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ISSN 0975-6329 Heal Talk

Heal Talk

A Journal of Clinical Dentistry

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M-14 | Estd 2008 | E- Journal : www.healtalk.in | myhealtalk@gmail.com | Volume 16 | Issue 03 | January - February 2024 | Price ₹ 100/-

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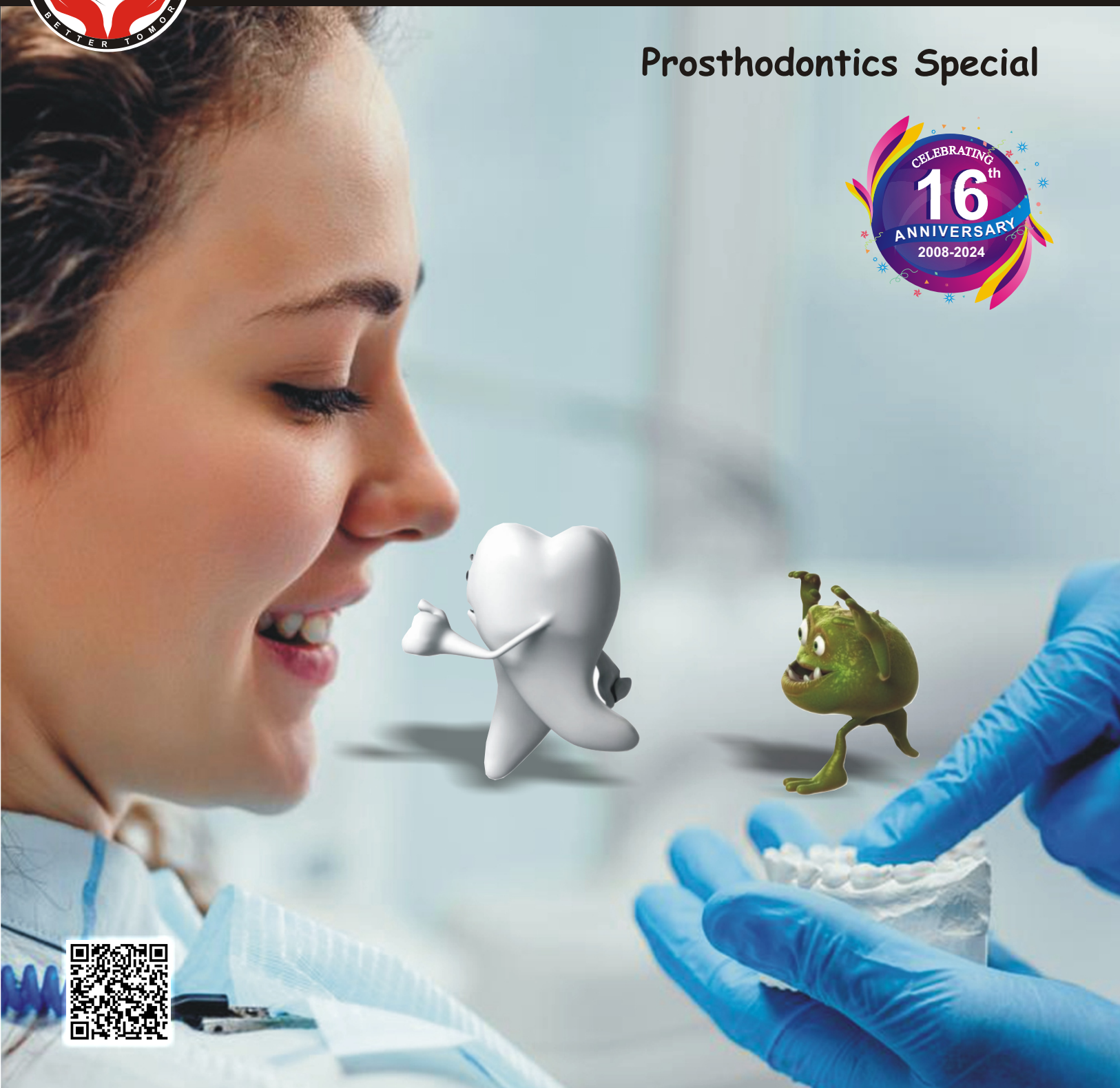

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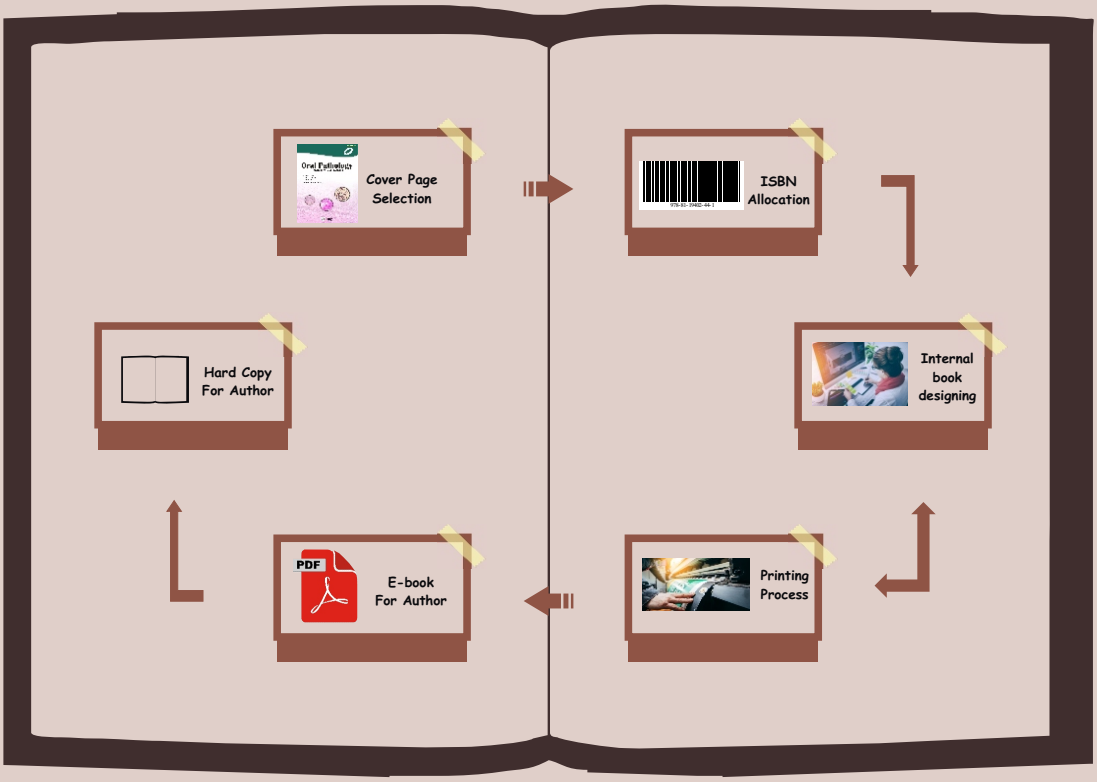

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A Journal of Clinical Dentistry

EDITORIAL

From The Desk of Guest Editor....

Embracing the Future: Impacting Technologies and the Futuristic Practice of Prosthodontics

In the ever-evolving landscape of Prosthodontics, where precision meets artistry, a profound transformation is underway—a metamorphosis fueled by impacting technologies.

This guest editorial embarks on a journey to unravel the intricacies of "Impacting Technologies and the Futuristic Practice of Prosthodontics."

We delve into the realm where cutting-edge innovations converge with clinical expertise, reshaping the very essence of patient care. From digital prowess to artificial intelligence, this exploration delves into how these advancements serve as not merely tools but as catalysts propelling Prosthodontics into a future defined by precision, accessibility, and unparalleled patient-centricity.

Advancements in Digital Prosthodontics:

The integration of digital technologies has redefined the precision and efficiency with which prosthodontic solutions are designed and implemented. Digital impressions, once considered groundbreaking, are now commonplace, providing a more comfortable and accurate alternative to traditional methods. The adoption of computer-aided design and manufacturing (CAD/CAM) techniques further amplifies the potential for customization and precision in prosthodontic restorations. From crowns to bridges and dental implants, the digital workflow streamlines the process, ensuring optimal fit and functionality.

In the nascent stages of my practice, I vividly recall the transformative impact of providing a complete denture to a completely edentulous patient. Witnessing the restoration of a beautiful smile brought immense satisfaction both to the patient and myself. However, the landscape of prosthodontics underwent a paradigm shift over the subsequent 15 years with the advent of dental implants. In the same patient who had minimal systemic concerns, the transition from a conventional denture to an implant-supported denture marked a remarkable evolution. The heightened level of satisfaction and contentment expressed by the patient served as a testament to the profound advancements in dental technology.

The ability to offer a more stable, functional, and aesthetically pleasing solution through implant-supported dentures not only underscored the progress within the field but also reinforced the commitment to enhancing the quality of life for those seeking prosthodontic care.

3D Printing and Customization:

Perhaps one of the most revolutionary advancements, 3D printing has significantly contributed to the realm of prosthodontics. The ability to craft patient-specific prostheses, implants, and even temporomandibular joint (TMJ) devices with meticulous detail has ushered in an era of unparalleled personalization. This not only enhances the aesthetic outcomes but also addresses unique anatomical variations, fostering improved patient comfort and satisfaction.

Artificial Intelligence in Treatment Planning:

The advent of Artificial Intelligence (AI) is gradually permeating every facet of healthcare, including prosthodontics. AI algorithms are proving to be invaluable in treatment planning processes by analyzing vast datasets and providing predictive analytics.As AI continues to evolve, it holds the promise of enhancing prosthodontic diagnostics, optimizing treatment protocols, and improving overall clinical predictability.

Virtual & Augmented Reality Enhancements:

Virtual and augmented reality technologies are not merely confined to the realms of gaming and entertainment; they are making profound contributions to prosthodontic practices. These immersive technologies offer unique opportunities for visualizing complex treatment plans, improving communication with patients, and refining procedural skills in a simulated environment.

For both practitioners and patients, virtual and augmented reality bridge the gap between conceptualization and realization, creating a shared understanding of treatment objectives and potential outcomes.

Haptic Technology for Virtual Training:

Haptic feedback technology is being incorporated into virtual training programs for prosthodontic procedures. This allows dental students and professionals to simulate tactile sensations, improving their skills in a virtual environment.

Nanotechnology:

Nanotechnology is making strides in Prosthodontics by improving the properties of dental materials at the nanoscale. Nanocomposites and nanotubes incorporated into dental materials enhance strength, durability, and biocompatibility.

Biosensors and Smart Materials:

The development of biosensors integrated into dental prosthetics allows for real-time monitoring of oral health parameters. Smart materials, responsive to changes in the oral environment, contribute to better adaptive and functional prosthetics.

Robotics in Prosthodontic Surgery:

Robotics is playing a role in precise implant placement and prosthodontic surgery. Robotic-assisted procedures enhance accuracy and reduce the invasiveness of certain interventions, contributing to improved outcomes.

Biomaterial Innovations:

The quest for advanced biomaterials remains central to the futuristic practice of prosthodontics. Innovations in materials science, including bioactive materials and nanotechnology-driven solutions, are poised to redefine the landscape of prosthodontic restorations. These biomaterials aim to mimic the natural properties of dental tissues, promoting biocompatibility, durability, and regenerative potential. As research in this area advances, prosthodontists can anticipate a broader array of biomaterial options, each tailored to specific clinical needs and patient considerations.

3D Facial Scanning for Facial Prosthetics:

Advanced 3D facial scanning technologies are being used for the fabrication of facial prosthetics. These scanners capture detailed facial features, allowing for highly personalized and natural-looking prosthetic reconstructions.

Challenges:

In India, prosthodontics holds immense potential, yet it grapples with a myriad of challenges. The insufficient awareness regarding oral health significance, compounded by socioeconomic variances, impedes a considerable segment of the population from accessing advanced prosthodontic treatments. Moreover, the scarcity of proficient prosthodontists and the imperative for ongoing professional development present hurdles to ensuring top-tier dental care nationwide.

The incorporation of modern technologies and materials demands significant investments in both infrastructure and training, adding another layer of complexity to the challenges faced by the field. The collaborative aspect of prosthodontics presents additional challenges. A seamless integration with interdisciplinary teams is essential for comprehensive treatment planning.

The exchange of cases, open discussions about challenges, and leveraging each other's expertise play a pivotal role in achieving successful outcomes. However, the potential hurdle lies in the communication gaps between dentists and laboratories, becoming an area of concern. Prosthodontics, being a demanding discipline with numerous clinical and laboratory procedures, heavily relies on close cooperation between dentists and dental technicians for a successful outcome.

Role of Prosthodontists

As prosthodontists, it is incumbent upon us to set the standard and endorse initiatives that foster the promotion and expansion of our specialty. At its core, this leads us to the fundamental principle that prevention surpasses cure. Ideally, advancing prevention techniques over time should diminish the necessity for extensive dental interventions in the future.

Throughout the practice, I am sure prosthodontists would have encountered cases that challenged their skills and pushed the boundaries of what is achievable. learning from these experiences can be invaluable, reinforcing the need for continuous education and staying abreast of emerging trends in prosthodontics. Engaging in ongoing professional development ensures that we can offer our patients the latest and most evidence-based treatment options.

Futuristic Practice Considerations-Patient-Centric Care in a Digital Era:

The fusion of technology and prosthodontics is not merely a clinical endeavor; it is fundamentally reshaping the patient experience. This shift towards patient-centric care fosters a deeper understanding and collaboration in the decision-making process. Patients can actively participate in co-designing their treatment plans, visualizing potential outcomes, and gaining a more profound appreciation for the role of technology in achieving optimal oral health. At the core of Prosthodontics is the art of comprehending the unique narratives of our patients. Each case unfolds as a distinctive story, and crafting treatment plans that resonate with the individual aspirations of our patients demands a combination of empathy and proficient communication. Whether it's the restoration of a single tooth or a comprehensive full-mouth rehabilitation, the journey extends beyond mere physical reconstruction, encompassing emotional support and reassurance.

Conclusion:

In navigating the confluence of impacting technologies and the futuristic practice of Prosthodontics, we find ourselves at the threshold of unprecedented possibilities. The symbiosis of digital innovations, artificial intelligence, and patient-centric approaches not only propels prosthodontic care into the future but also highlights our commitment to advancing precision, accessibility, and the overall well-being of our patients.

As we look ahead, into the future, a profound realization emerges — technology is no longer confined to the role of a mere tool; it stands as a transformative force, shaping the very essence of prosthodontics. The dynamic interplay between cutting-edge technological innovations and the artistry of prosthodontic practice is poised to redefine the landscape of patient care.

This transformative force extends beyond precision and accessibility, permeating every facet of the field. It heralds an era where the fusion of technology and prosthodontics not only propels the discipline into uncharted territories but also redefines the standards of precision, accessibility, and patient-centricity.

Prof. (Dr.) Mahesh Verma
MDS, MBA, PhD, FDSRCS (Eng),
FDSRCS(Edin), FDSRCPSG(Glas)
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Dr. B.C. Roy Awardee
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A Journal of Clinical Dentistry 'Heal Talk' is indexed/listed with Index Copernicus, Ulrich's International Periodical Directory, Genamics Journal Seek, Open J-Gate, Jour Informatics, Infobase Index , Open Academic Journals Index , Google Scholar & Inno Space etc.

The Journal is based on Clinical Dentistry & issues are published Bi-monthly in the last week of February, April, June, August, October, December.

Editorial Office :
967, Sector-21C, Faridabad-121001, Haryana (India)

Marketing & Circulation Office :
'Media House', Zaidi Colony, Near New Era Public School, Idgah Road, Qazi Para, Bijnor-246701 (U.P.) India.
Ph.: +91-1342-359-420

Website & e-mail :
http://www.healtalk.in, myhealtalk@gmail.com

Printed, Published & Owned by :
Sehba Zaidi, 'Express House', 967/21-C, Housing Board Colony, Faridabad-121001 (Haryana) India.

Printed at : Roller act Press Services C-163, Ground Floor, Naraina Industrial Area, Phase-I, New Delhi-110 028

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Heal Talk
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Media 14 | RNI : HARBIL | 2008 | 26335 | Estd : 2008 | ISSN 0975 - 6329

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Afzal A. Zaidi
Managing Editor
Media House, Zaidi Colony, Idgah Road
Near New Era Public School, Qazipara
Bijnor-246701 (U.P.) India
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Resorption in Endodontics III

Dr. Rajiv K. Chugh

National President, Indian Dental Association
Member, Dental Council of India
Secretary General, Indian Academy of Restorative Dentistry
Editor-in-Chief (Asia), UPDENT- A Journal of Advanced Dentistry
Vice Chairman, Pierre Fauchard Academy, India Section

External cervical resorption(ECR)

ECR usually occurs in the cervical region of the tooth immediately below the epithelial attachment. It has the potential to invade the root dentine in any direction and to varying extent. In advanced cases, ECR can progress into the mid- and apical thirds of the root.

