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A DIAGNOSED MENIERE'S DISEASE (MD) CASE, WAS EVALUATED WITH A DIGITAL OCCLUSION ANALYZER AND TREATED WITH DISCLUSION TIME REDUCTION (DTR) THERAPY.

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Abstract:

Meniere's Disease/Tinnitus (MD) remains a significant challenge to diagnose and treat effectively. This case report intends to assess the measured influence of DTR (Disclusion Time Reduction Therapy) treatment in patients diagnosed with Meiners disease. A patient suffering from Tinnitus and diagnosed by ENT specialists was referred to our dental office to look for any dental component that could be a point of concern. The Meiners symptoms of ear fullness, vertigo, and tinnitus before DTR reduced post-treatment significantly in intensity, duration, and frequency and correlated to symptom improvements or resolution at post 1 month and 3 months. Occlusal forces and timing were the major contributors to the Tinnitus/MD condition in this patient. Menier's disease may have an unnoticed occlusal etiology in long Disclusion Time. Disclusion Time Reduction therapy should be considered a treatment option in patients diagnosed with MD.

Key Words: Tinnitus, Meniere's Disease (MD), Immediate Complete Anterior Guidance Development (ICAGD) Coronoplasty, Vertigo, Disclusion Time Reduction (DTR).

Introduction:

There is a debate in the health field that excessively unbalanced occlusal forces produced during mastication and other functions can induce hearing problems. [1] Costen reported in 1936, that loss of posterior teeth support would predispose subjects to shift the mandibular condyles posteriorly against the tympanum putting compression on the eustachian tube, the auriculotemporal nerve, and/or the chorda tympani. [2,3] The research question is, does unbalanced occlusal force induce ear symptoms?

Quite a lot has been published on Meniere's Disease (MD), Prosper Meniere over 150 years ago [4] first identified this problem and even today; diagnosing and treating MD among clinicians still remains challenging. [5-10] Still there is no agreement on the etiology of MD, as it relates to endolymphatic hydrops. [9-16]

Kerstein's published study theorized that masticatory muscle hyperactivity during oral functions and parafunction due to prolonged mechanoreceptor compressions in the periodontal ligament (pdl) of posterior teeth may lead to signs and symptoms of temporomandibular dysfunction (TMD). [17] In the last 3-4 decades, the development of biometric tools for digital analysis of occlusal forces, electromyography of masticatory muscles, joint vibratography for temporomandibular joints, study of mandibular movements using a kinesiograph helped reveal the unknown terrain of influence of occlusal forces. [18-22] TMD symptoms such as primary headaches, hearing loss, tinnitus, ear pain, pain around the eyeball, neck pain, and facial pain are the main ones. A study by Lee et al shows that unilateral mastication was associated with hearing loss at different frequencies. [23] A study by Di Berardino et al and Peroz showed that tinnitus symptoms are more frequent in patients with occlusal disorders. [24]

Objective occlusal measurements performed with digital occlusal technology (T-Scan 10/BioEMG III; Tekscan, Inc., S. Boston, MA USA; Bioresearch Assoc., Milwaukee, WI, USA) (Figure 1) revealed that there was an imbalance of occlusal forces and the presence of prolonged exclusion time (DT) bilaterally. The patient chose to correct the underlying abnormalities of occlusal function, which significantly improved MD/tinnitus symptoms, including the return of previous hearing loss, as verified by audiometric testing after occlusal treatment.

Case Report:

A patient diagnosed with Tinnitus/Meniere's disease (MD) by an otolaryngologist (ENT) was evaluated in our dental office, which offers specialized Disclusion Time Reduction therapy for patients with temporomandibular dysfunction (TMD). The patient had gone through magnetic resonance imaging (MRI), which ruled out auditory neuromas.

The dental practice was located at Raja Rajeshwari Dental College, Department of Orofacial Pain in Bengaluru, India. The Otolaryngology Department of Raja Rajeshwari Medical College referred this patient who met for dental evaluation.

Informed consent was obtained for the patient undergoing DTR coronoplasty and for the collection of data on the severity, frequency, and duration of tinnitus/MD symptoms from questionnaires. An oral health history was also obtained where the patient reported having MD symptoms such as ear fullness, tinnitus, vertigo (including drop attacks), and hearing loss in at least one ear.

Before Immediate Complete Anterior Guidance development (ICAGD), the participant underwent an excursive evaluation of right and left exclusive movement using synchronized T-Scan 10/BioEMG III technologies (Tekscan Inc., S. Boston, MA USA; Bioresearch Assoc., Inc. Milwaukee, WI, USA) (Figure 1).

Figure 1: T-Scan 10/BioEMG III measuring the temporalis (red leads) and masseter muscles (green leads) in real-time. Subjects closed firmly into their Maximum Intercuspation Position (MIP) and clenched their teeth together for 1- 3 seconds.

Description of DTR Therapy with the ICAGD Coronoplasty:

Clinical MIP photographs of the subject and her right and left excursive occlusal relationship were obtained prior to any ICAGD. Pre-treatment day 1 recordings were collected, right and left excursive T-Scan/BioEMG recordings and pre-treatment exclusion durations (DT) and excursive electromyography (EMG) levels were recorded for comparison with DT and EMG values after ICAGD (Figure 2).

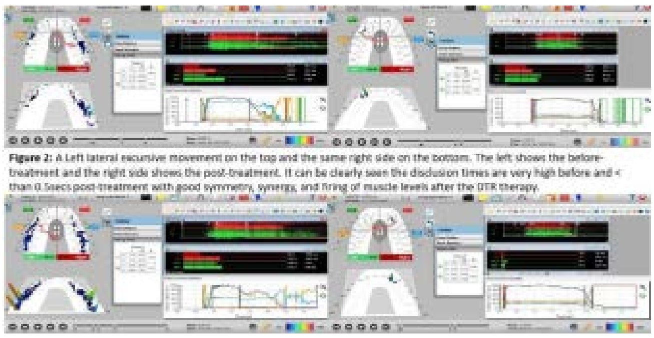

Figure 2: A Left lateral excursive movement on the top and the same right side on the bottom. The left shows the before-treatment and the right side shows the post-treatment. It can be clearly seen the disclusion times are very high before and < than 0.5secs post-treatment with good symmetry, synergy, and firing of muscle levels after the DTR therapy.

ICAGD occlusal corrections were performed in 2 phases:

• **ICAGD Phase I adjustments** –The patient's teeth were air-dried, and then the patient closed into the maximum intercuspal position (MIP) with an inserted articulation paper (Arti-Fol® Red, 8μ, Bausch, Germany); to initiate a right outward excursion into the right incisal edges of the canine, then slip back into the MIP and make a left excursion to the incisal edges of the left canine and then slide back into the MIP. Pre-treatment T-Scan/BioEMG recordings led to the correction of extended excursive contacts, as marked with articulation paper, using finishing burs (Mani Dia-Burs, Japan) leaving the central fossa, tip, and marginal ridge contact points.

