement. Several authors have mentioned different methods of gaining access to the abutment screw hole. Doerr and Tarlow described a method to gain access by using a vacuum formed matrix with access holes corresponding to abutment positions. Hill described the fabrication of a putty index for the same purpose. Schwedhelm and Raigrodski described a procedure which involves staining of the occlusal surface of the ceramic crown at the area corresponding to access hole location. Wadhwani et al. described a procedure for fabricating a custom-made and precision implant-locating device to record the access position of the abutment screw. Patil and Patil suggest preservation of the occlusal photograph of the restorations (indicating the access points) placed on a definitive cast in the form of a computer file and transferring this to the patient’s e-mail or social networking account. Most of the above mentioned methods are either cumbersome to fabricate, technique sensitive or require additional armamentarium and instrumentation. The current technique involves the use of an orthodontic wire along with a PVS putty matrix which enables the operator to easily and accurately locate the screw access hole intraorally.

Procedure:

Record the impression using a suitable technique (open tray or closed tray) and material and attach the laboratory analogue to the impression coping. Pour the impression after application of gingival mask. Retrieve the cast, attach the abutment to the analogue and perform the necessary
modifications, following which a crown is fabricated on the abutment. Once the crown is ready, unseat the crown from the abutment on cast and a 21 gauge wire is used to create a small loop of 2 mm diameter with wires extending about 10 mm from both arms of the loop.

The loop is then adjusted such that it corresponds with the occlusal aspect of abutment screw access hole with the wire positioned above the level of the prosthetic crown. (figure 1)

![Fig.1 A loop of orthodontic wire corresponding to the access hole on abutment.](image1)

Once this position is fixed and stabilized using pattern resin on the arms of the loop extending on adjacent teeth, the crown is replaced back on the abutment and the putty index is fabricated on the crown and the adjacent teeth covering both buccal and lingual sides.

![Fig.2 silicone putty embedding the orthodontic wire with the final crown seated in position.](image2)

Any excess putty covering the wire and the occlusal surface is cleared over the loop. This putty index is then preserved for future reference.

The technique presents advantages in terms of ease of fabrication, use of materials and accuracy of location of the access hole. Poor relocation of the access hole may lead to non-usage of the crown or rather damage to the underlying abutment itself which may necessitate usage of a new abutment and crown. This is especially true with regard to abutment screw retightening or replacement which does not involve any physical damage to the crown or abutment thereby not warranting their replacement. Operator does need to preserve the index which necessitates a certain amount of care in terms of record maintenance.

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