Aetiology and prevalence

The precise aetiology of ECR is poorly understood. Studies have shown that ECR could be multifactorial, with orthodontic treatment being the most commonly associated factor. Other factors frequently implicated are the history of trauma, parafunctional habits, poor oral hygiene, periodontal treatment etc. Orthodontic treatment and history of previous dental trauma or existing parafunctional habits are frequently seen combined in cases of ECR. Other factors that have been reported to contribute to ECR include extraction of adjacent teeth, herpes zoster virus infection, feline viruses, playing wind instruments, the use of bisphosphonates and intracoronal bleaching. All the suggested aetiological factors are considered predisposing factors or association rather than causative, to date, there is no evidence of the cause-and-effect relationship.

The pathogenesis of ECR is not fully understood. Damage to the protective unmineralized cementum allows the odontoclastic cells to resorb the underlying dentine.

Clinical features

There is no 'classic' presentation of ECR. The clinical findings can be variable depending on the severity and nature of the resorptive defect, tooth type and stage of ECR. It is often asymptomatic in the early stage. Occasionally, a 'pink spot' may develop in the cervical region of the tooth, and it can be detected as an incidental finding if it occurs at the labial/buccal or lingual/palatal surface. The pink discolouration is due to the fibrovascular granulation tissue occupying the resorptive cavity, giving the tooth a pinkish hue, through the thinned overlying enamel and dentine. Loss of periodontal attachment and profuse bleeding due to disturbing the vascular granulation tissue upon probing of the resorptive defect are among the other clinical features of ECR. Moreover, probing of ECR defects often gives a hard and scratchy tactile sensation, which helps to differentiate it from caries. In advanced cases, the resorption may eventually perforate the root canal wall and enter the pulp. Subsequent bacterial contamination of the pulp may result in symptoms and/or signs of pulpitis and/or periapical periodontitis. The affected tooth/teeth usually respond to pulp sensitivity tests, except if the ECR has perforated the pulp chamber and pulp necrosis has ensued.

Radiographic features

ECR can have varying radiographic features depending on the location, severity and phase of the lesion, i.e. resorptive or reparative. ECR often presents as a radiolucency in the resorptive phase; however, in moderate to advanced cases, the lesion may have mottled radiographic appearance as the body attempts to repair the resorptive defect. The border of the resorptive defect may be well defined or have a ragged, irregular appearance. There is no 'classical' radiographic appearance of ECR. The root canal outline is visible as long as there is no perforation of the root canal wall. It can be difficult to distinguish ECR from IRR especially when the tooth is asymptomatic.

Management

Management of ECR depends on the nature and accessibility of the lesion. Treatment aims include excavation of the resorptive lesion to arrest the resorptive process, restore the resorptive defect and monitor the affected tooth for recurrence. Prevention of ECR is not predictable as the cause of ECR is unknown.
The treatment options of ECR include external repair with(out) root canal treatment (RCT), internal repair along with RCT, intentional replantation (IR), periodic review with sensitivity testing or extraction for untreatable ECR.

External repair involves surgical exposure of the resorptive defect, complete excavation of the defect and restoration of the defects with composite, glass ionomer cement or Biodentine. RCT is indicated in the cases with (near) perforation of the root canal by ECR, and/or there are signs/symptoms of irreversible pulpitis, pulp necrosis or apical periodontitis. The root canal should first be accessed before external repair, a GP point should be placed in the root canal(s) to maintain its patency during the external repair. Once the external repair has been completed, the tooth may be root treated. Internal repair is indicated when ECR is close to or has perforated the root canal system, and a surgical approach is not possible due to poor accessibility, or if surgical access will lead to an excessive amount of sound, tooth structure removal and/or the portal of entry cannot be located. RCT is completed, and the access cavity is restored together with the resorptive defect. Long shank burs and ultrasonic tips are useful in removing the resorptive lesion under a dental operating microscope. Biodentine may be used to repair resorbed dentine, and its high pH may help to arrest the osteoclastic action of any residual osteoclastic remnants.

Intentional replantation has been described in several casereports to successfully repair ECR defects. This treatment option is indicated when ECR cannot be accessed and repaired by an external or internal approach, for example, ECR located interproximally in the middle or apical third of the root.

For untreatable ECR, if asymptomatic, the patient may choose to review the tooth periodically to monitor for any progression of the ECR and/or the development of symptoms.

Extraction is the treatment option for unrestorable, symptomatic ECR lesions. ECR tends to predispose the affected tooth to fracture during extraction due to the weakened and cavitated tooth structure and the infiltration of bone-like tissue in the resorptive cavity, and therefore, this needs to be carefully considered when ECR affects teeth in the aesthetic zone, a multidisciplinary approach is recommended.

External inflammatory resorption (EIR)

External inflammatory resorption (EIR) is present on the external surface of the root of majority of the teeth diagnosed with chronic apical periodontitis. EIR also affects teeth that suffer severe dental traumatic injury (for example, avulsion and luxation). In dental trauma injury (DTI) cases, EIR occurs as a result of injury to the root surface and adjacent periodontium. It is initially self-limiting and only focussed on the damaged root surface. Consequently, the loss of pulp vitality and infection of the necrotic pulp can result in the progression of EIR.

Clinical features

The clinical features of EIR are irreversible pulpitis and/or apical periodontitis such as pain, swelling, tenderness to percussion or palpation, sinus tract and discolouration. The affected tooth usually has a negative response to pulp sensitivity test.

Radiographic features

The diagnosis of EIR is confirmed on radiographic findings. EIR due to solely infected necrotic pulp contents may appear to be shorter or stunted in appearance than normally expected and sometimes have a ragged margin at the root end and associated with periapical radiolucency adjacent to the affected root. The root end may also have a ragged appearance.EIR associated with a history of moderate to severe DTI will usually have ragged bowl-shaped indentation along the lateral border of root surface with an adjacent periradicular radiolucency. Loss of lamina dura can also be seen in the region affected by the EIR and may be detected as early as 3–4 weeks after DTI. The root canal outline should be intact in the earlier stage of EIR.
Perforation of the root canal wall can occur in advanced stages where the EIR is diagnosed and treated late. EIR may be aggressive in nature, and the progression of the root resorption can be rapid after onset, for example, resorption of an entire root can occur within months. Therefore, it is essential to manage EIR as soon as possible and carry out RCT to arrest the progression of the resorption.

Management

The objective in the management of EIR cases is the disinfection to eliminate the aetiological factor, therefore RCT for the treatable cases and extraction for the unsalvageable cases. Root canal treatment will eliminate the stimulating factors (microbes and their toxins) and arrest the resorptive process, thus preventing further damage on the root, at the same time allowing hard tissue repair of the damaged root surface. When EIR is associated with DTI it is important to commence RCT as soon as possible due to the potentially rapidly progressing nature of EIR.Failure to do so may result in the affected tooth being extracted due to a severely resorbed root surface that is not possible to repair. Inadvertent overextrusion of the root filling is possible, therefore great care must be taken to ensure there is a good cone fit if gutta–percha is being used. Root filling with calcium silicate bioactive cements may be beneficial, due to their excellent biocompatibility.

External replacement resorption (ERR)

ERR refers to the resorption on the root surface and subsequent replacement by bone tissue, which may result in ankylosis.ERR is associated with severe luxation such as intrusion and avulsion injuries.

Clinical features

Clinical features of ERR include a lack of physiological mobility. The tooth may also be infraoccluded if ERR occurs in developing dentition.

Radiographic features

Conventional radiographic examination will reveal the absence of periodontal ligament space where the resorbed root surface appears to fuse with the surrounding bone. The root dentine will have an irregular or 'moth-eaten' appearance as the dentine is replaced by bone.Radiographs will only reveal the extent of ERR on the proximal aspects of the root.

Management

Presently, there is no treatment to arrest ERR. It may be self-limiting or continue to resorb the root and replace it with bone-like tissue for years, eventually resorbing the entire root.In the older patient, the progression of ERR may be slow, and the tooth can remain functional for many years without the need for any active intervention.

The early detection and management of ERR and ankylosis are crucial in children and adolescents before or during their pubertal growth spurt. This is because ankylosed teeth will arrest the development of the alveolar ridge on that region whilst the adjacent alveolar ridge continues to grow, causing the affected tooth to become infraoccluded and the alveolar ridge to underdeveloped. This will compromise the aesthetics, phonetics, function of the patient and further complicate future restorative or prosthetic treatment.

It has also been advocated that ankylosed, infraoccluded tooth is intentionally decoronated below the level of cementoenamel junction in children and adolescents. In this technique, a mucoperiosteal flap is raised, and the tooth is decoronated to 2 mm below the marginal bone level, the decoronated root is allowed to fill with a blood clot and sealed with the mucoperiosteal flap. This allows the root to be covered with attached mucosa. The decoronation aims to preserve the buccal-palatal dimension of the alveolar ridge, to allow for vertical growth and facilitate new bone formation above the decoronated root. Once the patient is an adult, in their early 20's, permanent restorative treatment such as dental implant treatment may be considered.

Extraction of the tooth with ERR is indicated if a pathological root fracture occurs or is likely to occur. It is also indicated in extremely compromised aesthetics. Extraction of an ankylosed tooth often requires a surgical approach and can result in a considerable amount of bone loss, complicating future implant placement.

The diagnosis and/or management of root resorption can be challenging for clinicians resulting in misdiagnosis. The importance of a thorough and systematic clinical and radiographic examination is paramount to ensure appropriate management. The prognosis of root resorption is dependent on an accurate and early diagnosis. Increasingly, CBCT is being used to confirm the diagnosis and/or aid management.

Medico-Legal Talk

Medico-Legal Issues in Clinical Dental Practice

Dr. Avinash Pundlikrao Kale
BDS, MDS , Department of Orthodontics and Dentofacial Orthopedics
Post Graduate Fellowship in Micro Dentistry, Implant Training, C. Journalism, LLB (Law and Medicine), LLM (Constitutional Law and Administrative Law)
Dental Surgeon, Department of Orthodontics Dentofacial Orthopedics, Government Dental College & Hospital, Saint Georges Hospital premises, Near CST, Mumbai
Ex-Joint Secretary, Mumbai District Committee, Maharashtra State Gazetted Officers' Federation, Ground floor, New Administrative Building, Opp. Mantralaya, Mumbai
Legal Consultant, Office of the Dean, Government of Maharashtra's Dental College and Hospital, Mumbai
Ex-Legal Consultant, Maharashtra University of Health Sciences, Nashik, Maharashtra
Legal Consultant, Directorate of Medical Education and Research, Mumbai, Government of Maharashtra

Concept and Importance of Informed Consent in Clinical Dental Practice:

Herewith, I extends my sincere thanks to the Administrator, the **Editorial Board** and the **Publisher** for publishing my article in medico-legal column in **November-December-2023** issue of this esteemed **"Heal Talk" Journal of Clinical Dentistry.** Also I extend my **Best Wishes** for **New Year-2024,** to the Administrator, the Editorial Board, the Publisher and valuable readers of this journal. I am happy to write and forward a next column on the importance of informed consent, subject of Medico-Legal issues in Clinical Dental Practice.

Introduction:

In first article **(Heal Talk // Nov-Dec 2023 // Vol-16 // No-2 // Issue-92, Pg No-14-15)** of this medico-legal column, readers have seen in brief, general idea about introduction of medico-legal issues. Wherein readers have seen: What is law and health? What is law and medicine? The article has also touched the terminologies like consent, names of various laws, rules, regulations, guidelines which governs medico-legal issues in Clinical Dental Practice.

In addition to general information about medico-issues, it is must to know for each dental practitioner some specific terminologies and their importance in Clinical Dental practice. In this current medico-legal article readers will get brief, general idea specifically on the concept and importance of Consent in day to day Clinical Dental practice. Amongst those laws which mentioned in earlier article, most prominent laws of land like Indian Constitution, Dentist Act of 1948, The Consumer Protection Act-1986 and many other adjunctive/supplementary Acts, Rules, Regulations and Guidelines laid down by judicial pronouncement has given birth to Rights and Duties to the patients and Dentists. Specifically the Indian Constitution has given 'Fundamental Rights' to Citizens of India.

The concept of "Doctrine of informed consent and patients' right of Self Determination":

The Apex Courts through various Landmark judgments has explained these Fundamental Rights very elaborately and touched many aspects of human life. The right of health of citizen is not exception to it. The patient empowerment took place through the "Doctrine of informed consent and patients' right of Self Determination". Whenever the Dentist is performing his duty of treating any patients in his Clinical Dental Practice, it is an obligatory for the Dentist that, along with his duty of doing consented treatment, the Rights of patients must be protected. The Dentist must be very careful and vigilant that at any cost "No any rights of patient should be violated".

Justice Cardozo in case of Schloendorff Vs Society of New York Hospital (1914) held that a Surgeon who gives Medical and/or Surgical treatment or performs an operation without his patients consent, commits an assault on his patient for which he is liable for damages. In Malette Vs Shulman et al 1980, His Lordship Allen laid down the principle that doctor who proceeds to disregard the requirement of obtaining consent, is strictly liable for any untoward consequences resulting from the procedure of treatment, even if he conforms to the accepted medical practice. The concept of informed consent is based on the premise that each individual has a right to make decisions concerning his health, disease and treatment. Hence, in a doctor-patient relationship it is the duty of a doctor to explain the procedure and complications to his patient. It is the right of the patient to accept or reject the treatment.

Success of Dental Treatment:

As a Dentist all of us are well aware that, in the dentistry, the ultimate success of any treatment is mainly depends on, conducting careful, thorough evaluation of patient history, evaluating clinical findings for arriving at correct diagnosis. All kinds of dental clinical examinations, including all dental treatment procedures; whether preventive, interceptive, corrective or surgical involves interference with the human body. Every human being of adult years and sound mind has right to determine that, what should be done to his or her body. Hence as per humans right, before interference with patients body, patients consent is mandatory in eyes of law.

Definition of Consent: U/Sect-13 of the Indian Contract Act-1872:

The term consent, is said to have been given when two or more persons have agreed upon the same thing in the same sense. Thus, a consent postulates unity or mutuality of minds of the contracting parties.

The Consent is also defined as a free and voluntary agreement or approval or permission for compliance of some act between two or more persons. Doctor-patients' relationship is also based on same principle. Patient needs treatment and hence he comes to the doctor and doctor being professional will give the treatment. It is a contractual relationship.

Types of Consent:

Depending on patient's mode of expression, like from his just action or by expressing in words, the consent can be:

1. Implied consent,
2. Expressed Consent,
3. Informed Consent
4. Legally valid and invalid consent.

1. Implied consent:

When the conduct/action of the person/patient is clearly indicates that, he is agreeable to some act or he desires the act to be done on him. In that case it is implied that he has given implied consent. When a patient comes to the Dental practitioner, he does not expressly say that he needs treatment. But, as the patient entered in the dental clinic and seats in dental chair and opens his mouth, in which the dental treatment is provided by the Dentist to the patents. This conduct of the patients is nothing but implied consent of the patients. However such implied consent of the patent is limited to the extent of preliminary procedures, such as history taking and clinical examinations for establishing diagnosis.

But it requires specific consent for the particular treatment procedures like complicated dental treatment procedures of extractions (Eg: Impacted teeth, Ankylosed teeth, Third molars, Badly carious root canal treated brittle teeth, Teeth with dilacerated roots and so on…) where the comparative probability of risk involved than normal extraction is high. Re-root canal treatment, Orthodontic treatment, implants and likewise any other procedures where the probability of risk involved is higher than routine dental treatment procedure. Thus for any specific treatment procedures apart from routine history taking and clinical examinations the Dentist must take definite consent from the patient by explaining the entire treatment procedures involved, prognosis of the treatment and complications likely to occurs during and post treatment.

In such cases after informing the patient, he is free to take decision of treatment acceptance or denial partially or in toto. That is right of self determination of the patients. In India the right of self determination flows from the right to health given under Article-21 of the Indian constitution.

2. Express consent: It can be verbal or written.

a) Verbal consent: When consent is expressed verbally in words, it is verbal consent and

b) Written consent: When consent is expressed in writing and signed by patient and witnessed by some other person. Where there is illiterate patient and he or she can not write, his mark or thumb print impression should be taken.