• **Phase II** – Modifications to the usual closure at MIP. After all posterior quadrants underwent ICAGD, the subject performed unguided mandibular closures to MIP. All high-force contacts were refined until the new MIP felt "comfortable". When only the contacts in the MIP remained and the trajectory of the center of force rested on the midline of the arch, indicating that there was good occlusal balance, the closure adjustments were complete.

Post-therapy recordings were taken in the same manner as before treatment to confirm that the excursion times were correct (Figure 2). Patients were followed up on day 1, one month, and 3 months to refine the above procedure. This allowed the muscles to heal after occlusal corrections. The patient completed new questionnaires at each of the 3 visits regarding frequency, duration, and intensity of symptoms.

Vertigo, Tinnitus, and ear fullness symptoms, duration, and frequency decreased from baseline to 3 months post-DTR. The disclusion time (DT) was reduced to less than the neurophysiological level of <0.5sec and the symmetry, synergy, and firing of Muscle EMG levels were neuro-physiologically healthy as measured by EMG.

Discussion:

The findings of this patient confirmed previous clinical reports on MD (Sutter, 2016, 2019) in that shortening the lateral excursive time with ICAGD resolved many MD symptoms within a short period of time lasting up to a 6-month observation period." Perhaps the reason the disease is so mysterious is that medicine and dentistry have been "looking under the wrong rocks for answers."

This presented case report supports the concept that, rather than separate entities, MD and malocclusion are one disease process with two different diagnoses depending on which practitioner confirms the diagnosis; otolaryngologist or dentist. Viewing and treating the true etiology of MD can prevent the recurrence of symptoms as well as the progression and worsening of the disease process. The authors suggest that the Academy of Otolaryngology-Head and Neck Surgery adopt a symptom screening protocol to include Meniere's disease (MD) in the scope of temporomandibular disorders (TMD) to avoid unnecessary treatment and waste of resources.

This case report confirmed the patient, diagnosed with Meniere's disease experienced reductions in the frequency, duration, and intensity of MD symptoms and muscle activity levels, after shortening the lateral excursion period, by performing computer-guided coronoplasty. Although occlusion has been overlooked as a possible etiology of MD in the medical and dental literature, the results of this study point to malocclusion, specifically bite force and bite timing, as the etiology of the symptoms experienced by this MD patient.

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REBUILDING SMILES: A JOURNEY TO FULL -MOUTH RESTORATION (CASE REPORT)

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Abstract

Full-mouth rehabilitation involves an extensive and intricate set of restorative procedures designed to modify the occlusal plane and achieve proper equilibration. The Broadrick flag is a tool traditionally used to assist in replicating tooth morphology that aligns with the curve of Spee. This case report highlights the creation and application of a custom-made Broadrick occlusal plane analyzer (BOPA) on a semi-adjustable articulator (Whipmix) to accurately determine the ideal occlusal plane orientation in full-mouth rehabilitation (FMR). Conclusion: Full-mouth rehabilitation played a crucial role in the treatment plan for this case. A custom-made occlusal plane analyzer was created and employed to restore the compromised occlusal plane, ensuring it aligned with the stomatognathic system.

Keywords: Full-mouth rehabilitation, Anterior survey point, Posterior survey point, Curve of Spee, Occlusal plane.

Introduction

In the past, individuals with severe dental issues were often subjected to full-mouth extractions, followed by the placement of complete dentures. However, advancements in technology, materials, and equipment have transformed Prosthodontics, making it easier to restore damaged mouths. Full-mouth rehabilitation involves comprehensive restorative procedures that modify the occlusal plane to achieve proper equilibration. Managing the occlusal plane is crucial in these cases. The Broadrick occlusal plane analyzer is commonly used to recreate tooth morphology in alignment with the curve of Spee, helping to prevent protrusive interferences. The Broadrick occlusal plane analyser (BOPA) is an expensive instrument and has been adapted to only a The use of the Broadrick occlusal plane analyzer is limited to certain articulator systems, restricting its broader application. To address this, a custom-made BOPA was developed for semi-adjustable articulators, allowing it to be adapted with minor modifications for any semi-adjustable articulator. This case report illustrates the fabrication and application of a custom-made Broadrick occlusal plane analyzer, which can be effectively utilized in full-mouth rehabilitation cases using any semi-adjustable articulator.

Case report:

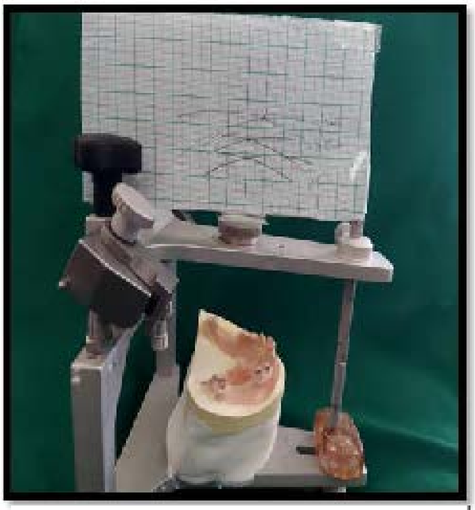
A 48-year old Female patient reported to the Department of Prosthodontics, AME's Dental College and Hospital, Raichur, Karnataka with a chief complaint of multiple missing and decayed teeth. The patient provided history of dental caries and periodontal disease and subsequent extraction of few decayed teeth. Intraoral examination revealed a partially edentulous maxillary arch mandibular arch. The missing teeth in maxilla irt 12, 22, 23 and mandible irt 46, 47 and root stumps irt 14, 16, 18 and mandible 37 and decayed irt 38. There was no loss of Vertical Dimension. Hence, only the occlusal plane was altered. The treatment for the decayed teeth was done i.e extraction of root stumps and root canal treatment of the decayed teeth. The use of a BOPA was indicated to assess and redesign the level and orientation of the occlusal plane.

The maxillary cast was detached from the articulator, and the custom-made flag was secured to the top of the articulator's upper member. The anterior survey point (ASP) was selected at the midpoint of the disto-incisal edge of the mandibular canines on both sides. From this point, a long arc with a 4-inch radius was drawn on the flag using a compass. The posterior survey point (PSP) was positioned at the anterior border of the articulator's condylar element, and a short arc was drawn from the PSP to intersect with the ASP arc. The compass needle was placed at the point where the two arcs met, and a 4-inch radius line was drawn along the buccal surfaces of the right mandibular teeth. The same process was repeated for the left mandibular teeth. A putty index using polyvinyl siloxane impression material was then made on the buccal surfaces of the mandibular teeth up to the line. Accordingly a splint was made through which the plane reduction was done.

Following which an arbitrary facebow transfer was done and bites in centric and lateral occlusion were made and mounted on a whipmix articulator accordingly.

The tooth preprations were done accordingly irt 11,12,13,14,21,22,23,24,25,26 and mandible 44,45,46,47,34,35. Implants were planned and placed irt 36,37 and rehabilitated.Temporization was done. Permanent restorations were temporarily cemented for one week, necessary corrections were made on recall appointment and then final cementation was done.

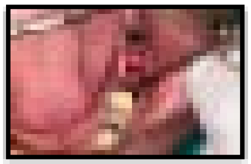
PRE-OPERATIVE EXTRAORAL AND INTRAORAL VIEWS



BROADRICK'S OCCLUSAL PLANE ANALYZER(CUSTOM MADE)

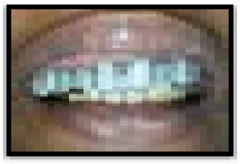
FACEBOW TRANSFER

FACEBOW TRANFER ON WHIPMIX ARTICULATOR

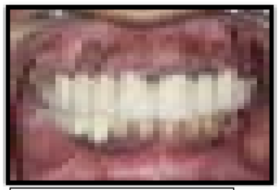


TOOTH PREPRATION DONE IRT MAXILLARY AND MANDIBULAR ARCHES

IMPLANT PLACEMENT IRT 36,37



METAL TRY-IN DONE



FINAL PROSTHESIS INTRORAL AND EXTRAORAL POSTOPERATIVE VIEW

Discussion:

The mouth is a crucial element of the stomatognathic system, and any disruption within its components can lead to malfunction. To restore proper function, reintegration of these components often requires full-mouth rehabilitation. The goal of full-mouth rehabilitation is to transform any detrimental forces acting on the teeth into beneficial forces that support normal function and promote healthy periodontal conditions. This process involves performing all necessary procedures to achieve this outcome. a healthy, aesthetic, well-functioning, self-maintaining somatognathic system. In 1963, Dr Lawson Broadrick developed an instrument to provide a guide to the most suitable position and orientation of the posterior occlusal plane. Its purpose is to permit reconstruction of the Curve of Spee in harmony with incisal and condylar guidance. Since no such apparatus was available with Dentatus semiadjustable articulator, a custom-made BOPA was fabricated, which served the following purposes in the treatment plan of the case:

(a) Preliminary determination of an acceptable plane of occlusion on the study models as an aid in treatment planning.

(b) Preliminary determination of the amount of reduction that will be required when each tooth is prepared.

(c) In the laboratory wax-up and final metal-ceramic restoration, determination of the height of each cusp tip, which helped in establishing the curve of Spee and the curve of Wilson.

The weekly follow up for two months showed no clinical signs of occlusal disharmony, no regressive changes in the teeth, maximum intercuspation in centric occlusion, no interferences in protrusive and lateral excursions. The patient reported improvement in masticatory function with the prosthesis.

Conclusion:

Full mouth rehabilitation was an imperative aspect in treatment protocol of this case. It entailed all the procedures necessary to produce a healthy, aesthetic, well-functioning, self-maintaining masticatory mechanism. A custom¬made occlusal plane analyzer was fabricated and used for re¬establishing the decimated occlusal plane in harmony with the somatognathic system. Complete treatment procedure ultimately resulted in confidence and satisfaction to the patient.

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GUIDED SURGERY FOR IMPLANT SUPPORTED PROSTHESIS USING ALL ON FOUR CONCEPT: A CASE REPORT

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Abstract:

Dental implants are widely recognized as one of the most dependable and conservative methods for replacing lost teeth. The success of implant dentistry has grown more predictable with the development of newer materials and advancements in digital technology, particularly in the areas of guided implant surgery, implant planning software, and computed tomography. This case study demonstrates the use of 3D guided technology for dental implant surgery diagnosis, planning, and execution. Dental implantologists have been studying and researching the combination of CBCT with three-dimensionally guided implant surgery employing stents, since it has opened up new avenues for the discipline. A digitally designed and printed stent is used to create an osteotomy in order to install a surgically guided implant, which has the ability to achieve the maximum degree of control, precision, and accuracy.

Keywords: Guided implant surgery, CBCT, Surgical stent, All on Four, Full Mouth Rehabilitation

Introduction:

The field of clinical dentistry has seen a significant change with the introduction of computer aided design and manufacturing (CAD/CAM) technologies, particularly in the field of oral implantology, thanks to the fast advancement of computer technology in recent years. Computer-aided design/computer-aided manufacturing (CAD/CAM) and three-dimensional (3D) computed tomography (CT) scan images have been used to create this therapeutic approach of 3 dimensionally guided implant placements. Clinicians can plan implants in the simulated three-dimensional image created from CT data by using specialized software. This helps medical professionals to create a treatment plan that takes prosthetics and anatomy into account. The computer-guided stereolithographic surgical template is then created using the desired data. Predictability, precision in implant placement, low invasiveness, and reduced post-operative pain are the benefits of the 3D guided surgical procedure. Additionally, it shortens the amount of time needed for tissue recovery as compared to traditional implant insertion techniques because the template makes it possible to place implants without raising a flap. To get the greatest clinical outcome, the accessible bone can be assessed eliminating the need for a bone graft.[1-3]
This case study describes the utilization of 3D CBCT computer-assisted diagnostics, virtual implant planning by merging the DICOM files for a prosthetic guided implant placement, the creation of a stereolithographic surgical template, and the insertion of dental implants using surgical guides at pre-planned sites.

Case report:

A 51 year old male patient presented with the chief complain of ill fitting complete denture. On thorough examination, it revealed the patient had a

set of complete denture fabricated one year prior with underextended flanges leading to poor retention. Intraoral examination revealed well rounded completely edentulous ridge in maxilla and the mandible and the inter-ridge distance was 29mm. The patient had no significant past medical history and deleterious habits.
After discussing various treatment modalities, the approach of full mouth rehabilitation using surgical stent guided implant placement was chosen.
The case was then planned and executed adhering to surgical protocols laid by the manufacturer.

Treatment planning→

An intraoral orthopantomogram and CBCT was done for evaluation and further treatment planning.

↓

The denture was tried inside the patient's mouth to verify the location of the existing acrylic teeth and their location over the ridge.

↓

CBCT data revealed inadequate bone in the posterior region of maxilla and mandible with the crest being in close proximity to the vital structures present (maxillary sinus in the maxilla and inferior alveolar nerve canal in mandible)

↓

Considering the limited amount of bone available, it was decided to place implants following the All on Four concept with mesial angulation of the maxillary posterior implants.

Scan of the prosthesis→

A CBCT scan of the existing denture was made using radio-opaque markers in the intended site of implant placement.

↓

The canine region in the anterior and first molar region in the posterior maxilla was selected to be the site of implant placement. For mandible it was the lateral incisor region and the second premolar region.

Software based planning and designing of the surgical guide→

The data of the CBCT of the hard tissue and the existing denture was merged together (DICOM on DICOM merging).