While drafting the written consent, the consent words should be clear, visible, without twisting of any words and without any ambiguity. So that later on while claiming, the patient can not deny the particular procedure whether diagnostic or therapeutic or surgical was done without his will or consent.

3. Informed consent: The foundation of the doctrine of informed consent is, "A conscious adult patient of sound mind is entitled to decide for himself or herself, whether or not, he will submit himself to a particular examination, a course of investigation or treatment proposed by the doctor, after the full disclosure of the nature and consequences about the investigation and the treatment."

4. Legally valid and invalid consent:

Section 14-22 of the Indian Contract Act 1872 defines the validity of consent. The Dentist must be aware about the validity of the consent in legal aspect. The consent given by the patient should be free from coercion, undue influence, fraud, misrepresentation or mistake. The Doctor/Dentist patient relationship is legally recognized as contractual relationship. Hence the basic foundation lies in consent and contract emerging out of it.

Ingredients of consent:

i. Consent by adult age above 18 years age,
ii. Consent with sound mind,
iii. Consent with free will,
iv. Consent must be for performing legal act as per concerned laws.

Who can give consent?:

i. Adult age above 18 years,
ii. Mentally sound person who is capable of understanding what he is doing or what is done to him.
iii. Parents of child, close relatives or guardian, attendant and custodian of the patient for minor.
iv. In some cases from the Court.

What are exceptions for consent? In emergency life threatening operation or condition, in situations like mass disaster:

In situations like in emergency life threatening operation or condition, mass disaster episodes, the treatment can be given without the informed consent as there is question of danger to his life. When accused patients is in police custody and he refuses for medical examination which is compulsory to prove or disprove an offence. In such instances the law allows the use of necessary force at the request of Police Officer (Not below the rank of Sub-inspector) to examine him without his consent or even if he refuses his consent for medical examination. Even a person who is on Bail can forcefully be examined by medical practitioner, if it is necessary for the action in law.

"Ignorance of law can not be excuse":

Though the health profession has long been considered a noble profession. However in recent times, the patient doctor relationship has undergone major transformation. It is obligatory for the Dentist that he must be aware about the laws and rules related to their profession like the consent laws. It is mandatory for the Dentist to explain the patient treatment procedures, risk involved, prognosis, alternative treatment approach and obtain legally valid consent in the eyes of law. Means the consent obtained should be from adult of sound mind, having age above 18 years and for legally valid treatment. Any consent obtained for illegal act, investigation or treatment procedure is not valid. For example the consent obtained for investigation of sex determination, the Medical Termination of Pregnancy (MTP) beyond the guidelines given in the concern law. The Dentist cannot take stand for his defense by saying that he was not aware about consent and taking legally valid consent before treatment is mandatory.

Do's and Don't:

1. Do not rely on blanket consent for one and all treatment procedure. Please take consent specifically and cautiously for the procedure to be done.
2. Do not obtain consent from patient fraudulently or by misrepresenting himself as a expert person to offer required treatment.
3. Explain the treatment procedures to the patient. Also inform about probable risk of procedures to be carried out. Also give options to the patient for alternative treatment available. While explaining this to patient use simple non technical language known to patent by choosing clear and unambiguous words.

Conclusion:

As all kinds of Dental treatment requires interference with the human body and every human being of adult age and sound mind has right to determine, what should be done to his body. Hence if the Dentist who gives any treatment or performs any operation on patients body without explaining him investigations, mode of treatment or surgical procedure, full disclosure of the nature, consequences, prognosis and risk involved in the treatment and also alternative mode of treatment and gives treatment without obtaining patient's informed consent. Then the Dentist commits an assault on his patient for which the Dentist is liable for damages. Hence, it is must to give all the above information to the patient in his or language and obtain informed consent from the patient before giving any treatment. If the Dentist fails to do this, then the act of the Dentist is considered as negligence in the eyes of law and is punishable in accordance with governing laws.

Dental Crowding

Dr. Devinder Preet Singh

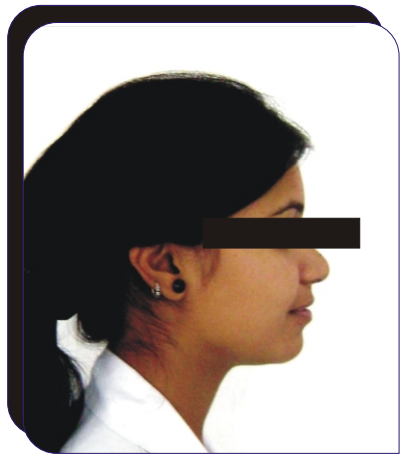
Case 1

A twenty three year old female patient reported to the dental clinic with a chief complaint of irregular upper and lower front teeth. Intraorally the patient had Class I molar and canine relationship with moderate to severe crowding and proclination in upper and lower anterior teeth. The patient was skeletal Class I with horizontal growth pattern. The patient was treated with comprehensive fixed mechanotherapy, with all first premolar extractions, with conventional metal brackets having 0.022" slot. The leveling and alignment of the teeth took about 9 months with the correction of anterior crowding in upper and lower anterior teeth. The extractions were done prior to the leveling and alignment stage so that about half of the space was utilized before the space closure stage. The space closure was done on U/L 19X25 SS archwires and it took about 6 months. The total treatment took about I.5 years. Upper and lower Hawley's retainers were given after the completion of treatment.

Extra-oral Photographs (Pre-Treatment)

Frontal View

Smiling View



Profile View

Intra-oral Photographs (Pre-Treatment)

Right Lateral

Left Lateral

Frontal View

Maxillary Occlusal

Mandibular Occlusal

OPG (Orthopantomogram)

Lateral Cephalogram

Extra-oral Photographs (Post Treatment)

Frontal View

Left Lateral

Right Lateral

Intra-oral Photographs (Post-Treatment)

Right Lateral

Left Lateral

Frontal View

Maxillary Occlusal

Mandibular Occlusal

OPG (Orthopantomogram)

Lateral Cephalogram

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A Case Report

Crafting Lifelike Smiles: Achieving Esthetic Excellence With Layered Zirconia Prostheses In Modern Dentistry

Varun Kumar[1], Kedar Deole[2]

Head of Department[1]
Dept. of Prosthodontics and Crown & Bridge
Seema Dental College and Hospital
Rishikesh, Uttarakhand.

Postgraduate Student[2]
Dept. of Prosthodontics and Crown & Bridge
Seema Dental College and Hospital
Rishikesh, Uttarakhand

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Corresponding Author:

Dr. Varun Kumar
Head of Department
Dept. of Prosthodontics and Crown & Bridge
Seema Dental College & Hospital,
Rishikesh, Uttarakhand, India
drvarun_smile@yahoo.com

Abstract

Dealing with the intricate challenges involved in restoring anterior teeth to attain a natural appearance requires a thoughtful consideration of various factors such as inappropriate size, shape, gingival contour, and aesthetically displeasing shades. The growing desire for solutions that combine aesthetic appeal with the absence of metallic elements has driven the widespread adoption of dental zirconia, acknowledged for its outstanding aesthetic qualities and advantageous mechanical properties. This case report delves into clinical encounters related to custom-designed layered zirconia fixed dental prostheses specifically crafted for the restoration of anterior teeth. The report emphasizes the importance of prosthetic restoration for both endodontically treated and vital abutments, investigating the influence of zirconia composition, layering technique and the distinctive challenges associated with each condition. The specific characteristics of the abutments intricately influence the choices made regarding zirconia composition, framework design, and shade in layered zirconia prostheses. This interdependence underscores the significance of adopting a considerate and personalized approach to meet the distinctive requirements of each clinical scenario.

Key words –Aesthetics,CAD-CAM, CEREC,E-max, Layered dental zirconia.

Introduction

The pursuit of esthetic excellence stands as a core tenet in the realm of restorative dentistry, wherein dental ceramics have endured as a preferred choice for their exceptional properties and a semblance akin to that of natural teeth. Zirconia, in particular, has garnered widespread acclaim as a material of aesthetic allure within the dental domain.[1] Traditional fixed dental prostheses often employ a zirconia substructure coupled with veneering porcelain. Nonetheless, challenges such as breakage, fracture, delamination, and chipping have prompted a discernible shift towards the adoption of monolithic zirconia crowns. Renowned for their complete contour design, monolithic zirconia crowns have witnessed a surge in popularity due to their manifold advantages. This predilection for monolithic zirconia crowns assumes notable significance, especially in the context of maxillary anterior teeth, where the attainment of optimal aesthetics and functionality is of paramount importance.[2,3]

Presented herein is a detailed case study, showcasing the efficacious treatment of an educator through the application of zirconia all-ceramic crowns. The resultant outcome not only attains exacting aesthetic standards but also ensures complete functional proficiency, thereby yielding a favorable psychological and mental impact on the patient. It remains imperative for the dentist engaged in

How to cite this article: Kumar V et al.: Crafting Lifelike Smiles: Achieving Esthetic Excellence With Layered Zirconia Prostheses In Modern Dentistry-A Case Report, ***HTAJOCD.2024; Jan-Feb(3):23-27.***

the crafting of ceramic crowns to exhibit sensitivity to the esthetic predilections of the patient, recognizing that technical precision alone may fall short of fulfilling the nuanced symmetry and aesthetic aspirations of the individual. Achieving triumphant results necessitates a comprehensive comprehension of the patient's expectations, coupled with meticulous attention to anatomical considerations.[2,5]

The utilization of CAD/CAM (computer-aided design CAD and computer-aided manufacturing CAM) zirconia material in the treatment is expounded upon in the case study, with particular focus on a patient grappling with discolored maxillary anterior teeth. The discourse underscores the increasing prominence of zirconia in contemporary dental procedures.[6,7]

Case

A 27-year-old female patient presented herself at the department of prosthodontics and crown & bridge, expressing concerns regarding the absence and discoloration of teeth in the maxillary anterior region, which could be traced back to a history of trauma. A thorough intraoral examination revealed that Tooth 21 had undergone endodontic treatment, with X-ray diagnostics indicating satisfactory treatment extending to the apex without any apical issues, albeit with notable discoloration. Additionally, Tooth 22 was absent.

Various treatment options were meticulously deliberated, encompassing implant prosthodontic rehabilitation, the crafting of a full coverage fixed prosthesis using porcelain-fused-to-metal, or an all-ceramic full coverage prosthesis. The patient, desiring a prompt completion of treatment and expressing a strong inclination towards the most aesthetically pleasing material, leaned towards the creation of an all-ceramic zirconia fixed partial denture, meticulously fashioned with CAD/CAM technology. This preference aligns seamlessly with the patient's expectations and underscores both efficiency and aesthetic excellence within the proposed dental restoration plan.

The shade selection was performed using a conventional shade guide (Vitapan classic, Vita Zahnfabrik, Bad Säckingen, Germany) (Fig. 2). Tooth preparation was done with 21and 23 for all ceramic.The maxillary, mandibular arch and buccal bite registration were scanned using CEREC Omnicam(Fig.3) and the digital impression of prepared abutment teeth in the maxillary arch and mandibular arch were obtained (Fig.4).

After the conclusive data acquisition, the prepared structure underwent meticulous analysis using construction software (CEREC SW 5.2.2, DentsplySirona, Charlotte, USA). The assessment of occlusal reduction yielded satisfactory outcomes, devoid of any detected undercuts. The automatically determined preparation limit seamlessly transferred without necessitating modifications. Recent updates have markedly improved the restoration proposals automatically generated by the software, delivering reliable restorations with minimal adjustments.The optical impression, conveyed to the computer, was employed to delineate the restoration boundaries, and the volume and shape of the intended restoration were defined. Following the selection of the shade, a CEREC MTL Zirconia medi block (Fig. 5) was opted for in the C2 shade.

CEREC MTL Zirconia, infused with yttrium oxide, stands as the epitome among zirconium oxide materials, leaving scant room for unfulfilled expectations. Forged and introduced by VITA Zahnfabrik, a standout feature of this material lies in its distinctive color technology, marked by a multilayer color gradient. The MTL (multi-transitional layer) technology, harmonizing with remarkable translucency, plays a pivotal role in achieving profoundly natural aesthetics without compromising strength. This defining attribute positions CEREC MTL Zirconia as a genuine innovation, rendering it an exemplary choice for a myriad of dental applications, spanning bridges, crowns, inlays, onlays, and veneers.The visible augmentation in color transition enhances the overall esthetic allure, while the 3-point flexural strength surpassing 850 MPa ensures an exceptional level of resilience. This high strength enables minimally invasive crown preparation, allowing for a reduction in wall thickness to as low as 0.6 mm. Such strength combined with minimal wall thickness contributes to the creation of posterior restorations with an ideal anatomical design, affording clinicians heightened flexibility in the CEREC workflow.

The framework was meticulously crafted through a dry-milling process (MC-XL, DentsplySirona, Charlotte, USA), utilizing a multilayer translucent zirconia block (CEREC MTL Zirconia medi, DentsplySirona, Charlotte, USA). Throughout the fabrication process, the "fine" milling mode was chosen, maintaining the occlusal and radial spacer settings at 120 µm, adhering to the established standard configurations (Fig. 6).

Subsequent to this, the crafted framework was detached from the retention pin, and the connecting area underwent refinement. Following these steps, the framework underwent a speed sintering process (CERECSpeedfire, DentsplySirona, Charlotte, USA) (Fig. 7).

Following this, the framework was adorned with E-max in C2 shade, and the anatomical and esthetic characteristics of the anterior restoration were meticulously defined. Subsequently, the prosthesis underwent staining using DS Body Stain S1, DS Incisal Stain I1, and DS Overglaze High Flu from DentsplySirona in Charlotte, USA (Fig. 8).

The restorations were delicately positioned on a firing tray with a firing pad (DeguDent, Hanau-Wolfgang, Germany) and subjected to firing at 760°C (Fig. 7). A thorough examination was conducted on the prosthesis to assess both marginal and interproximal fit. The restoration underwent preparation for the final cementation process, accomplished through air-abrading with fine-grained alumina (50 µm) at a pressure range of 0.1-0.2 MPa. The prosthesis was then cemented using adhesive resin cement (Calibra Ceram, Dentsply Sirona, Charlotte, USA). Excess cement was meticulously removed, followed by tack-curing. Both static and dynamic occlusion were thoroughly evaluated (Fig. 10).

Fig. 1 Intraoral preoperative view

Fig. 2 Vitapan Classic Shade Guide

Fig. 3 CEREC Omnicam

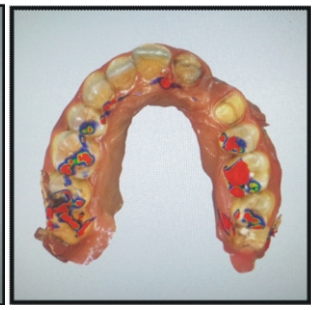

Fig. 4 Digital impressions of maxillary and mandibular arches

Fig. 5 MTL Zirconia Block

Fig. 6 CEREC MC XL Milling Unit

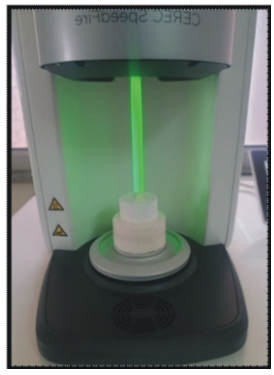

Fig. 7 CEREC SpeedFire

Fig. 8 Stains and Glaze

Fig. 9 Final Restoration

Fig. 10 Final Cementation

Discussion

This case report outlines the chairside creation of a monolithic zirconia fixed partial denture enhanced with E-Max layering. Typically, such restorations can be produced in a single appointment. Nevertheless, it is essential to note that this procedure is contingent upon specific technical prerequisites, including superfast milling, a speed-sintering process, and the utilization of multilayer zirconia material.[8]

The employment of a swift-sintering process stands as a pivotal technical prerequisite. In this current case narrative, a distinct sintering furnace designed for the CEREC system (CERECSpeedfire, DentsplySirona, Charlotte, USA) found application. It's imperative to note that zirconia materials can solely undergo swift-sintering when in a desiccated state.ne must take into account that speed-sintering represents a comparatively recent processing method. Numerous in vitro investigations have substantiated that for appropriate zirconia materials, this economical and time-efficient process exerts no adverse effects on mechanical and optical attributes. These include factors such as hardness, fracture toughness, Weibull characteristics, hydrothermal aging behavior, and translucencies.[9,10]

E-max crowns stand apart with several noteworthy advantages compared to their counterparts, particularly porcelain fused to metal crowns. Revered as the epitome of natural tooth resemblance, E-max crowns showcase a transparent hue and an authentic appearance, effortlessly harmonizing with one's native dentition. Significantly, the absence of a metal alloy base eliminates the occurrence of an unsightly grey line near the gum line, contributing to a more aesthetically pleasing outcome. Beyond their cosmetic virtues, E-max crowns earn recognition for their robustness and longevity, surpassing the performance of various crown types. Their durability renders them less susceptible to cracks or fractures, ensuring a enduring solution for individuals seeking both functional and visually appealing dental restorations.[11]

The innate automation within CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) technology works to minimize inaccuracies, ensuring precision in the crafting of dental restorations. Furthermore, these systems play a crucial role in reducing the risks associated with infectious cross-contamination, thus elevating the safety standards in dental procedures. Remarkably, machinable zirconia ceramics emerge as exceptionally well-suited materials for the application of CAD/CAM techniques. These ceramics can be adeptly designed and milled while in their pliable pre-sintered state, allowing for intricate shaping and customization. The subsequent sintering process further enhances the physical properties of the milled restorations, establishing machinable zirconia ceramics as a versatile and dependable choice in the field of dental prosthetics.[12]

Conclusion

This case report delves into a detailed analysis of the restoration process for anterior teeth that are both missing and affected by discoloration. Prioritizing the patient's aesthetic concerns, the selected treatment approach involved an all-ceramic restoration, specifically opting for a layered zirconia restoration. Zirconia restorative prostheses, crafted using advanced CAD/CAM technology, showcase exceptional biocompatibility. This not only minimizes wear on neighboring teeth but also ensures enduring aesthetics with reliable color stability. These inherent qualities play a vital role in assisting patients to regain a fulfilling social life and boost their confidence and self-esteem. In the field of prosthodontics, zirconia-based restorations hold tremendous promise due to their outstanding mechanical, chemical, and clinical performance.