↓

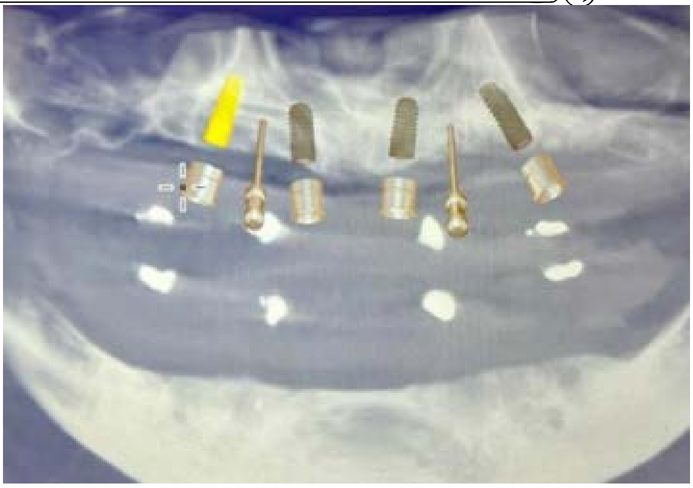
The posterior implants in maxilla were angulated mesially to bypass the maxillary sinus. The anterior implants were angulated labially according to the bone morphology.

↓

In mandible the posterior implants were planned straight and anterior implants were angulated labially. Shorter length of implant in mandibular posterior region was to bypass the anterior loop of inferior alveolar nerve.

↓

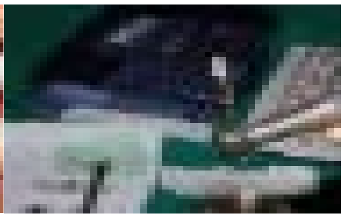
The finalised guide design was printed via a stereolithographic printer.



Osteotomy and Implant Placement:
The fit of the surgical stent was verified intra-orally prior to the day of surgery.
During surgery, the area was anesthetized and the stent was fixed using anchorage pins. The surgery was performed as per the guided instrument set in surgery cassette.
Using a tissue punch, soft tissue was scooped out and the sequence of drills was used starting with the pilot guided drill, the twist drill, final drill and the crestal drill.
Healing abutments were placed post the implant placement and the patient was kept on a therapeutic

dose of antibiotic, analgesic and antiulcerogenic drugs for a period of five days along with chlorhexidine containing mouthwash.

The patient was recalled after one month for follow-up.



Discussion:

A new approach of guided implant surgery makes use of 3D CBCT and a stereolithographic surgical template to design the final position of the implants. This helps to make implant placement easier. It is critical to comprehend the methodology and final location of implants positioned with the help of a surgical template. Even though flapless guided surgery may need less time for the surgical intervention than conventional approaches, significantly more time is spent on preoperative preparation.[1-4]

When implant placement, the freehand/conventional method yields much more errors than either static or navigation approaches. When employing a computer-assisted static system and placing the implant at the right depth, there is a noticeable increase in accuracy at both the apical and coronal positions of the implant. It leads to a smaller angulation error (<5°) and crestal and apical position variation (<2 mm). It is a noninvasive technique that results in less trauma and morbidity than freehand techniques and supports the working surgeon's improved posture.[4]

However using surgical guides in the posterior areas or in restricted mouth opening might present some difficulties because of the different drill diameters.

Since a flapless technique is frequently employed it is beneficial when the implant location is close to anatomical features such as the maxillary sinus, mental foramen, and mandibular nerve and has a sufficient thickness of keratinized tissue. Hahn claims that this approach's success rate is comparable to that of traditional methods. The accuracy and speed of treatment were given by Nickenig and Eitner, who in 2007 verified the dependability of static aided computer navigation using a flapless technique.[4]

This approach's main flaw is its inability to gauge the operative bone region and provide access. Accidental perforation on and through the crest can also result in implant failure.[4]

Conclusion:

With the current age of digital technology, the ease, predictability and success of implant placement has increased immensely. Paying due attention to the limitations, the margin of error could be reduced both during implant planning and placement. A comprehensive knowledge about the software and rationale of implant placement would provide the best results to the patient.

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QUALITATIVE AND QUANTITATIVE OCCLUSAL MARKERS: A REVIEW

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Abstract

Achieving proper occlusion is crucial for the function and health of the masticatory apparatus. Each element plays a vital role, from the alignment of individual teeth to the harmony between occlusal contacts and the positioning of condyles and mandibular musculature. Any disturbance in this delicate balance can lead to various issues, ranging from trauma and periodontal disease to bruxism and temporomandibular joint dysfunction (TMD).In clinical practice, identifying and addressing occlusa interferences is paramount. Various occlusal indicators are available to assist clinicians in this task, each with its own characteristics, sensitivity, and method of usage. These indicators can range from simple articulating paper to more advanced systems like the T-Scan.

However, it's crucial for clinicians to have a comprehensive understanding of these tools, including their limitations and proper interpretation of the markings they provide. By carefully evaluating occlusal contacts and utilizing appropriate indicators, clinicians can ensure that prosthetic replacements for missing teeth achieve optimal occlusion, thereby promoting overall oral health and function. A manual search of pertinent publications and a literature search utilizing the PubMed database. Relevant English-language articles published between January 1950 and May 2024 were taken into consideration.

Keywords: Articulating Paper; Articulating Silk; Articulating film; High Spot Indicator; Occlusal Indicators; T Scan

Introduction

Occlusal contacts arise when the mandibular and maxillary teeth come into contact with one another.[1] Noncontacts are regions where there is a 0.5-2 mm gap between the teeth, conversely, near contacts are defined as having a separation of no more than 0.5 mm between the occluding surfaces [2] The distinction between occlusal contacts, near contacts, and noncontacts is essential for understanding how the teeth come together during various movements.

"Occlusal interference" refers to any tooth contact that hinders the remaining occluding surfaces from creating harmonised and stable connections. "[3] It is necessary to eliminate occlusal interference as little as 15 µ since it may result in an unwanted result.. While data suggests that occlusal interferences are not the cause of persistent jaw dysfunction issues, they can cause tooth pain or movement.[4,5]

Since all occlusal surfaces should connect at the same period during mandibular closure, there should be a time interval of 0 s between the first and the last occlusal contact. This is known as true occlusal contact time simultaneity.[6]

Sufficient evaluation and management of occlusion are necessary to ensure optimal performance of the masticatory machinery. An array of clinical symptoms, including tooth migration, broken enamel, periodontal tissue atrophy, gingival recession, migraines, and orofacial pain, can result from irregular occlusal contacts. [7-15].

The use of occlusal indicators plays a significant role in assessing occlusion and guiding treatment. While many indicators are commonly used, their accuracy can vary, especially in determining the sequence of occlusal contacts. Using qualitative indicators may lead to false markings and misinterpretations, potentially resulting in incorrect treatment decisions such as placing restorations in infra-occlusion. The thickness, tensile strength, and flexibility of the recording substance, the oral setting, and the dentist's interpretation all affect how accurate the applied approach is. [16, 17]

Therefore, selecting the appropriate occlusal indicator is critical for achieving precise occlusal therapy and ensuring optimal dental function and patient comfort.