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A Review

Digital Evolution in Prosthodontics: Applications in Removable Partial Denture Fabrication

Manu Rathee[1], Kritika Diwan[2], Maqbul Alam[3], Sarthak Singh Tomar[4]

Senior Professor and Head[1]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Pt. B.D. Sharma University of Health Sciences
Rohtak, Haryana, India

Post Graduate Student[2]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Rohtak, Haryana, India

Senior Resident[3]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Pt. B.D Sharma University of Health Sciences
Rohtak, Haryana, India

Post Graduate Student[4],
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Rohtak, Haryana, India.

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Website:
www.healtalk.in

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Corresponding Author:

Dr. Kritika Diwan
Post Graduate Student
Department of Prosthodontics
Post Graduate Institute of Dental Sciences,
Pt. B.D Sharma University of Health Sciences,
Rohtak, Haryana, India.
Email:diwankritika096@gmail.com

Abstract

Although computer-aided design and manufacture (CAD/CAM) technology have shown some promising applications in the fabrication of fixed prosthesis, maxillofacial prosthesis, the field of removable prosthodontics has not utilized these technologies so far. This article describes complete digital and combined analog-digital workflow of Removable Partial Denture (RPD) fabrication. In both processes surveying, framework designing and fabrication will be performed digitally. The shape of components of the removable partial denture modelled on the 3D model, using computer aided design software. The purpose of this article is providing the brief knowledge regarding utilization of digital technology in RPD fabrication in a compiled form.

Keywords: CAD/CAM framework, Digitisation, Digital maxillomandibular relation recording, Electronic surveying, Intraoral scanner (IOS), Removable partial denture.

Introduction

Rapid advancement in digital technology have opened new pathways for Removable Partial Denture (RPD) fabrication using computer aided designing and computer aided manufacturing that involves additive and subtractive method.[(1)] RPD can either be digitally designed on the conventionally poured cast or by direct digital scanning of partial edentulous ridge through which a virtual cast is produced. Digital workflows are advantageous as include simplified processes, increased manufacturing speed with precise outcomes.[(2)]

In contemporary dental practice Intraoral Scanners (IOS) are used for impression making for single crown and multi-unit prosthesis fabrication, implant and RPD frameworks and complete denture fabrication. To adequately reproduce the surface details of oral and dental tissues, accurate impression making and cast pouring is required.[(1,2)]

Digital technologies usage reduced the chances of human errors caused by laboratory technician which helps in fabricating a removable prosthesis with less distortion and better precision.[(3)]CAD/CAM frameworks can be produced by two manufacturing pathways: combined analog-digital and completely digital.[(4)] Few published articles have concluded that prosthesis fabricated from intraoral digital impressions had remarkable results over those from conventional impressions.[(5)]This article aims to discuss the role of digital technology in fabricating removable partial dentures (RPD).

Data collection and analysis

A comprehensive search was done on electronic database like PubMed/

How to cite this article: Rathee M et al.: Digital Evolution in Prosthodontics: Applications in Removable Partial Denture Fabrication, ***HTAJOCD.2024; Jan-Feb(3):28-31.***

Medline, Scopus and Goggle scholar for the relevant studies related to fabrication of removable partial prosthesis using digital technology. After that articles were searched selected on the bases of exclusion and inclusion criteria. Articles published in English language and the article for which English translation was provided, were screened and reviewed.

Steps involved in RPD Framework Fabrication

A. Impression making

Conventional method of framework designing include clinical and laboratory procedures that involves impression making, working cast fabrication and bite registration. Back then, all these procedures were carried out manually.[4] In this era of digitisation, various digital technologies are available in dental market for alleviating patients experience and reducing practitioner's manual workload. Two manufacturing pathways can be used for CAD/CAM framework fabrication: combined analog-digital and complete digital(Fig.1).

Combined analog-digital workflow involves conventional impression making and working cast fabrication followed by digital scanning of cast and so on. This process will reduce human related errors and laboratory procedures up to some extent, as after cast fabrication rest of the steps are going to be carried out digitally.[1,4]

Completely digital workflow involves use of digital technology in the very first step, is scanning partially edentulous ridges using Intraoral Scanners (IOS). The Standard Tessellation Language (STL) files are generated by scanning the intraoral structures. Generated data sent to open laboratory CAD system for further processing.[5] Digital impression making is real cost saving as there is elimination of trays, impression material and shipping cost. One of the main advantage is that processed data can be stored for subsequent follow up during functional period and also for the future use. According to current literature prosthesis fabricated from intraoral digital impression has better marginal fit in comparison to conventional method.[4,5]

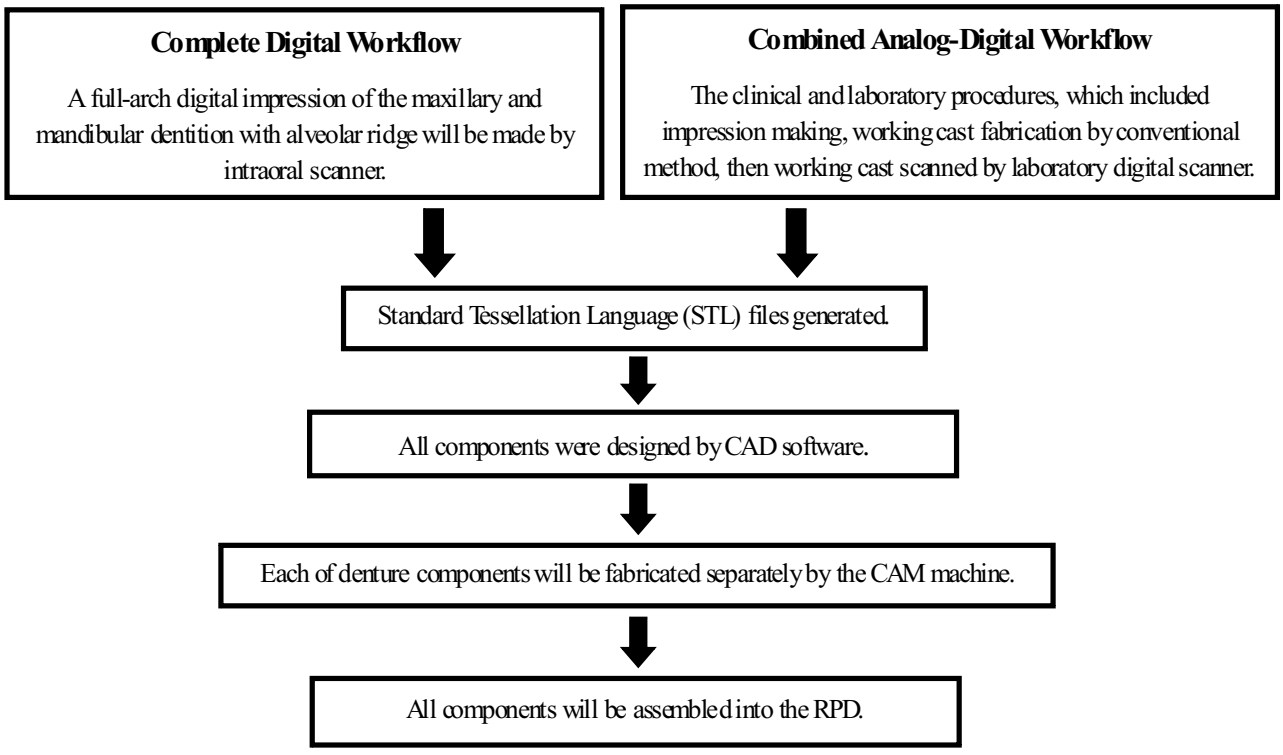

Fig. 1 Flow chart of the combined analog-digital and digital RPD fabrication workflow.

B. Working cast fabrication

This step is done in combined analog-digital workflow. After making physical definitive impression, stone cast is fabricated. The working cast is scanned to generate a digital model (Fig. 2). Generated data is acquired and sent to open system laboratory for computer aided designing of RPD components using software.[6]

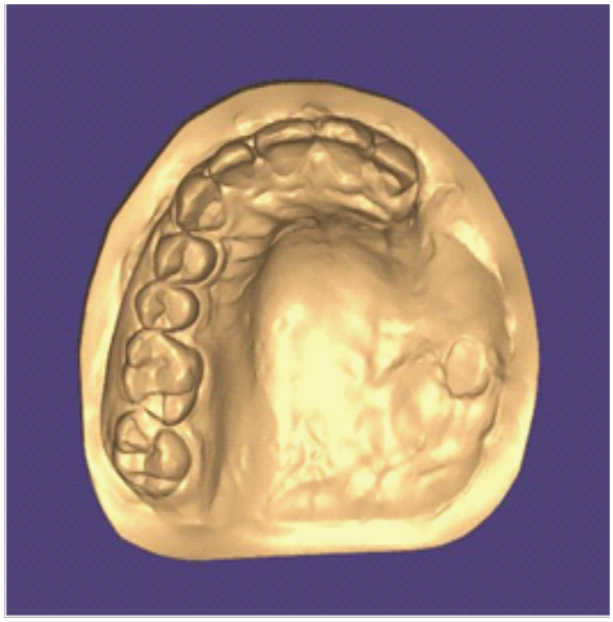

Fig. 2 Digital model of maxillary arch

C. Digital Maxillomandibular relationship recording

There are two techniques for digital Maxillo-mandibular relation (MMR) recording,using record bases with occlusion rims and without using record bases. The IOS is used for digital MMR recording, the images of teeth and gingiva captured from buccal view and maxillary and mandibular digital models are mounted on the virtual articulators.[6]In cases with small number of missing teeth and good molar occlusal support, MMR recording will be done without using record bases as it influence the occlusion with remaining teeth. In cases of distal extended partial ridges with multiple missing teeth, record bases with occlusal rims are used to set the MMR at centric relation position. The accuracy of digital MMR record associated with number and position of remaining teeth.[6,7]

D. Electronic cast Surveying

As author is discussing about digital workflow for RPD framework fabrication, its necessary to include electronic method of surveying of digital models.[7] This step is of great importance as followed by framework designing. Electronic surveying of scanned cast enables computer aided designing of pattern for metal framework fabrication according to RPD designing principles using relevant software. Programs will be written for identifying thesurvey lines using software which reads the triangular facetted surface models.[8] By electronically identifying the closest and farthest points relative to the straight line, connecting them together will step-by-step produce the survey lines. After marking the survey lines, undercut area will be marked and depth of undercut will be calculated automatically.[7,8]

E. Computer aided Framework designing

After completion of surveying part, depth of undercut is copied from definitive digital models to model the shape of components of RPD framework on the scanned 3D surface model using CAD software (Fig. 3). The framework designing using CAD/CAM technologies will reduce the human error encounter in the traditional laboratory steps, hence produce RPD frameworks with higher accuracy and better fitness.[8] Detailed verification is must at each step, such as providing adequate amount of relief throughout the design process and setting optimal parameters. Actual RPD design must consider the physiological conditions and occlusal condition of the abutment teeth and the residual ridge as well as the oral habits and esthetic requirements of the patient.[9]

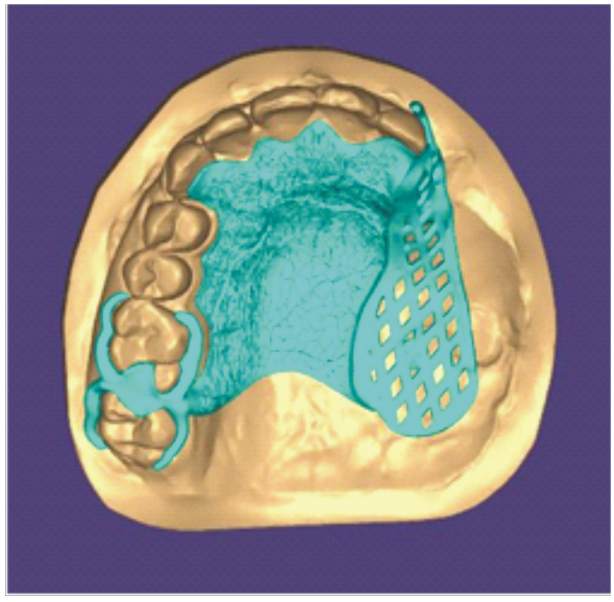

Fig. 3 Framework designing using Computer-aided Designing (CAD) software.

F. Digital RPD framework fabrication

Digital RPD framework is fabricated from CAD model into a physical product, which undergoes processing, finishing and polishing before inserted into patient mouth. CAD/CAM involves subtractive manufacturing (milling) or additive manufacturing (rapid prototyping, 3D printing). The subtractive manufacturing is based on processes in which desired 3-dimensional geometry is achieved by cutting the material by computer programmed power driven machine tools with sharp cutting tools.[9] On the other hand additive manufacturing (rapid prototyping)is a process in which there layer-by-layer addition of material to produce a 3-dimensional product. Additive technology further involves several techniques like Direct Metal Laser Sintering (DMLS), Selectively Photocuring (3SP), Poly-Jet, Stereolithography (SLA) and Direct Light Projection (DLP). The digital manufacturing eliminates time and material consumed in investment-casting process and also provides a product with better precision and proper fit.[10]

Conclusion

There is limitless scope of digital technology in prosthodontics. Every day science is one step ahead in terms of advancement of technology as well as its beneficial applications. Still, some of the fields of prosthodontics have not been digitally explored and needs technology advancement. The results of MMR recording and electronic surveying are not satisfying, as the full digital workflow is limited to cases with Kennedy class III/IV partially edentulous arches with several missing teeth. Further studies on durability, accuracy, cost effectiveness of digital RPDs will improves the understanding about field for betterment of patient care.

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A Clinical Study

Comparative Clinical Study on Reduction of Pain & Anxiety During Administration of Local Anaesthesia With Nois Vs Dental Vibe

Gaurav Gupta[1], D. K. Gupta[2], Neelja Gupta[3], Devanshi Sankhla[4], Parth Shah[5], Kuldeep Singh Rana[6]

Professor, MDS[1]
Dept. of Pediatric & Preventive Dentistry
Jaipur Dental College

Private Practice[2]
Wisdom Dental Clinics
Jaipur, Rajasthan

Senior Consultant, BDS[3]
(Cosmetic & Aesthetic Dentist)
Wisdom Dental Clinics, Jaipur

Associate Dentist[4]
Wisdom Dental Clinics
Jaipur, Rajasthan

Sr. Consultant[5]
Saanchi Pediatric Hospital
Surat, Gujarat

Assistant Professor[6]
Dept. of Conservative & Endodontics
Government of Dentistry
Indore, Madhya Pradesh

NOIS (Nitrous oxide inhalation sedation) and dental vibe are widely advocated in dental practice for reducing pain and anxiety produced by administration of local anaesthesia.