Types of occlusal indicators

The two main categories of occlusion indicators are qualitative and quantitative, with the primary distinction being the latter's ability to quantify tooth contact events.

Qualitative markers

• High spot indicator; articulating paper; articulating silk; articulating film; metallic shim stock film

Quantitative markers

• Virtual patient; Occlusal analysis system T-Scan

Qualitative indicators

Articulating Paper

The most widely utilized qualitative markers for intraoral occlusal contact location are articulating papers. Their differences include variations in width, thickness, and type of impregnated dye. Their nature is hydrophobic. Their main ingredients are a coloring agent and a bonding agent (like Transculase-Bausch Articulating paper) that are placed between the two layers of the film. The bonding agent adheres the coloring agent to the tooth surface while the coloring agent is released from the film upon occlusal contact. The unique marking is seen as a core region that has no colorant and a rim of dye surrounding it. Because of how they appear, this area is referred to as the "target" or "iris," and it indicates the precise site of contact. The density of these markings does not reflect the force of the contact since heavy contact tends to disperse the mark peripheral to the actual place of the occlusal contact. In significant contact areas, the interference that needs to be corrected is only visible in the middle portion.

Some writers claim that the articulation paper's markings cannot be accurately interpreted since occlusal interactions are subjectively assessed, making it impossible to pinpoint the exact timing or intensity of the contacts .[18–21] The drawback of high-quality occlusal indicators is that they cannot determine the strength and order of interactions. Some authors contend that the marking's intensity is a flawed metric for determining how strong occlusal interactions are. [18]

Utilizing two distinct articulating paper thicknesses (23 and 60 mm thick) sandwiched between articulated ivorine casts and obscured by a load cell at three distinct loads (150, 200, and 250 N), Saad et al. (2012) tested the reliability of articulating paper marking as well as the ability to describe occlusal force. The thicker paper produced more and larger markings, according to the scientists, while an increase in the applied weight had no discernible effect on mark size. They also mentioned that the professional needs to use "acumen" in order to interpret the marks subjectively and distinguish between false positives and true occlusal contact. [22]

600 paper marks produced by applying increasing occlusal pressures to articulated epoxy casts (between 0 and 500 N) were examined by Carey et al. in 2007.[23] According to the scientists, there was a significant variation in mark sizes for every test load, indicating that many mark sizes could be indicative of a single load. Additionally, they showed that no one tooth's mark area size increased in proportion to a little increase in load. Rather, they noticed that the articulating paper mark areas occasionally shrank in size when subjected to higher stresses. Ultimately, they discovered that the load that was applied and mark size only agreed by 21%, indicating a low likelihood of equal loads being displayed by marks of the same size.

Figure1: Bausch Articulating paper of various shapes

Source Courtesy: Bauschpaper.com

Articulating Silk

Articulating silk is composed of a color pigment that has been micronized and mixed with an emulsion of wax and oil. It is effective when used intraorally and does not generate pseudomarkings during use due to its soft texture. But as stain components dry, they lose their capacity to mark, and saliva can damage them. Therefore, it is imperative that it be stored in a cold, dry place. On highly polished surfaces, such as gold and ceramic in lab models, one strip can be used up to ten times, making it the

perfect tool for the job. Some researchers claim that the most effective way to register occlusal interactions is by silk articulation.[24,25]

Figure 2: Bausch Articulating silk

Source Courtesy: Bauschpaper.com

Articulating film: The thickness of the Bausch Inc. Artifol articulating film is just 8 μ, far less than the patient's threshold for perceptual thickness. It is composed of a 6 μ thick hydrophobic emulsion encased in a polyester film. It must be used with specific holders in a dry environment. It works on lab models as well as intraorally and is generally applicable.

Figure 3: Bausch Articulating Film

Source Courtesy: Bauschpaper.com

Metallic shim stock film: One side of the film is colored coded, while the other has a metallic surface. It is mainly advised for use in occlusal splint therapy so that the lab can accurately mark the contacts on the soft splint.

Figure 4: Bausch Arti-Fol

Source Courtesy: Bauschpaper.com

According to Sharma et al., articulation foil is the thinnest occlusal indicator and registers occlusal interactions between teeth more accurately than paper and silk. [26] Using the Shimstock foil, it is possible to determine whether the antagonist teeth are in contact with one another. [27] A perfect occlusal registration strip, according to Halperin et al. (1982), should be thinner than 21 lm, as this is the average proprioception of patients who present with normal dentitions.[28]

High spot indicator: This liquid indicator is recommended for use in laboratories to examine the proximal contacts . Using a brush, the liquid is applied to the coping's proximal surface, creating a

3 μ thick film. The proximal contact area is recognized as a show-through area in the base material of the crown upon removal once the dye has been seated in the cast.

Figure 5: High Spot Indicator

Source courtesy: Yeti Dental

The two-phase occlusion indication method: This technique uses the articulating paper and articulating film in succession to accurately and clearly identify the actual interference locations. The articulating paper is used to first designate the contacts as a distinct central zone surrounded by a peripheral filled with dye. In the next phase, articulating foil in a contrasting color is used to identify the contact locations in the midst of the contact areas indicated by the earlier articulating paper markings. The core portions indicated by the articulating foil are the actual interferences that need to be eliminated.

Choosing the Qualitative Indices

The majority of patients perceive thickness at a level lower than the parameters to be taken into account when choosing these qualitative indicators.[29] This will enable the centric occlusion mounting on a hinge articulator, the occlusal contact of freshly restored teeth, and the establishment of the contact of unrestored teeth, as well as the occlusal precision of wax-ups..[30]

Locating the working and balancing interferences is another use for it.

• Thickness - Even in cases when there is no tooth contact between opposing teeth, registration strips can indicate tooth contact when their thickness exceeds the space between the teeth.[31] Furthermore, an overabundance of thickness may trigger a proprioceptive reaction, which may displace the jaw.

• Plastic deformation: Dentists can yank at occlusal registration strips with plastic deformation to assess occlusal contact since the strips will stretch before tearing.

Tensile strength: While thinner strips would rupture before they could be used, those with plastic deformation will stretch before ripping.

• Marking ability: The coloring material ought to adhere to the tooth upon occlusal contact. The occlusal registration strip should be thin and flexible. Marking sensitivity ratings are highest for articulating foils and lowest for articulating paper. The teeth should be dried before using the registration strips because it has been discovered that saliva negatively affects the marking capabilities of all qualitative recording media.

Quantitative indicators

T-Scan

The T-Scan occlusal analysis system (Tekscan), a Microsoft-compliant system, has the ability to record a specific contact sequence in intervals of 0.01 seconds. It is made up of a sensor handle, a piezoelectric foil sensor, and hardware and software for data recording, analysis, and visualization. The distribution and time magnitude of the occlusal contacts are determined by the T-Scan.

In any circumstance when bilateral simultaneous occlusal contact is required, this device is advised. Complete dentures; Fixed or removable partial dentures; FPD-only complete arch reconstruction; full arch reconstruction utilizing implants; disclusion time reduction; occlusal splints; and mandibular repositioning devices.