Aim: Purpose of this study was to compare efficacy of Nitrous oxide inhalation sedation and dental vibe on the pain perception during intraoral injection using visual analog scale (VAS).

Study design: Spit-mouth design study was used here, total of 50 patients were selected and were divided into 2 equal groups having 25 patients in each group.

Results: Both dental vibe and nitrous oxide inhalation sedation has shown similar results ($p < 0.001$) whereas no significantdifference was observed between dental vibe and nitrous oxide inhalation sedation.

Conclusion: Bothdental vibe and NOIS had shown significantly same efficacy

Keywords: Dental Vibe, Nitrous Oxide Inhalation Sedation, VisualAnalog Scale

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Corresponding Author:-

Dr. Gaurav Gupta
Sector - 10, Plot number - 15,
Vidhya Dhar Nagar, Jaipur, Rajasthan
Contact- 9829560606
Email - dr.gauravgupta99@gmail.com

Introduction

Local anaesthesia administration achieves painless field, administration of injection itself is painful. Clinician stries to minimize needle prick pain by reassurance, correct technique and local medications. Dental treatment cause anxiety due to various reasons such as negative or traumatic past experiences, experiences of family members, individual personality traits, and visualizing fear-provoking posters or videos of dental surgeons. Anxiety is usually triggered by sight of needles or sound of rotary instruments in dental office. [1] However, irony of situation is that local an aestheticsis most effective drugs for prevention and management of pain [2] are themselves associated with the pain and this pain gets further aggravated due to fear and anxiety caused by sight of needle and has been referred to as needle phobia or blenophobia. [3]

Painless treatment is an integral element of quality paediatric dental care. Fear associated with experiencing and seeing needle penetration, as well as sensation of swelling soft tissues, is most common factor causing children and dental clinicians to experience anxiety regarding use of infiltration local anaesthesia (LA). Recent progress in field of dental pain management has led to development of newer delivery devices and also modification in injection techniques.[4] Their aim is to allow clinician treatment approach, associated with reduced injection pain, essential for managing anxiety in paediatric patients.

Gate control theory of pain by Melzack [5] is widely accepted concept

How to cite this article: Gupta G et al.: Comparative Clinical Study on Reduction of Pain & Anxiety During Administration of Local Anaesthesia With Nois Vs Dental Vibe, ***HTAJOCD.2024; Jan-Feb(3):32-36.***

of pain perception. In recent years, several innovative dental appliances have been developed on its basis—Accupal, DentalVibe (DV), Vibraject and others.[6] Their concept is to reduce pain of needle injection by applying pressure, vibration, micro-oscillations or combination of them. Applied physical stimuli are hypothesised to modify or interfere with pain signals by closing neural gate of cerebral cortex, aimed to decrease pain perception due to distraction.

Both pharmacological and nonpharmacological techniques have been developed for management of child's behavior at dental office. Now a days, nonpharmacological methods are gaining popularity which includes parental presence and reassurance, tell-show-do, distraction, relaxation, systematic audio analgesia, desensitization, modeling, physical contact by light touching or stroking and music, etc.

One of most commonly used non pharmacologic behaviour management technique is tell-show-do. It was introduced by Addleston in 1959. In this technique, dentist tells child what is going to be done in words so child can understand, then dentist demonstrates exactly how procedure will be conducted, followed by performing procedure exactly as it was described and demonstrated.[7]

In present case behaviour management technique Tell-Show-Do technique was used for reducing anxiety which was performed by dentist in operatory with kid. Dental vibe was used on kid hand and cheeks to make her feel vibrations generated by dental vibe. [Figure 1]

Considering the beneficial effect of Dental Vibe and NOIS. The lack of literature about its efficacy among adultpopulation, thisstudy was designed tocompare use of DentalVibe against NOISin reducing pain during administration of local anaesthetic injection during dental procedures. [Figure 2,3]

Fig. 1 Tell show do technique

Fig. 2 Dental Vibe

Fig. 3 NOIS

Methods

This was a split-mouth, open-label, randomized, controlled clinical study.

1. Calculation of sample size

The sample size was calculated using the online OpenEpi sample size calculator. A pilot study was conducted among 50 patients and the results of this study were used for sample size calculation [mean ± SD = 8.36 ± 2.76 (group 1), mean ± SD =6.4 ± 4.1 (group 2), power = 80%, confidence interval = 95%]. The calculated total sample size was 50, and it was equally distributed between the two sites.

2. Inclusion and exclusion criteria

Inclusion criteriawere patients aged between8 to10years, scheduled for retained lower deciduous anterior and carious lower D extractionrequiring infiltrate and IANB,were selected to participate in the study.

3. Patient selection, randomization, and allocation

Fifty patients were screened from 15 January 2021 to 20 June 2023. Twenty-fivepatients requiring extraction ofretained lower deciduous anterior were selected and 25 patients require extraction of lower carious D were selected. Hence, the total number of extraction sites was 50. The investigator randomized the extraction sites into sites A and B using a computer-generated random number table. The sequence of allocation, i.e.,which site was to be treated first, was generated using Sequentially Numbered, Opaque, Sealed Envelope (SNOSE) technique. Site A was written on25 pieces of paper, and site B was on another 25 pieces of paper. These papers were placed in opaque, sealed envelopes. Each participant was allowed to pick an envelope. The investigator then opened the sealed envelope, and the participant was treated accordingly. Site A Group 1 received infiltrate application with nitrous while Group 2reived infiltrate with dental vibe. Site B with Group 1received vibration with DentalVibe for IANB Group 2 received IANB with nitrous. The time interval between the two procedures was 2 years.

Results

Fifty patients aged 8 to 10 years (mean age, 25.06± 7.32) participated in the study. The sex distribution was 25 females [50%] and 25males [50%]. The VAS score for pain ranged from 0 to 8for site A and from 0 to 5for site B. The Mann-Whitney U test showed a statistically significant difference (Mann- Whitney U test value = 51.50, $P < 0.001$) between the two sites. The median pain scores for sites A and B were7 and 3, respectively.

Materials & Methods (Flow Chart 1)

A total of 50 healthy children with no history of systemic diseases (ASA Grade I status) and without any allergic history to local anesthesia in the age group of 8 to 10 years were selected.

It was a split-mouth parallel randomized study, so patients requiring local anesthetic block (either infiltrate block or IANB) for any of the dental procedures in lower jaw was recruited. Selected patients were then randomly divided into two equal groups (groups I and II) having 25 patients in each group (Table 1).

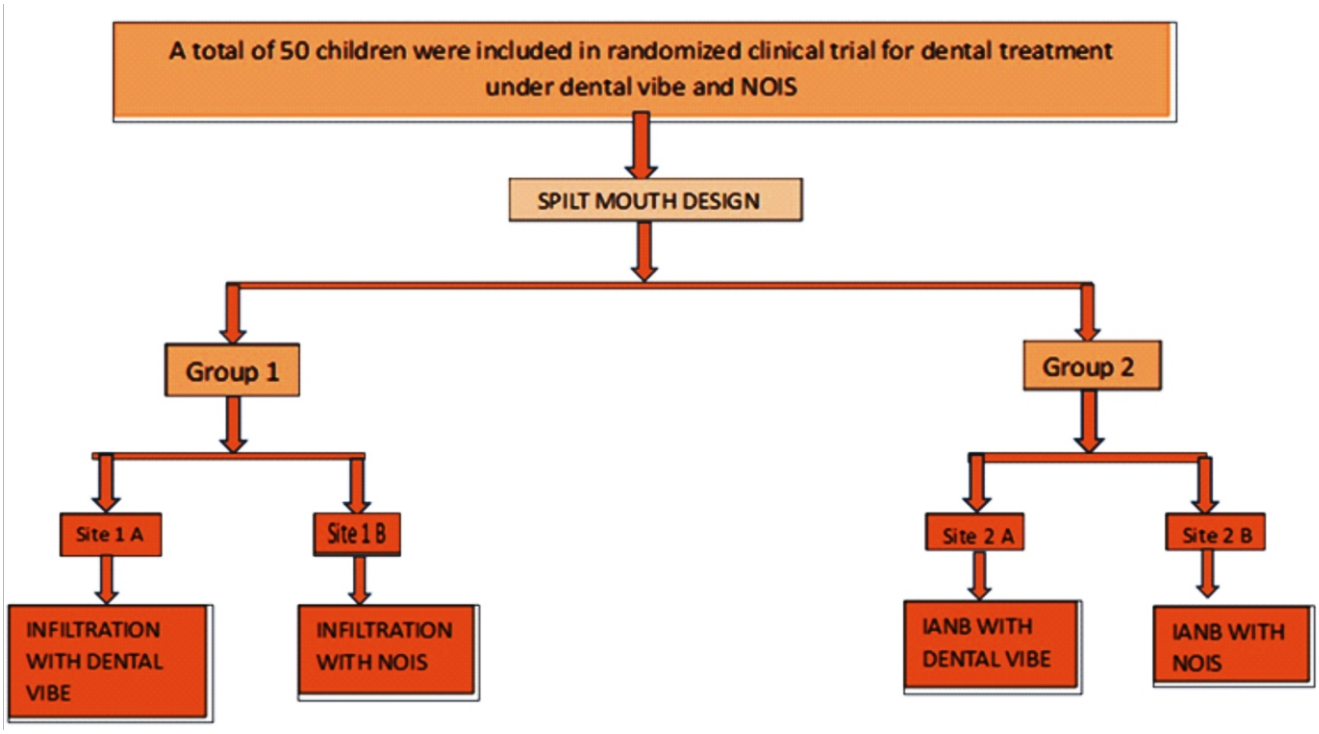

Table 1: Methodology

Once the group was selected, the sites for the application of infiltrate and NOIS was selected randomly by and the selected sites were then named as site IA, IB and 2A, 2B for their respective groups.

In group I, site IA was treated with infiltrate with dental vibe and site IB was treated with infiltrate with NOIS. Whereas, in group II, site IIA was treated with IANB with dental vibe and site IIB was treated with IANB with NOIS. Thus, NOIS was used in both the groups of the study and therefore, acted as control (site IB and site IIB). The procedures were carried out after wiping the mucosa in relation to the area of needle penetration free of saliva and after maintenance of isolation with the help of cotton rolls and suction tips.

In all sites of both the groups after the application of anesthetic agent, administration of local anesthetic injection Cartilage was done.

During the insertion of needle, the patient's behaviour was evaluated for pain perception and visual analog scale (VAS) by the operator (Figure 4).

The statistical analysis was done using Statistical Package for Social Sciences (SPSS) Version 15.0 Statistical Analysis Software. The values were represented in mean ± SD.

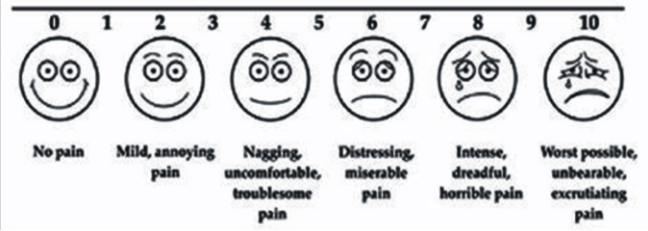

Fig. 4 Visual analog scale for the assessment of child's pain

Observations & Results

Graph shows that their was no significant difference($p > 0.05$) was observed on comparing dental vibe with NOIS.

Discussion

Pain control is a challenging task in clinical pediatric dentistry. Conventional pain control techniques, however, deal with only one aspect of pain control, i.e. pharmacological/sensory, the psychologic component is often left unresolved. This is especially true of the pediatric population where the fear of needle is a major deterrent to quality dental care. It is ironical that to eliminate pain we must momentarily create a painful stimulus.[8]

In the study, the patient's behavior was evaluated for pain perception using VAS by the operator which is a form of cross-modality matching in which the length of a line is adjusted to match the strength of a perception.[9]

In this, the child was asked to rate the discomfort of the injection on a 10 cm scale where 0 represented a happy child with no pain at one end and 10 represented a crying child with extreme pain at the other end. Median value 5 represented sad child with taken in order to get more sensitive and accurate representation of pain intensity.

DentalVibe is cordless, rechargeable, handheld device that delivers pulsed micro-oscillations to injection site. It requires no modification to be made to traditional anesthetic technique[10]. DentalVibe is designed such that it retracts buccal or labial mucosa. It can be held easily and operated with non-working hand, leaving operating hand free for administering injection. Massaging with Vibra Pulse technology at injection site prevents swelling caused by bolus of anesthetic solution and assists in its dissipation, resulting in faster and more profound anesthesia .It has an embedded light source, which helps in better visualization of injection site. [11]

Nitrousoxide (N2O)is colorless and virtually odorless gas with faint ,sweet smell. It is an effective analgesic /anxiolytic agent causing central nervous system(CNS)depression and euphoria with little effect on respiratory system.[12]

Technique uses subanesthetic concentrations of nitrous oxide delivered with oxygen from dedicated machinery vianasal mask.Nitrous oxide is poorly soluble with high minimum alveolar concentration;rapid onset of action is therefore coupled with arapid recovery period; duration of sedation is controlled and patient can quickly return to normal activities[13].

Conclusion

It was concluded from study dental vibe and NOIS have same efficany .But cost of installation of NOIS machine is very high in comparision with dental vibe. NOIS administration require regular update of knowledge through confrences and session which also reqired cost but for use of dental vibe does not require any session or confression. Hence dental vibe is more cost effective then NOIS .

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Original Research

Myofibroblasts as Important Diagnostic & Prognostic Indicators of Oral Squamous Cell Carcinoma

Priyanka Raghav[1], Abhiraj Raghav[2]

Associate Professor[1]
Dept. of Oral Patholgy & Microbiology
Subharti Dental College
Meerut

Tutor[2]
Subharti Medical College Meerut
Swami Vivekanand Subharti University
Meerut

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Abstract

Background: Squamous cell carcinoma (SCC) accounts for approximately 94% of all oral malignancies, hence establishing oral squamous cell carcinoma (OSCC) as one of the top 10 most prevalent malignant tumors. Cells with several functions, such as macrophages and myofibroblasts, play a vital role in the biological behaviour of tumors. The aim of this study was to assess and evaluate the prevalence of myofibroblasts (MF) and macrophages in squamous cell carcinomas occurring in oral region.

Methodology: A total of 50 experimental subjects with well-differentiated oral squamous cell carcinoma (WDOSCC) ,moderately differentiated oral squamous cell carcinoma (MDOSCC), and poorly differentiated oral squamous cell carcinoma (PDOSCC) were taken .While 50 healthy subjects were taken as control group. The tissue samples were divided into sections that were 4 micrometers thick. These sections were subsequently subjected to both conventional staining using hematoxylin and eosin, as well as immunohistochemistry(IHC) staining using α-SMA. The comparative analysis of the expression levels of microRNAs was conducted across different stages of oral squamous cell carcinoma (OSCC). Statistical analysis was conducted on all of the outcomes.

Results: The findings revealed that the average final staining index score for patients with well-differentiated oral squamous cell carcinoma (WDOSCC) was 9.23, while it was 8.98 for those with moderately differentiated oral squamous cell carcinoma (MDOSCC), and 6.54 for individuals with poorly differentiated oral squamous cell carcinoma (PDOSCC). The control group, on the other hand, exhibited favourable cellular expressions.

Conclusion: The present investigation's results indicate that MFs play a significant role in the pathogenesis of OSCCs, and their evaluation may serve as a valuable tool for predicting the invasive characteristics of these malignancies. Consequently, we advocate for the utilization of MFs as a stromal marker to facilitate the identification of invasion and progression in patients with oral squamous cell carcinoma (OSCC).

Keywords: Alpha-smooth muscle actin, myofibroblast, oral squamous cell carcinoma.

Introduction

Oral cancer is a group of malignant diseases arising from the surface of the lips, gums, tongue, mouth, and palate. As keratinocytes are the major components of the epithelium over the oral cavity, squamous cell carcinomas (SCCs) account for 90–95% of patients with this subtype of head and neck malignant diseases in histology, followed by basal cell carcinomas, mesenchymal malignancies, hematologic tumors, and melanomas [1]. Oral

How to cite this article: Raghav et al: Myofibroblasts as important diagnostic & prognostic indicators of oral squamous cell carcinoma, ***HTAJOCD.2024; Jan-Feb(3):37-40.***

SCC is a perennial major public health concern because of its high prevalence worldwide. According to 2018 statistics from the International Agency for Research on Cancer [2], approximately 350,000 cases of oral cancer are newly diagnosed each year, accounting for a cumulative incidence of 4.0 per 100,000 persons. In Taiwan, betel nut consumption has led to an incidence rate of 32.46 per 100,000 persons—the highest globally [3]. Therefore, several measures, including a population-based screening program, have been employed to prevent and control oral cancers in Taiwan [4].

Myofibroblasts are morphologically enlarged and irregular (star or web-shaped) fusiform cells with well-developed cell–matrix focal interactions and intracellular gap junctions [5,6]. The incorporation of α-SMA into actin stress fibres grants the myofibroblast contractile power, approximately 2-fold that of the force of fibroblasts, when cultured on substrates with high elastomer stiffness [7-9].

Hence, the current study was undertaken to assess the role of myofibroblasts as important diagnostic and prognostic indicators of oral squamous cell carcinoma.

Material and methods

The current study recruited 50 subjects with WDOSCC, MDOSCC, PDOSCC, and 50 healthy controls to evaluate the expression of myofibroblasts (MFs) using immunohistochemistry (IHC) utilizing a smooth muscle actin (SMA) antibody. The study sample consisted of 50 cases of well-differentiated oral squamous cell carcinoma (WDOSCC), moderately differentiated oral squamous cell carcinoma (MDOSCC), and poorly differentiated oral squamous cell carcinoma (PDOSCC), all of which were histologically confirmed. Additionally, 50 tissue samples from normal mucosa were included in the study, also with histological confirmation. The control group consisted of dental follicular tissue that was medically removed for orthodontic purposes, representing normal mucosa. Two slices, each with a thickness of 4 meters, were obtained from every tissue block. One tissue segment underwent staining using the conventional hematoxylin and eosin (H&E) method, while the other was submitted to immunohistochemical examination using the SMA marker. Hematoxylin and eosin (H&E) stained slides were employed as reference slides for the assessment and verification of oral squamous cell carcinoma (OSCC) cases.

Results

The present study involved the enrolment of 50 cases each of WDOSCC, MDOSCC, PDOSCC, as well as 50 controls. The investigation was carried out across three various grades of OSCC. Immunohistochemical analysis was conducted on the tissues using the SMA marker. The findings revealed that the average final staining index score for patients with well-differentiated oral squamous cell carcinoma (WDOSCC) was 9.23, while it was 8.98 for those with moderately differentiated oral squamous cell carcinoma (MDOSCC), and 6.54 for individuals with poorly differentiated oral squamous cell carcinoma (PDOSCC). The control group, on the other hand, exhibited favorable cellular expressions. The intergroup comparison of the final staining index score among different stages of oral squamous cell carcinoma (OSCC) showed no statistically significance difference($P > 0.05$). Similarly, the analysis of myofibroblast expression across different grades of OSCC showed uninteresting findings. There was a significant statistical difference ($P < 0.05$) observed in the final staining index score when comparing instances of oral squamous cell carcinoma (OSCC) with normal controls. Additionally, the expression of MF between the two groups also showed strong statistical significance.

Groups	P value
Well differentiated oral squamous cell carcinoma V/s Moderately differentiated oral squamous cell carcinoma	0.123
Well differentiated oral squamous cell carcinoma v/s poorly differentiated oral squamous cell carcinoma	0.101
Moderately differentiated oral squamous cell carcinoma v/s poorly differentiated oral squamous cell carcinoma	0.110

Table 1: Comparison of final staining index score between different grades of oral squamous cell carcinoma.

Discussion

Oral squamous cell carcinoma (OSCC) is the most frequent type of oral malignancy globally and is associated with a high mortality rate.[10] The progression of carcinomas has conventionally been attributed to a stepwise accumulation of genetic changes within the target epithelium. Such molecular progression has been demonstrated in the oral mucosa where it is initially reflected in the appearance of precursor lesions with epithelial hyperplasia and dysplasia followed later by the development of frank carcinoma, changes paralleled by increase in genetic alterations in the epithelium.[10] However, the focus on solely epithelial changes has begun to change, and a recent paradigm shift leads to increasing recognition that the micro-environment makes significant contributions to tumor progression.[11]

Concurrent with the conversion of nondiseased epithelial tissue to precancerous epithelium to carcinoma, the stroma also changes from normal to "primed" to "activated or tumor associated." Remodeling of the extracellular matrix (ECM) or "stromagenesis" is initiated by tumor cells, while stromal cells are responsible for the organization of this process. Fibroblasts are considered as one of the most important mesenchymal cells involved in tumor progression. Myofibroblasts are a unique group of cells phenotypically intermediate between smooth muscle cells and fibroblast.[12] In addition to their normal role in tissue homeostasis and repair, altered number and function of myofibroblasts have been implicated in diseases with increased ECM deposition and resultant fibrosis,[13] and now, researchers have started understanding their role in cancers. They modulate the tumor stroma through secretion of a myriad of factors such as chemokines, growth factors, and matrix-degrading enzymes like MMPs.MF are prominent feature of tumor stroma of many but not all OSCCs.[13] Hence, the current study was undertaken to assess the role of myofibroblasts as important diagnostic and prognostic indicators of oral squamous cell carcinoma.

The present study involved the enrolment of 50 cases each of WDOSCC, MDOSCC, PDOSCC, as well as 50 controls. The investigation was carried out across three various grades of OSCC. Immunohistochemical analysis was conducted on the tissues using the SMA marker. The findings revealed that the average final staining index score for patients with well-differentiated oral squamous cell carcinoma (WDOSCC) was 9.23, while it was 8.98 for those with moderately differentiated oral squamous cell carcinoma (MDOSCC), and 6.54 for individuals with poorly differentiated oral squamous cell carcinoma (PDOSCC). The control group, on the other hand, exhibited favorable cellular expressions. The intergroup comparison of the final staining index score among different stages of oral squamous cell carcinoma (OSCC) did not demonstrate statistical significance ($P > 0.05$). Similarly, the analysis of myofibroblast expression across different grades of OSCC showed uninteresting findings. There was a significant statistical difference ($P < 0.05$) observed in the final staining index score when comparing instances of oral squamous cell carcinoma (OSCC) with normal controls.

Prasad BV et al[14] evaluated the presence of myofibroblasts in OSCC, by immunohisto-chemistry using alpha smooth muscle actin (a-SMA) antibody. They evaluated a total of 50 biopsy specimens from the archives of the oral pathology, where 20 specimens out of 50 were of well-differentiated OSCC (WDOSCC), 20 were of poorly differentiated OSCC (PDOSCC), and 10 were of normal healthy controls. All the specimens were stained by immunohistochemically using with monoclonal antihuman α-SMA. Etemad-Moghadam et al method was used for assessing the myofibroblast distribution. Staining index was evaluated for the groups and compared. All the results were analysed by Statistical Package for the Social Sciences (SPSS) software. The mean percentage of myofibroblasts score for WDOSCC and PDOSCC were 2.88 and 2.92 respectively. The mean staining intensity score in WDOSCC and PDOSCC were 2.88 and 2.55 respectively. Statistically significant results were obtained while comparing the final staining index score between the OSCC group and normal control group. No significant correlation could be obtained while comparing the mean staining index score in between WDOSCC and PDOSCC. Malignant epithelium might induce the adjacent stromal tissue to produce myofibroblasts. These specialized cells may be utilized as therapeutic targets for the treatment of OSCC.

Conclusion

Based on the findings of the present study, it has been determined that MFs play a crucial role in the pathogenesis of OSCCs. Furthermore, the assessment of MFs may serve as a valuable tool in predicting the invasive behaviour of OSCCs. Hence, we advocate for the utilization of MFs as a stromal marker in patients with oral squamous cell carcinoma (OSCC) in order to facilitate the visualization of invasion and progression.

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A Review

Intraoral Scanners in Dentistry: A Review

Manu Rathee[1], Savita Narwal[2], Surbhi Mittal[3], Sarthak Singh Tomar[4], Kritika Diwan[5], Balavignesh S[6]

Senior Professor and Head[1]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Pt. B.D. Sharma University of Health Sciences
Rohtak, Haryana, India

Post Graduate Student[2]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences,
Rohtak, Haryana, India.

Post Graduate Student[3]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Rohtak, Haryana, India

Post Graduate Student[4]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Rohtak, Haryana, India

Post Graduate Student[5]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Rohtak, Haryana, India

Post Graduate Student[6]
Department of Prosthodontics
Post Graduate Institute of Dental Sciences
Rohtak, Haryana, India

Access This Article Online

Website:
www.healtalk.in

Quick Response Code:

Corresponding Author:-

Dr. Manu Rathee
Senior Professor and Head,
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Pt. B.D. Sharma University of Health Sciences,
Rohtak, Haryana, India
Email: ratheemanu@gmail.com

Abstract

An Intraoral Scanner (IOS) device captures direct optical impressions in dentistry. Harnessing state-of-the-art 3D imaging technologies, Intraoral Scanners accurately capture the shapes and contours of teeth. This advanced technology enables dentists to attain superior scanning results, offering clearer insights into patients' dental structures and ensuring precise and customized treatment. Essentially, these devices streamline the direct optical capture of dental impressions. The objective of the present review of literature is to discuss various Intraoral Scanners (IOS).

Keywords: Intraoral scanners, Intraoral Scanning, Digital impression, Digitalization.

Introduction

The trend of digitalization has led to advanced computer-aided design and computer-aided manufacturing technology (CAD-CAM) extensive use in the field of Prosthodontics. Intraoral scanners (IOS) have various benefits in daily clinical use, including selective repeatability and capture of relevant areas, chairside options, virtual follow-ups, and quick communication with dental technicians.[1,2] Dentists increasingly favor IOS (Intraoral Scanning) technology for implant impressions compared to traditional impression techniques.[3,4] The utilization of IOS streamlines the workflow, potentially minimizing clinical treatment duration, and simultaneously enhancing patient comfort when compared with analog protocols.[5-8] In 1973, Durethas introduced the concept of intraoral scanning for dental applications,[9] where scanners projected a light source onto objects like implant scan bodies and prepared teeth in dental arches. This mechanism shared similarities with other 3D scanners. Today a variety of intraoral scanners are employed in prosthodontics for crafting diverse prostheses. This review aims to assess the evolution of available intraoral scanners and recent advancements.

Intraoral Scanning System

The scanners consist mainly of

1) A machine handling probe movement,
2) A measurement probe,
3) A control or computing system, and
4) Measurement software.[10,11]

The scanning field size ranges minimally from 14x14mm up to optimally 25x14mm, with a scanning depth between 10mm and 14mm for clarity and proper scanner placement. The scanner resolution should be at least 25µm.[12]

How to cite this article: Rathee M et al.: Intraoral Scanners in Dentistry: A Review, ***HTAJOCD.2024; Jan-Feb(3):41-44.***

Scanner Types Based on Emission[10]

1) **Optical Scanner:** Projects white light or a laser source, with the source and receiving unit at a specific angle.
2) **3D Laser Scanners:** Emit laser beams and detect their return.
3) **Photographic Technology Scanners:** Have a conical field of view, limiting information collection from hidden surfaces.
4) **Mechanical Scanner:** Scans a gypsum model obtained conventionally from printing.
5) **Video Technology Scanners:** Record scanned areas in a sequential shot manner, similar to a video camera, using the open standard tessellation language.

Evolution of Intraoral Scanners

Impression techniques, model-making, and appliance construction date back to the 18th century. Various impression materials were developed, each with limitations. In recent years, intraoral digital scanners emerged as an alternative to conventional methods.[13] In 1973, Dr. Francois Duret proposed the CAD/CAM technique to the dental world.[14] In 1977, Young and Altschuler developed a complex and costly intraoral grid surface mapping system.[15] In the 1980s, Dr. Werner Mörmann, a Swiss dentist, and Marco Brandestini, an Italian electrical engineer, invented the first digital intraoral scanner. In 1987, the CEREC concept was introduced by Sirona Dental Systems at the University of Zurich.[16] The evolution of intraoral scanning technologies has resulted in improved techniques over time(Table 1).

Lava C.O.S system	Year 2006, principle of active wave-front sampling. It has the 13.2mm wide smallest scanner tip.[11]
The iTero	Year 2007, utilizes parallel co focal imaging technology with red laser to capture a color 3D digital impression.[16]
Planscan	Year 2008, Real time laser video-streaming technology along with blue light is used to capture the dental data. Built-in heated mirrors along with scanner tips. Powder free system.[16]
E4D system	Year 2008, principle of optical coherence tomography and co focal microscopy.[11]
CEREC Bluecam	Year 2009, Using a powerful light-emittingdiode, Camera can allow the acquisition of high resolution images. A thin layer of titanium dioxide powder as a contrast medium is needed.[10]
TRIOS	Year 2010, a powder free, ultra fast optical scanning technology was introduced, featuring an open file system consisting of the TRIOSR Pod and TRIOSR Cart. According to Nedelcu et al, TRIOS exhibited the highest level of distinctness at the finish line.[17] The system is designed to automatically detect and digitally remove unwanted objects from the digital impression in real-time.[16]
CEREC Omniscan	Year 2012, a digital streaming technology was introduced, generating a full-color digital cast.[16] This system creates images by seamlessly stitching together individual frames, resulting in a monochromatic digital cast reminiscent of yellow stone. The video camera employed in this process produces a 3D model with authentic colors and temporal dimensions. Additionally, the system allows for the export of STL files to external systems through a designated license. Notably, it operates as a powder free system.[10]

CS 3500	Year 2013, click-and-pointsystem, powder free, adequate overlapping of the single images which should be ≥50% of the previous image is essential.[16]
True Definition	Year 2016, System uses blue LED light and a video imaging system for data collection. It requires a light dusting with titanium oxide reflective powder.[16]
Virtuo vivo	Year 2017, Advanced Imaging Technology with Multiple Scans. The lightweight hand piece, constructed from metal, weighs approximately 105 grams.[10] A total of five types of 3D scanners have been integrated into the system, operating simultaneously to capture challenging-to-reach areas. The system also features the development of DWOS CAD software.
Mediti500	Year 2018, uses video photogrammetry. [10] Differentiation between the soft tissue and dental structure can be made.
WOW	Year 2019, video photogrammetric technology.[10] Images with hyperrealistic texture and color can be developed using open system which develops a complete digital workflow. Powder free.
CEREC Primescan	Year 2019, touch-panel and screen, with the all new CEREC 5 software processor of the scanner can process up to 10,00,000 of 3D points per second. Depth of scanning should be up to 20 mm.[10]

Table Summary chart based on year of manufacturing and properties

Limitations

Intraoral scanners face challenges in capturing metal and other reflective materials within the oral cavity. The accuracy of scans can be compromised in clinical situations involving edentulous areas. Acquiring precise digital impressions becomes challenging in regions lacking teeth due to the absence of clear anatomical landmarks.[18]

Comparison of Intraoral Scanners

In a study conducted by Bocklet C et al, the Planmeca Emerald, Planscan, 3-Shape Trios, iTero Element, iTero Element II, CEREC Omnicam, and Carestream 3600 were assessed for their ability to capture the trueness of substrates. The study found that PlanScan failed to reveal trueness differences among various substrates, whereas Emerald demonstrated precision variations between the substrates.[19] In another comparative study on trueness by Mangano F et al, including CS 3700, iTero Element 5D i-500, TRIOS 3, CS 3600, PRIMESCAN, VIRTUO VIVO, RUNEYES, EMERALD s, EMERALD, OMNICAM and DWIO, the best results were reported with ITERO ELEMENT 5D®, while DWIO exhibited the lowest trueness.

Discussion

A contemporary and innovative approach in dentistry involves the integration of 3D digitization methods into dental practice, serving as a viable alternative to traditional impression techniques, particularly within the realm of Prosthodontics. The formulation of treatment plans now considers both clinical and virtual evaluations.[20]

Presently employed technologies

1) **Triangulation:** This process involves determining a point's location in 3D space based on its projections onto two or more images.
2) **Parallel Co-focal Imaging:** In confocal imaging, a focused laser beam is utilized to create a small spot illumination on the specimen, resulting in a higher resolution image.