The T-Scan system was deemed the best clinical instrument in 2016 by Afrashtehfar and Qadeer for the diagnosis of occlusion because it documented the distribution of contacts rapidly and accurately .[19]When utilizing the T-Scan system, the dentist obtains data that enables precise occlusal modification. [32,33]

Figure 6: Tekscan T - Scan

Souce courtesy:Tekscan

Virtual Dental Patient

This is a freshly developed idea in which the patient's dentition cast data is scanned to create a three-dimensional dental model. This offers quantifiable data that can help determine the occlusal interferences and evaluate his chewing performance. Furthermore, the dentist can determine how the patient's occlusion has changed over time by sequentially comparing these occlusal contacts.[34]

Discussion

Based on the average proprioception of patients presenting with normal dentitions, Halperin et al. (1982) proposed that the optimal occlusal registration strip should be less than 21 microns thick.[28] Researchers and practicing doctors alike should take note of this discovery. Clinically, since materials with varying thicknesses have been demonstrated to produce occlusal surface markings of varied regions, the thickness of the articulating paper or foil may have an impact on the capacity to find and evaluate the amount of premature contacts and interferences.[29, 31] This is clinically relevant because the final objective of any dental restoration is to be created, placed, and adjusted in

harmonious contact with the opposing dentition. The size of the markings that these materials produce can influence the need for adjustments that a clinician or laboratory technician may need to make.

Some researches claim that the most effective way to register occlusal interactions is by silk articulation. [24, 25] Some writers claim that because occlusal contacts are subjectively assessed and it is impossible to pinpoint the exact timing and intensity of their occurrence, the markings produced from the articulation paper cannot be accurately interpreted. [18–21] Because there is no scientific correlation between the depth of color and the mark's surface area, force, or amount, articulating papers are unable to detect occlusal load.[23]

Although there are literature data that indicate the strength of the contact based on stain intensity, the downside of quality occlusal indicators is their inability to detect the sequence and strength of contacts. Some authors contend that the marking intensity is a flawed metric for determining the strength of occlusal interactions. [18, 35]

According to Sharma et al., articulation foil is the thinnest occlusal indicator and registers occlusal interactions between teeth more precisely than paper and silk. [24] It is feasible to ascertain whether there is contact between the antagonist teeth with the aid of the Shimstock foil. [17] Because the T-Scan technology measures both contact duration and occlusal forces, it provides a dependable way to record occlusion. [36]

Conclusion

We have talked about the several occlusal registration indications that are accessible. Their traits and level of sensitivity distinguish how they should be used in various contexts.

1. The location and quantity of contacts can be determined using qualitative recording materials. The main reasons these materials are favored are their affordability and simplicity of use.

2. Any qualitative recording medium's ability to be marked is adversely affected by saliva; therefore, it is advised that when using intraorally, the teeth be dried before testing and that the medium be used only once.

3. Since the T-Scan technology measures the force and timing features of occlusal contacts, utilizing it to produce bilateral simultaneous occlusal contacts that are genuine and measurable is a therapeutically feasible goal.

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ENHANCING DENTURE STABILITY IN FLABBY RIDGES: A CASE STUDY ON LIQUID-SUPPORTED PROSTHETICS

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Abstract:

An ideal complete denture should be flexible, adapt well to the tissue surface, and offer proper retention, which conventional dentures often lack due to their rigidity. This rigidity leads to uneven load distribution, particularly in patients with flabby, atrophic ridges and significant bone resorption, causing discomfort and instability. Liquid-supported dentures address this issue by incorporating a flexible foil over the denture base that adapts to the mucosa during both functional and resting states. These dentures offer better load distribution, retention, and stability, while continuously adjusting to the oral environment. This makes liquid-supported dentures a superior option, particularly for managing flabby ridges, as they provide improved comfort, support, and long-term fit without the need for frequent adjustments.

Key Words: Flabby ridge, polyethylene sheet, glycerine, liquid supported denture.

Introduction:

The flabby ridge is a dental condition characterized by the presence of loose, movable soft tissue on the alveolar ridge, either in the maxilla or mandible [1]. This condition frequently arises in patients who have worn dentures for an extended period, particularly due to the gradual loss of underlying bone and trauma caused by ill-fitting prosthetics. As a result, the ridge becomes covered with hyperplastic tissue that can compromise denture stability and retention. In the edentulous patient, it is found more commonly in the anterior region [2].

Histologically, flabby ridges are made up of hyperplastic mucosal tissue, loosely arranged fibrous connective tissue, and dense collagenized connective tissue. They may also contain significant amounts of metaplastic cartilage and/or bone. This composition contributes to the mobility of the tissue, impacting the fit and stability of dentures in affected patients. Understanding these characteristics is important for effective diagnosis and management [3].

Patients with flabby ridges may have serious problems with denture stability and retention, making prosthetic rehabilitation difficult. The flabby tissue that is easily twisted during the impression process is the cause of these challenges. Surgical intervention to treat the soft tissue, implant-retained prostheses for increased stability, or traditional prosthodontics without surgery are the available treatment options for this problem. To guarantee the best results and the comfort of each patient, each strategy needs to be customized to meet their specific demands1. Most of the time, conservative management is the preferred course of treatment when surgical intervention or the use of implants are not feasible.

The use of elastic impression material to alleviate traumatized tissue was first described by Chase in 1961[4]. Nevertheless, this can only be a short-term measure. Additionally, candidal growth might be easily derived. Ideal dentures in flabby ridge conditions should be strong enough to resist masticatory pressures and have flexible tissue surfaces to lessen trauma and stress on the underlying tissues [5]. Therefore, one potential answer to this issue is a liquid supported denture.

This case report presents a liquid-supported denture for a patient with a completely edentulous maxillary arch featuring flabby tissue in the anterior region, opposing a partially edentulous mandibular arch. This method aims to enhance stability and comfort.

Case report:

A 52-year-old female patient reported to Srinivas Institute of Dental Sciences, Mangalore for replacement of missing teeth. The patient had a history of wearing a maxillary complete denture for 5 years. Her chief complaint was the poor fit of the denture and it felt loose while eating. She gave a history of using denture adhesive. Missing mandibular teeth were not replaced by any prosthetic treatment. By intraoral examination, a completely edentulous maxillary arch with flabby tissue existing in the anterior region and a partially edentulous mandibular arch were observed (Fig. 1a, 1b, 1c).

Fig. 1a

Fig. 1b

Fig. 1c

Keeping the various challenges associated with the case, clinical steps and treatment plan was modified to suit the patient's need. It was decided to give a maxillary complete denture (liquid supported) opposing a mandibular removable partial denture.