3) **Accordion Fringe Interferometer (AFI):** AFI is an active-triangulation, surface-profiling technique that projects interference fringes onto an object's surface from one location and captures them with a camera at another location.
4) **Three-dimensional In-Motion Video:** This method employs triangulation between corresponding points in two views of the same scene at different angles to continuously compute depth through video analysis.[21]

Factors influencing the precision of IOS

1) **Scanning Software:** The ease with which the software is handled plays a crucial role.
2) **Scanner Technology:** This pertains to the resolutions and image quality delivered by the scanning technology.
3) **Powder Material Application:** The thickness of the powder material applied to the scanning site can potentially distort the actual surface thickness being scanned.
4) **Presence of Saliva and Blood**: The clarity of scanning is adversely affected by the presence of saliva and blood.
5) **Soft Tissue Movement and Limitedspace:** Challenges arise in achieving accurate scanner positioning due to soft tissue movement and constrained space.[17,22]

Summary

The primary indication area for Intraoral Scanners (IOSs) is determined by their properties, and understanding the distinctions among various IOSs can assist practitioners in selecting the optimal device. The latest generations of IOSs exhibit superior properties compared to their predecessors, featuring more specialized capabilities and heightened accuracy. As new generations of IOSs and software versions emerge in the market, the differences among IOS devices are expected to diminish over time.

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Artificial Intelligence: Precision Dentistry Unleashed

Varun Kumar[1], Jyotsna Seth[2], Shubham Talele[3]

Head of Department[1]
Dept. of Prosthodontics and Crown & Bridge
Seema Dental College and Hospital
Rishikesh, Uttarakhand.

Professor[2]
Dept. of Prosthodontics and Crown & Bridge
Seema Dental College and Hospital
Rishikesh, Uttarakhand.

PG III[rd] Year[3]
Dept. of Prosthodontics and Crown & Bridge
Seema Dental College and Hospital
Rishikesh, Uttarakhand

Access This Article Online

Website:
www.healtalk.in

Quick Response Code:

Corresponding Author:

Dr. Varun Kumar
Head of Department
Dept. of Prosthodontics and Crown & Bridge
Seema Dental College & Hospital,
Rishikesh, Uttarakhand, India
drvarun_smile@yahoo.com

Abstract

Over the past two decades, the field of artificial intelligence (AI) has experienced notable growth and progress. In the fields of medicine and dentistry, AI shows significant potential for improving patient care and revolutionizing healthcare practices. In the dental field, ongoing research delves into various AI applications, including the recognition of normal and abnormal structures, disease diagnosis, and the prediction of treatment outcomes. This appraisal provides an overview of both current and potential utilizations of AI in the realm of dentistry.

Keywords- Artificial intelligence, dentistry, technology.

Introduction

Artificial Intelligence (AI) refers to the capability of machines to perform tasks traditionally requiring human intelligence. While the concept dates back to 1950, it only became a practical tool in the last two decades. The rapid development of AI technology, driven by big data, computational power, and sophisticated algorithms, has significantly impacted various aspects of daily life. In dentistry, AI has been embraced across all disciplines, including operative dentistry, periodontics, orthodontics, oral and maxillofacial surgery, and prosthodontics. Most AI applications in dentistry focus on diagnosis using radiographic or optical images.[1]

When employed in medicine and dentistry, AI presents significant opportunities to enhance patient care and revolutionize the healthcare landscape. In dental universe, ongoing research is exploring diverse applications, including the identification of various structures, disease detection, and the forecasting of treatment outcomes.[2]

What is Artificial Intelligence?

Artificial intelligence involves replicating human mental abilities within a computer system. The ultimate goal is to create a machine capable of emulating or surpassing various aspects of human cognition, such as reasoning, understanding, imagination, perception, recognition, creativity, and emotions. Although achieving this ambitious objective is still a considerable distance away, there have been noteworthy successes in certain aspects of the field. Certainly, more significantly, the exploration of artificial intelligence has not only led to modest accomplishments but has also given rise to a suite of highly beneficial computing tools. These tools have empowered the resolution of challenges once deemed overly complex, facilitating more effective solutions for a broad spectrum of problems. AI tools can be broadly categorized into the following types:

How to cite this article: Kumar V et al.: Artificial Intelligence: Precision Dentistry Unleashed, ***HTAJOCD. 2024; Jan-Feb(3):45-48.***

1. Knowledge-based systems (KBSs), which involve explicit models utilizing words and symbols.
2. Computational intelligence (CI), which employs implicit modeling through numerical techniques, including hybrid approaches.[3]

History of Artificial Intelligence

In 1955, the term AI was initially introduced during a two-month workshop called the Dartmouth Summer Research Project on Artificial Intelligence. This workshop was led by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. Despite its inception, the concept remained theoretical, and practical constraints hindered researchers from actualizing AI machines in the 1950s.

Between 1957 and 1974, the AI field experienced rapid expansion, driven by the increased availability and accessibility of computer power, along with advancements in AI algorithms. During the 1980s, the development of AI took place along two distinct paths: machine learning (ML) and expert systems. These paths represent opposing approaches in AI theory. Machine learning enables computers to learn through experience, while expert systems, conversely, replicate the decision-making processes of human experts.[4]

Applications in Dentistry

AI in Prosthodontics-

The integration of AI-driven progress has brought about a substantial transformation in the field of prosthodontics. The adoption of digital impression-taking and intraoral scanning techniques has revolutionized the construction of both fixed and removable prostheses, guaranteeing an unprecedented level of precision.

In the field of removable prosthodontics, AI algorithms play a crucial role in analyzing patient data, which includes assessments of oral scans and impressions. This analysis contributes to the creation of more precise and personalized designs, ensuring a superior fit and increased comfort for patients. Additionally, AI aids in the selection of optimal materials and configurations for removable prosthetics, maximizing their durability and aesthetic appeal.

While the development of an AI-powered system in fixed prosthodontics is ongoing, its primary advantage lies in its ability to analyze and extract insights from an extensive database containing millions of doctor-approved crowns. This database continues to expand as new data is regularly added to the cloud. The AI system assesses the construction of each high-performance restoration to determine the most optimal functions, taking into account perfect occlusion, contacts, and margins tailored to individual cases. Through this process, the AI system learns from successful crown designs, continually enhancing its capabilities over time.[7]

AI in Endodontics-

Understanding the different types of roots and root canal systems is crucial for the success of nonsurgical root canal therapy. Cone-beam computed tomography (CBCT) imaging and periapical radiography are commonly used for this purpose. Compared to radiography, CBCT imaging has shown higher precision in evaluating the shapes of both roots and root canals.[8] Precisely establishing the working length (WL) is essential for ensuring the success of root canal treatment. Several techniques are utilized to assess the working length, including radiography, digital tactile sense, electronic apex locators, patient feedback based on the insertion of a paper point or file point into the root canal system, and cone-beam computed tomography (CBCT) imaging. Among these, dental practitioners commonly use radiography and electronic apex locators as standard methods. In digital radiography, the clarity of the image plays a crucial role in accurately interpreting the root canal system's anatomy.[8]

AI in Implantology-

In implantology, AI plays a crucial role beginning with computer-assisted planning. Algorithms analyze patient-specific data, including radiographs and medical history, to recommend optimal implant locations, sizes, and angles. AI-powered image analysis is also utilized to evaluate bone quality and quantity for implant placement. Through accurate analysis of radiographic images, AI assists in identifying potential anatomical limitations, aiding clinicians in making informed decisions about implant surgical techniques.[9]

A noteworthy advancement is the incorporation of AI into robotic surgery. AI-powered robots offer real-time guidance during implant procedures, ensuring the precise execution of the preoperative plan. This diminishes the likelihood of errors, resulting in safer surgeries and improved patient outcomes.[10]

AI in Orthodontics-

Cephalometric analysis, specifically the identification of landmarks on lateral cephalograms, plays a pivotal role in orthodontic diagnosis, treatment planning, and evaluating treatment outcomes. The traditional manual landmarking process is time-intensive, dependent on experience, and can exhibit variations both within and among orthodontists, significantly affecting clinical practices' efficiency and precision. While automated landmark detection was explored as early as the mid-1980s, the initially high error margin hindered practical implementation in clinical settings. In recent years, with the advancements in AI, several studies have utilized cephalometric analysis, with ongoing efforts to improve its reproducibility, efficiency, and accuracy. Effective orthodontic treatment relies on thoughtful decision-making, especially in areas such as planning tooth extractions and evaluating the potential need for surgical interventions. AI is anticipated to play a substantial role in supporting orthodontists, particularly those with limited experience, by assisting in making precise and informed decisions.[11]

AI in Periodontics-

Luciano et al. pioneered a specialized haptics-based dental simulator designed exclusively for Periodontics. This simulator assists students in developing the necessary skills for diagnosing and treating periodontal diseases. Utilizing a haptic device, students can physically perceive 3D representations of upper and lower teeth, as well as the gingiva, offering a tactile learning experience. The haptic feedback generated emulates the clinical sensation experienced by an operator using dental instruments.

Companion et al in 1998 released the first results of an ultrasonographic periodontal probe developed at NASA Langley. The primary objective of this probe was to address the prevalent problems of pain and imprecision associated with manual probing. It incorporates a hollow conical tip filled with water to facilitate the transmission of the ultrasonic beam into the tissues.[12]

In 2017, Rana, Yauney, et al. introduced a machine learning classifier designed to distinguish between inflamed and healthy gums. After being exposed to light ranging from 405 to 450 nm in wavelength, an oral imaging device captured the fluorescence emitted by the biomarker porphyrin. Plaque manifested in yellow and orange hues, while inflamed gums were depicted in shades of magenta and red. The classifier then produces a pixel-by-pixel segmentation, pinpointing areas suspected to be impacted by gingivitis.[13]

AI in Oral and Maxillofacial Surgery-

AI has made significant strides in the realm of robotic surgery, particularly within Oral and Maxillofacial Surgery (OMFS). Cranial surgical interventions, including procedures like dental implants, tumor resection, biopsies, and temporomandibular joint surgery, have demonstrated successful outcomes with the assistance of AI. Research suggests that surgery augmented by AI has improved the precision and safety of oral implant procedures compared to conventional freehand methods. Notably, the integration of AI has resulted in a decreased requirement for revision surgeries and implant repositioning in specific cases. Furthermore, AI-assisted approaches have facilitated more accurate surgical resection of tumors and cysts, thereby reducing the necessity for additional procedures.[14]

The application of computer-aided planning, relying on 3D imaging, streamlines tasks such as cephalometric analysis, splint production, and operation simulation. This technology provides a more lucid visualization of dental irregularities, encompassing aspects like yaw rotations, occlusal plane canting, and variations in the length of the mandible's body/ramus. The integration of virtual surgical planning, facilitated by advancements in 3D imaging and 3D printing, enhances surgeons' understanding of anatomical structures, leading to significantly improved treatment outcomes. The potential for AI to contribute to the planning of orthognathic surgery is considerable, complementing the existing methodologies of 3D imaging and 3D printing.[14]

Conclusion

Although numerous studies have highlighted potential applications of AI in dentistry, these systems are far from having the capacity to substitute dental professionals. Instead, the use of AI should be viewed as an adjunctive tool to aid dentists and specialists. It is crucial to ensure the secure and regulated integration of AI, emphasizing that humans maintain the capability to guide treatment and make informed decisions in the field of dentistry.

Successfully incorporating AI into dentistry necessitates training in dental practices and continuous education—a challenge that many institutions are currently ill-prepared to address. Additionally, AI plays a crucial role in virtual reality (VR) and augmented reality (AR). The emerging concept of mixed reality integrates elements of generative AI, VR, and AR, incorporating computer-superimposed information overlays to enhance learning and surgical planning. With diverse AI systems under development for various dental disciplines and demonstrating promising initial results, the potential of AI in the healthcare system, particularly in oral health, should not be underestimated. AI systems hold the promise of serving as valuable tools for oral health professionals.[2]

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A Case Report

Bar Versus Stud Attachment Retained Mandibular Over-denture For Rehabilitation of Resorbed Ridges

Lalit Kumar[1], Shrishti Bhardwaj[2], Shefali Singla[3], Charnpreet Singh[4]

Associate Professor [1]
Dept. of Prosthodontics and Crown &Bridge
Dr HSJ Institute of Dental Sciences
Panjab University, Chandigarh

Post Graduate Student[2]
Dept. of Prosthodontics and Crown &Bridge
Dr HSJ Institute of Dental Sciences
Panjab University, Chandigarh

Professor and HOD[3]
Dept. of Prosthodontics and Crown &Bridge
Dr HSJ Institute of Dental Sciences
Panjab University, Chandigarh

Post Graduate Student[4]
Dept. of Prosthodontics and Crown &Bridge
Dr HSJ Institute of Dental Sciences
Panjab University, Chandigarh

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Abstract

The most common problem associated with the management of edentulous patients is the severely resorbed residual alveolar ridge of the lower jaw which results in the fabrication of unsatisfactory dentures with poor retention and stability, reduced oral function and may further precipitate psychosocial problems. Implant supported overdentures are seen to be a treatment modality of choice to overcome limitations of traditional denture therapy as they are seen to improve the retention, stability, aesthetics as well as overall patient comfort. Commonly used attachments used to retain implant supported overdenture are stud, bar, magnetic and telescopic attachment.[(1)]

Keywords: Implant supported Overdenture, Resorbed mandibular ridge, Locator attachment, Bar overdenture

Introduction

Prosthetic management of edentulous patients with conventional complete denture offer less retention, stability and comfort to the patient, particularly in mandibular arch. Use of attachment retained implant supported over-denture increases the retention, stability, support, masticatory efficiency, proprioception and decreases the rate of ridge resorption which makes it an acceptable treatment option in resorbed mandibular arch.[(1)] Implant supported overdentures employ the use of different retention systems that are broadly categorized as splinted or unsplinted. The splinted attachment systems are the bar attachments while the unsplinted systems comprise spherical/ball types, magnets, telescopic crowns or stud type attachments. The unsplinted systems are indicated in clinical situations with diminished inter-arch distances and are further advantage-ous in terms of hygiene, ease of fabrication and initial treatment cost whereas bars present the lowest rate of prosthetic complications.[(4)] The use of two implant overdenture is not the gold standard for implant therapy, it is the minimum standard that should be appropriate for many people, taking performance, satisfaction of the patient, cost and clinical time into consideration.[(2,3)]

Case Report1:

A 76-year female patient had reported to the Department of Prosthodontics with the chief complaint of loose upper and lower denture. Clinical examination revealed extremely resorbed lower ridge with implants in #33 and #43 region placed 5 years back and rehabilitated with ball abutment retained mandibular overdenture and conventional maxillary complete denture. Attachments inserts had dislodged in lower overdenture and both dentures had compromised retention and repeat of both dentures was planned. Jaw relation revealed reduced vertical distance of 10 mm available for lower overdenture which ruled out the use of ball attachment.

How to cite this article: Kumar et al: Bar versus stud attachment retained mandibular overdenture for rehabilitation of resorbed ridges. ***HTAJOCD.2024; Jan-Feb(3):49-52.***

So, a low profile locator attachment (locator Rt-x Osstem) was selected for retention. (Fig.1) After processing of both upper and lower dentures, following procedure was adopted to pick up housing for locator attachment.

1) White coloured block out spacer was inserted above the locator attachment. (Fig.2)
2) Then black processing cap was fitted into the metal cap and placed above the blockout spacer.(Fig.3)
3) The implant positions were marked on the intaglio surface of the denture and a small space was created and selfcure acrylic (DPI) was filled into that space and the denture was placed on the mandibular arch. (Fig.4)
4) The metal cap along with black processing cap was picked up in the denture after the self-cure acrylic sets. (Fig.5)
5) Black processing cap was then removed and retentive attachment cap with low retention of 6N (Blue) was fitted and placed inside the metal cap.[6] (Fig.6 & 7)

Finally, the maxillary and mandibular denture were checked for occlusal errors and patient comfort. (Fig.8)

Fig.1 Intraoral picture with locator attachment in place.