A Preliminary impression was made with alginate material using perforated edentulous stock trays. A maxillary cast was poured and the flabby ridge area was marked, followed by fabrication of custom tray [spaced (2 mm), tissue stops] with two posterior handles. The tray was tried in the patient mouth and the flanges were adjusted to be 2 mm shorter than the depth of sulcus using a slow-speed motor and carbide acrylic trimming bur. Border molding was performed using the conventional technique with green stick impression compound following which a maxillary (Fig. 2) & mandibular secondary impression was made using zinc oxide eugenol paste. Pickup impression was made of mandibular arch using alginate impression material in relation to mandibular arch.

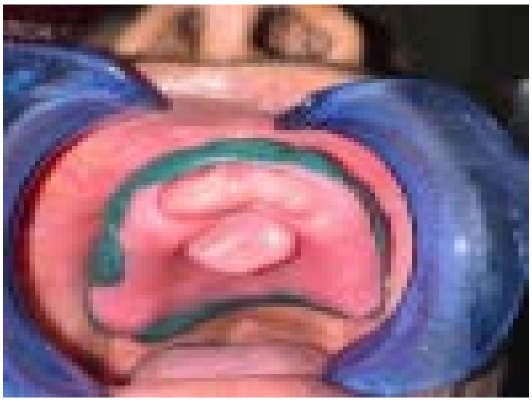

Fig. 2

The impression was evaluated carefully for defects and any excess material on the periphery was removed. In addition, the impression material in the area of flabby ridge was carefully removed using scalpel blade. The maxillary secondary impression was re-seated in the patient's mouth and type II dental plaster was placed in the flabby window region and master cast was obtained (Fig. 3a, 3b).

Fig. 3a

Fig. 3b

Jaw relations were recorded. Teeth were set and the try in procedure of the waxed denture was done (Fig. 4).

Fig. 4

The upper denture design was modified to make a liquid supported denture. Lower removable partial denture was acrylized using conventional procedure.

Steps in Fabricating a Liquid Supported Denture:

A 1 mm thick vacuum heat-pressed polyethylene sheet was adapted to the master cast (Fig. 5), ensuring it was 2 mm short of the sulcus and did not extend into the post-palatal seal (PPS) area. This sheet was incorporated into the denture during the packing stage.

Fig. 5

The upper complete denture, incorporating the 1 mm thick sheet, and the lower removable partial denture were fabricated (Fig. 6a) and delivered to the patient (Fig. 6b).

Fig. 6a

Fig. 6b

The patient was then recalled after two weeks to convert the denture into a liquid-supported version, allowing for an assessment of the patient's comfort with the polyethylene sheet.

At the recall appointment, the 1 mm thick spacer sheet was removed from the denture, resulting in crevices along the borders. These crevices facilitated the final placement of a 0.5 mm thick sheet (Fig. 7a). An addition silicone putty impression of the tissue surface was made (Fig. 7b), and a cast was created to accurately record the junction of the sheet and denture (Fig. 7c). A 0.5 mm thick polyethylene sheet was then vacuum pressed onto this cast, replacing the 1 mm sheet and creating a 0.5 mm space (Fig. 7d).

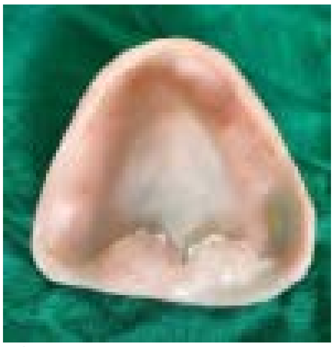

Fig.7a

Fig. 7b

Fig. 7c

Fig. 7d

The polyethylene sheet was cut using the putty index as a guide. The borders of the 0.5 mm thick sheet were positioned in the crevice created by the removal of the 1 mm thick sheet.

Cyanoacrylate adhesive and auto-polymerizing acrylic resin were used to seal the borders, preventing any leakage of liquid (Fig. 8).

Fig. 8

The space created by replacing the 1 mm thick sheet with a 0.5 mm thick sheet was filled with glycerine. Two holes were made in the buccal flange area for glycerine injection, while monitoring the vertical dimensions. After filling, the holes were sealed with self-curing acrylic resin to prevent leakage and maintain the denture's integrity (Fig. 9).

Fig. 9

The upper liquid-supported denture was delivered, and the patient received care instructions, including cleaning the tissue surface with a soft cloth. Recall appointments were scheduled for 1 day, 1 week, 1 month, and 3 months. At the 1-week appointment, the patient reported a floating sensation. However, by the 3-month recall, the patient was comfortably using the denture, which was well maintained (Fig. 10a, 10b).

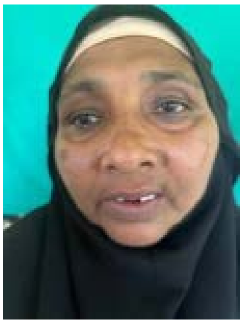

Fig. 10a: Pre-Operative

Fig. 10b: Post-Operative

Discussion:

The liquid supported dentures feature a flexible, liquid-filled base that provides a cushioning effect to the underlying mucosa. They continuously adapt to the resorbing ridge, maintaining a close fit over time [6]. The principle behind this design is that a liquid-supported denture meets the requirements outlined in the introduction. The denture base is covered with a pre-shaped, snug-fitting, flexible membrane that holds a thin layer of liquid in place. This design acts as a continuous reline for the denture, offering advantages over traditional denture designs by ensuring a better fit and comfort. When no forces are exerted, the sheet returns to its pre-shaped form, set during the manufacturing process. The liner acts like an elastic "tissue conditioner," preserving the original contours of the denture and ensuring that its shape and fit remain stable over time [7] (Fig. 11). When masticatory forces are applied, the foil adjusts to the altered shape of the mucosa due to the hydrodynamic plasticity of the liquid beneath it. In this state, the liner behaves like a "soft liner," providing comfort and adaptability. Once the forces are removed, the foil returns to its original shape.

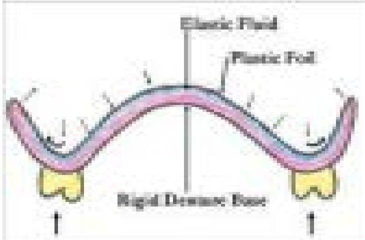

Fig. 11

In addition to combining the advantages of tissue conditioners and soft liners, this type of denture ensures optimal stress distribution during masticatory functions. Biting forces, including those from bruxism, are spread over a larger surface area, reducing pressure points and preventing overloading of the supporting tissues. Vertically directed loads are redistributed in other directions by the liquid, minimizing localized stress on the tissues. This pressure distribution could also help alleviate issues around the mental foramen in a resorbed mandible, potentially slowing and evening out residual ridge resorption over time [8].

The main challenges in this case were related to combination syndrome, caused by the unfavourable distribution of forces leading to adverse tissue changes. These issues were addressed by modifying the impression techniques and fabricating an upper liquid-supported denture alongside a lower removable partial denture. This approach helped achieve better force distribution and minimize tissue damage.

Precautions:

- The denture base should have a minimum thickness of 3 mm for optimal strength and durability.
- A proper seal is essential to prevent microleakage.
- Patients should be provided with detailed denture care instructions.
- Repairs to the denture are feasible when needed.

In this case, a polyethylene thermoplastic clear sheet was selected due to its softness, flexibility, and biocompatibility. Glycerine was used as the liquid component because it is colourless, odourless, viscous, and biocompatible, making it ideal for supporting the denture base.

Conclusion:

Liquid-supported dentures represent a significant advancement in prosthodontics, particularly for patients with challenging anatomical conditions such as flabby ridges. By utilizing a flexible, liquid-filled base, these dentures ensure optimal retention, stability, and patient comfort, addressing many of the shortcomings associated with conventional complete dentures. Their unique characteristics, including plasticity and elastic recovery, facilitate better adaptation to the oral environment, thereby preserving existing tissues and enhancing overall function. As a result, liquid-supported dentures not only meet the aesthetic and functional needs of patients but also align with modern prosthodontic principles, emphasizing the importance of preserving what remains. This innovative approach ultimately leads to improved patient satisfaction and quality of life.

Source of Support:

Nil

Conflict of Interest:

None declared.

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LOW DENSITY BONE MANIPULATION USING OSSEODENSIFICATION APPROACH: A CASE REPORT

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Abstract: Low density regions such as Maxillary posterior region still may pose certain challenges for rehabilitation using implant supported prosthesis. It is difficult to achieve high primary stability in such areas due to the low density of the bone and thus also prevent immediate loading in such areas. Various techniques have been utilised to increase the primary stability in low density bone areas. Bone manipulation approaches such as osseodensification have shown optimum results in cases where there is deficient bone. This case report describes the use of osseodensification drilling approach to achieve high primary stability to ensure successful immediate loading of the implant.

Key words: Implants, Osseodensification, Primary stability, Immediate Loading

Introduction

With new emerging trends and concepts, the field of oral implantology is an evolving branch of dentistry. A vital feature to achieve osseointegration of implants is high implant primary stability, which is correlated to surgical technique, density of bone, implant surface texture. Bone density being one of the major factors affecting it. [1] In desire to achieve osseointegration with a higher primary stability of the implant, a technique has been introduced called as Osseodensification. Osseodensification is a technique of preparing an implant site by condensing or densifying the bone, which is in contrast to the normal osteotomy preparation. The non cutting, condensing action of this technique results in a higher density bone. [2 This case report aims to describe the technique of osseodensifcation using specifically designed burs to achieve a prerequisite primary stability.

Case Report

A 45 year old female reported to the Department of Oral Implantology with a chief complaint of missing upper posterior tooth. A thorough examination of the patient and the area of interest was done. Relevant medical and dental history along with required blood investigations were recorded. A thorough treatment planning was done. It was concluded according to various factors to place an implant in the area of interest.

Maxillary posterior region comprises of D3/D4 bone (Misch Classification of bone) which is highly porous and of poor quality. To enhance the primary stability of the implant placed, it was decided to follow the osseodensification technique. Specially designed Densah burs by the Versah company were used for implant site preparation. Densah burs are multi -fluted tapered burs which help in preserving the bone by condensing the bone, accomplished by their counterclockwise rotation.

A prophylactic antibiotic therapy ((Amoxicillin 500mg+Clauvulanate 125 mg offer) was given to the patient before the procedure, one night before and on the day of the procedure. The surgery was performed in a sterile minor operation theater. The patient was prepared for the procedure by painting a Povidone-Iodine solution(betadine) that acts as a disinfectant. Surgery was performed after administration of Lignospan special (2% Lidocaine with 1:80,000 Adrenaline) for local infiltration anesthesia.

After administration of local anaesthesia, mid crestal incision was placed and full thickness mucoperiosteal flap was elevated. Sequential osteotomy preparation using Densah burs was performed. Implant (Ankylos) of 3.5mm diameter and 14mm length was placed. Resonance frequency analysis using Ostell Mentor unit was done to assess the implant stability quotient, which gave a reading of 78 ISQ. Standard abutment of diameter 3mm and gingival height of 4mm was placed and torqued manually followed by immediate loading of the implant with a temporary prosthesis (3 M ESPE, Protemp 4). Post operative instructions were given and patient was recalled after 7 days for suture removal.

At follow up session after three and six months respectively, the abutments were untorqued and the Smartpeg was re-inserted and stability was evaluated. A radiographic assessment was also done at each follow up session. After six months of implant placement, a closed tray, abutment level impression was made with putty and light body (Aquasil putty and light body, Dentsply India) and the impression was sent to the laboratory with the laboratory analogue. Metal ceramic crowns were fabricated in physiologic occlusion and cemented using Zinc phosphate cement (De Tray® Zinc).

Discussion

Osteotomy preparation for the dental implant site preparation can greatly influence the primary and secondary stability of the implant. Primary stability is the biometric stability achieved immediately after implant insertion. It can be influenced by various factors such as bone quality and quantity, implant geometry, implant surface. [3] Various techniques have been previously used to achieve a greater primary stability include undersizing of the osteotomy, bone condensation using osteotomes. Surgical instrumentation using specially designed Densah burs to increase bone density while extending an osteotomy.They work by compacting the wall around the implant site preparation and by forming an 'implant lamina dura'. [4] Higher resonance frequency values were reported after implant placement using the osseodensification technique in the above clinical report, suggestive of higher primary stability achieved. As the prerequistes were attained, immediate loading of the implant was followed. Immediate loading of the implants has been associated with better patient comfort and reduced treatment time.

In poor density bone such as maxillary posterior region, osseodensification can be used to achieve a greater primary stability. A higher primary stability has been associated with a faster osseointegration of the implants in the literature by preventing any micromotion. [5]

According to the results obtainedin a systematic review done by periera et al in 2023, the OD technique has advantages over the SD and osteotome techniques in terms of primary implant stability, bone density, BIC, and clinical success of the implants. [6]

In addition, the OD technique can allow for additional procedures such as maxillary sinus elevation, narrow alveolar ridge expansion, and post-extraction implants. The patient comfort is also a consideration for selection of densah burs,rather than the usual mallet and osteotome technique. Patient are more accepting and calm of these burs.various studies have shown that the risk of tinnitus is comparatively less while using this method.[7] Osteotomy preparation for the dental implant site preparation can greatly influence the primary and secondary stability of the implant. Primary stability is the biometric stability achieved immediately after implant insertion. It can be influenced by various factors such as bone quality and quantity, implant geometry, implant surface. [3 Various techniques have been previously used to achieve a greater primary stability include undersizing of the osteotomy, bone condensation using osteotomes. Surgical instrumentation using specially designed Densah burs to increase bone density while extending an osteotomy. They work by compacting the wall around the implant site preparation and by forming an 'implant lamina dura'. [4]

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Conclusion

This case report suggests that when used in low-density bone, maxillary posterior area,densah burs have shown positive outcome by increasing primary stability, bone–implant contact, and clinical success. However, the studies must be conducted to evaluate the limitations and biases.

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