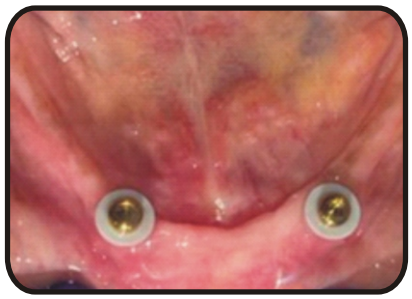
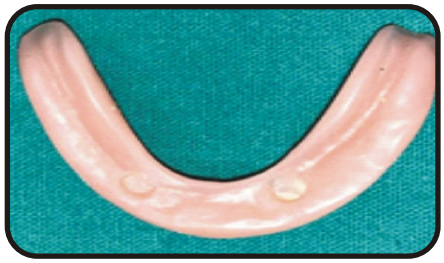


Fig.2 Placement of blockout spacer

Fig.3 Metal housing with black processing inserts



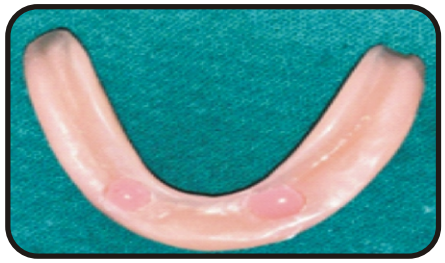


Fig.4 Denture was modified followed by application of self cure acrylic resin

Fig.5 Black processing caps picked in denture

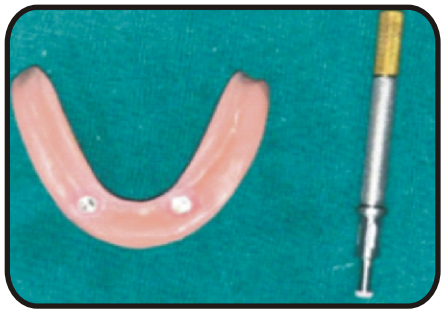


Fig.6 Processing cap was removed

Fig.7 Placement of blue retentive cap

Fig.8 Insertion of the denture was done.

Case Report 2:

A 70-year male patient had reported to the Department of Prosthodontics with the chief complaint of loose upper and lower denture and having difficulty in mastication. On clinical examination, patient was havinga bar retained mandibular overdenture with implants in #33 and #43 region placed 6 years ago with conventional complete denture in maxillary arch (Fig.9) Dentures had compromised retention and the lower denture was fractured. So, the patient was adviced a new bar retained mandibular overdenture and conventional maxillary complete denture. The following procedure was adopted for the fabrication of overdenture:

1) Impression of the maxillary arch was made with irreversible hydrocolloid (Zhermack Tropicalgin) and mandibular arch was made with putty-light body. (Coltene President)
2) The bar portion was poured in pattern resin(GC) followed by Type IV die stone (Kalabhai Kalrock) over it and master cast was obtained.(Fig. 10)
3) After that maxillary and mandibular complete dentures were processed. Space below the bar was blocked out by carding wax and metal clip with nylon insert (Ceka attachment, Preci Line) were placed over bar. (Fig.11)
4) Then, the denture was trimmed and space was created from the bar portion followed by application of self-cure acrylic resin.(Fig. 12) After that the clips were picked up after seating and removal of the denture intraorally.(Fig. 13)
5) Maxillary and mandibular denture were checked for occlusal errors and patient comfort. (Fig.14)

Fig.9 Intraoral picture with bar attachment in place.

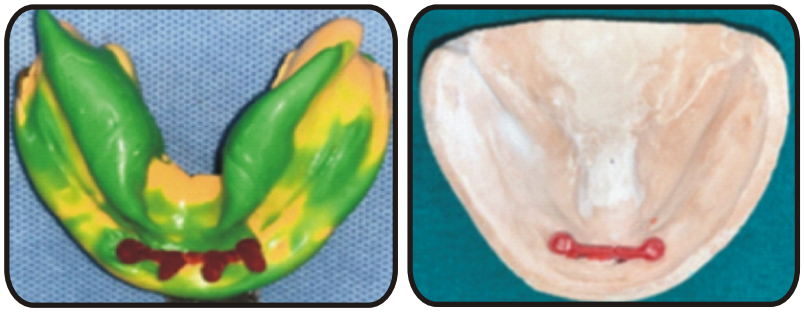


Fig.10 Portion of the bar was poured with pattern resin

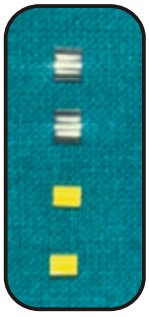


Fig.11 Space was blocked out by carding wax and housing with nylon clip were placed over bar

Fig. 12 Denture modification and self-cure acrylic application

Fig.13 Picked-up clips in denture

Fig.14 Final Insertion of the prosthesis

Discussion

Compared with complete denture, implant-supported overdenture improves the stability of the prosthesis. Increased number of implants may guarantee more retention. However, there is a problem of increased cost and anatomical limitations in severely resorbed residual ridges, especially in the mandible. Several studies have demonstrated that the two-implants-supported overdenture therapy can be considered as a very reliable treatment for patients with an edentulous mandible. [(2)]

The choice between a bar and locator attachment for a mandibular overdenture in the rehabilitation of resorbed ridges involves careful consideration of various factors. Both attachment systems have their advantages and considerations that should be taken into account during the treatment planning process.

A bar-supported overdenture involves the use of a metal bar that is attached to implants. The overdenture then clips onto the bar. It provides stability and support to the denture, reducing lateral forces and improving overall retention. They are suitable for cases where there is a significant resorption of the ridge and more support is needed. Locator attachments on the other hand consist of male and female components with a resilient, flexible, and self-aligning design.It provides good retention and stability, allowing for some degree of movement and rotation.It is a low profile attachment requiring less vertical space compared to a bar attachment which require 14 mm of average vertical space, making it suitable for cases with limited inter-arch space.[(5)] Hence, in first case report, locator was used instead of ball attachment.

Various factors like number of implants, interridge distance, type of prosthesis, amount of retention, patient expectation and cost factor have to be considered while selecting attachment for a successful prosthesis. [(1)]

Conclusion

These clinical reports describe step by step procedure for fabricating implant supported overdenture utilising both low profile attachment such as locator and high profile attachment such as bar.

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A Case Report

Precision in Aesthetics: Case Report on Gingival Depigmentation in a 36-Year-Old Patient with Soft Tissue Diode Laser

Vipul Srivastava[1], Shally Mahajan[2]

Professor[1],
MDS
Endodontics & Conservative Dentistry,
Advanced Proficiency in Laser Dentistry (ALD, USA)
Masters in Laser Dentistry (Vienna)
Private Practitioner,
32 Pearls Multispecialty Dental Clinic,
Lucknow

Professor[2],
Department of Dentistry,
Dr. Ram Manohar Lohia Institute of Medical Sciences

Abstract:

Gingival pigmentation is characterized by the presence of diffuse deep purplish discoloration or irregularly shaped brown and light brown or black patches, striae, or strands on gingiva.

It has become a concern for many individuals seeking aesthetic improvement. This article explores the application of soft tissue diode laser in treating gingival depigmentation, comparing it with conventional methods. The advantages, disadvantages, indications, contraindications, and benefits to both dentists and patients are discussed.

This case report documents the successful treatment of gingival depigmentation in a 36-year-old male using a soft tissue diode laser. The patient presented with a chief complaint of dark gums, expressing dissatisfaction with the aesthetics of his smile. Following a thorough clinical examination, the decision was made to employ a minimally invasive approach with the diode laser. The procedure demonstrated precision, minimal bleeding, and efficient removal of pigmented tissue. The patient exhibited a swift recovery with a significant improvement in gingival appearance. This abstract highlight the efficacy and aesthetic benefits of diode laser therapy in addressing melanin-induced gingival pigmentation.

Keywords: Gingival depigmentation, soft tissue diode laser, melanin, melanocytes

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Introduction:

Gingival health and appearance are essential components for an attractive smile and removal of unsightly pigmented gingiva is the need for a pleasant and confident smile. Gingival pigmentation is a common cosmetic issue that can affect an individual's smile and self-confidence. Melanin, carotene, reduced haemoglobin, and oxyhaemoglobin are the prime pigments contributing to the normal colour of the gingiva. Excessive deposition of melanin located in the basal and supra-basal cell layers of the epithelium usually results in gingival hyperpigmentation.

Various traditional methods have been employed to treat this condition:

1. **Scalpel Surgery:** Involves the physical removal of pigmented tissue.
2. **Chemical Agents:** The use of chemical substances to lighten pigmented areas.
3. **Bur Abrasion:** using a rotary instrument and a diamond bur to scrap off the pigmented layer of the gum tissue
4. **Cryosurgery** and Electrosurgery

How to cite this article: Srivastava V et al.: Precision in Aesthetics: Case Report on Gingival Depigmentation in a 36-Year-Old Patient with Soft Tissue Diode Laser *HTAJOCD.2024;Jan-Feb(3):53-55.*

5. **Lasers - Neodymium:** Aluminium- Garnet (Nd:YAG) Lasers, Erbium lasers, Carbon di oxide (CO2) lasers, Diode lasers

With the advent of soft tissue diode lasers, a more precise and less invasive alternative has been introduced in a dental office. Soft tissue diode lasers, emitting at specific wavelengths, selectively remove pigmented cells.

Case Report:

A 36-year-old male presented with a concern regarding the dark pigmentation of his lower gums, particularly in the anterior region (Figure 1). The patient expressed dissatisfaction with the appearance of his smile and sought an aesthetic solution. His medical history was unremarkable and oral hygiene was good, with no known contraindications to dental procedures.

Figure 1: Pretreatment

Clinical Examination:

Upon clinical examination, distinct dark pigmentation was observed in the gingival tissues, predominantly in the mandibular anterior region from canine to canine. The pigmentation was determined to be melanin-induced, and the patient was informed about the available treatment options.

Diagnosis:

Gingival Depigmentation due to Melanin Accumulation.

Treatment Plan:

Considering the patient's desire for a minimally invasive and aesthetically pleasing solution, the decision was made to proceed with gingival depigmentation using a soft tissue diode laser.

Procedure:

1. **Preoperative Preparation:** The patient underwent routine oral prophylaxis to ensure optimal oral hygiene before the procedure.
2. **Topical Anaesthesia:** Topical anaesthesia was administered to ensure the patient's comfort during the procedure.
3. **Diode Laser Treatment:** A soft tissue diode laser (wavelength 810 nm) was used to selectively remove pigmented gingival tissue. The laser's precision allowed for controlled ablation of melanin-rich cells.
4. **Haemostasis:** The coagulative properties of the laser minimized bleeding during the procedure, contributing to a cleaner surgical field.
5. **Postoperative Care:** The patient received postoperative instructions, including oral hygiene measures and any prescribed medications.

Postoperative Results:

The patient exhibited a remarkable improvement in gingival pigmentation immediately postoperatively (Figure 2). The treated areas showed minimal bleeding, and the patient reported mild discomfort, which subsided within a few days (Figure 3). Oral hygiene measures were reinforced. Follow -up appointments were scheduled to monitor healing and address any concerns. Complete resolution of gingival pigmentation was noticed. The gingival tissues appeared healthy, and the patient expressed high satisfaction with the aesthetic outcome.

Figure 2: Immediate Post operative

Figure 3: After 1 week

Discussion:

The use of a soft tissue diode laser proved to be an effective and well-tolerated method for treating gingival depigmentation in this case. The precision and minimal invasiveness of the laser contributed to a swift recovery and a pleasing aesthetic outcome.

Soft tissue diode lasers offer a more controlled and targeted approach. They minimize bleeding, reduce post-operative discomfort, and provide efficient tissue ablation, leading to quicker recovery.

Advantages of Lasers Over Conventional Methods:

1. **Precision:** Laser treatment allows for precise removal of pigmented tissue.
2. **Minimal Bleeding:** The coagulative properties of lasers minimize bleeding during the procedure.
3. **Reduced Discomfort**: Patients experience less post-operative pain compared to traditional methods.
4. **Faster Healing:** Laser-treated areas tend to heal faster than those treated with conventional methods.

Benefits to a Dentist:

1. **Enhanced Precision:** Laser technology enables precise tissue removal.
2. **Increased Patient Satisfaction:** Faster healing and reduced discomfort contribute to higher patient satisfaction.

Benefits to a Patient:

1. **Minimally Invasive**: Laser treatment is less invasive than traditional methods.
2. **Quick Recovery:** Patients experience faster healing and reduced downtime.
3. **Aesthetic Improvement:** Achieves a more aesthetically pleasing gum appearance.

Disadvantages:

1. **Cost:** Initial setup costs for laser equipment can be higher.
2. **Operator Skill:** Skilful handling of the laser is crucial, requiring specialized training.

Conclusion:

Soft tissue diode lasers have revolutionized the treatment of gingival depigmentation, offering a precise, minimally invasive, and efficient alternative to conventional methods. Gingival depigmentation with a diode laser offers a valuable solution for individuals seeking aesthetic improvement. This case report highlights the successful treatment of a 36-year-old male, demonstrating the efficacy of diode laser technology in achieving optimal results with minimal discomfort and rapid recovery. The positive outcome observed in this case supports the continued consideration of diode lasers in addressing gingival depigmentation concerns. While challenges such as cost and operator skill exist, the benefits to both dentists and patients make laser treatment an increasingly preferred option in aesthetic dentistry. Continued research and advancements in laser technology hold promising prospects for the future of gingival depigmentation procedures.

A Case Report

Prosthetic Rehabilitation of Post Enucleation Ocular Defect Using Customized Esthetic Prostheses

Shefali Singla[1], Komalpreet Kaur[2], Manjot[3], Shrishti Bhardwaj[4]

Professor and HOD[1]
Dept. of Prosthodontics, Crown and Bridge,
Dr. HSJ Institute of Dental Science
Panjab University, Chandigarh

Post Graduate Student[2]
Dept. of Prosthodontics, Crown and Bridge,
Dr. HSJ Institute of Dental Science
Panjab University, Chandigarh

Assistant Professor[3]
Dept. of Conservative Dentistry & Endodontics,
Dr. HSJ Institute of Dental Science
Panjab University, Chandigarh

Post Graduate Student[4]
Dept. of Prosthodontics, Crown and Bridge,
Dr. HSJ Institute of Dental Science
Panjab University, Chandigarh

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Abstract

The loss of an eye or a disfigured eye can profoundly affect a person's mental and social life.(1) Custom-made ocular prostheses are preferred over prefabricated stock eye shells because they provide intimate contact with the tissue bed, ensuring an ideal fit.(2,3) This clinical report describes the rehabilitation of post-enucleation ocular defect using custom-made acrylic eye prostheses with acceptable fit, retention and esthetics.

Case Presentation

A 67-year-old male patient reported to the department with chief complaint of facial disfigurement due to missing right eye. History revealed iris and ciliary body melanoma of right eye, followed by enucleation of the same four months ago. Examination of the eye socket revealed a healthy conjunctiva with no signs of infection or inflammation. Patient was using a conformer. A semi customized ocular prosthesis with stock iris and custom made sclera, followed by characterization was planned for the patient.

Technique

Custom tray fabrication:

Putty was adapted to the intaglio surface of the conformer that served as a scaffold for the tray. Tray was fabricated using auto poly merizing acrylic resin (DPI, India). Relief holes were created and custom tray was attached to disposable syringe to act as medium to transfer material into the defect(Figure 1a)

Impression:

Petroleum jelly was applied on eyelashes and surrounding areas. Light body poly vinyl siloxane was loaded in syringe and slowly injected into the defect. To record the functional borders, patient was asked to perform medial, lateral, superior, inferior and rotational eye movements (Figure 1b).

Wax pattern fabrication and try-in:

Impression was invested in alginate in disposable cup. Impression was cut and molten wax was poured into the mould and after cooling wax pattern was removed. (Figure4). Contours of pattern were altered till he was comfortable in both open and closed positions of the eyelids (Figure 5).

Selection and Iris centering:

The size, shade, and con-figuration of the iris were selected by using the contra lateral natural eye as a guide. Scleral part of the stock eye was trimmed off using an acrylic trimmer to retrieve iris part. A customized scale with graph grid was used for iris centring. Stock iris button was placed in pattern in desired position(Figure 2a and 2b)

Flasking & packing of wax pattern:

Cold cure handle was attached to iris button before flasking, to secure its position during processing of prosthesis in tooth coloured heat cure acrylic resin (DPI, India) (Figure 3).

After finishing prosthesis was tried in patient and all the contours were verified and analysed for any areas that required any adjustment.

How to cite this article: Singla et al:Prosthetic rehabilitation of post enucleation ocular defect using customized esthetic prostheses.***HTAJOCD.2024; Jan-Feb(3):56-58.***

Characterization:

A digital photograph was taken of the patient left eye to act as guide for characterization. Three ceramic stains lemon (E03, Ivoclar), Basic Red (e21, Ivoclar) And Blue (es 11, Vita) were used with bonding agent as solvent and light cured. Red micro pen (Pigma, micron 005) was used to simulate blood vessels. Two layers of optiglazeclear (GC, America) was applied and light cured to give smooth glass like appearance.(Figure 4a)

Final ocular prosthesis was inserted into the socket and evaluated for fit, esthetics, and the coordinated movements with the contra lateral eye (Figure 4b). Patient was advised to remove ocular prosthesis during night and be soak it in an antibacterial solution before using daily.[4]

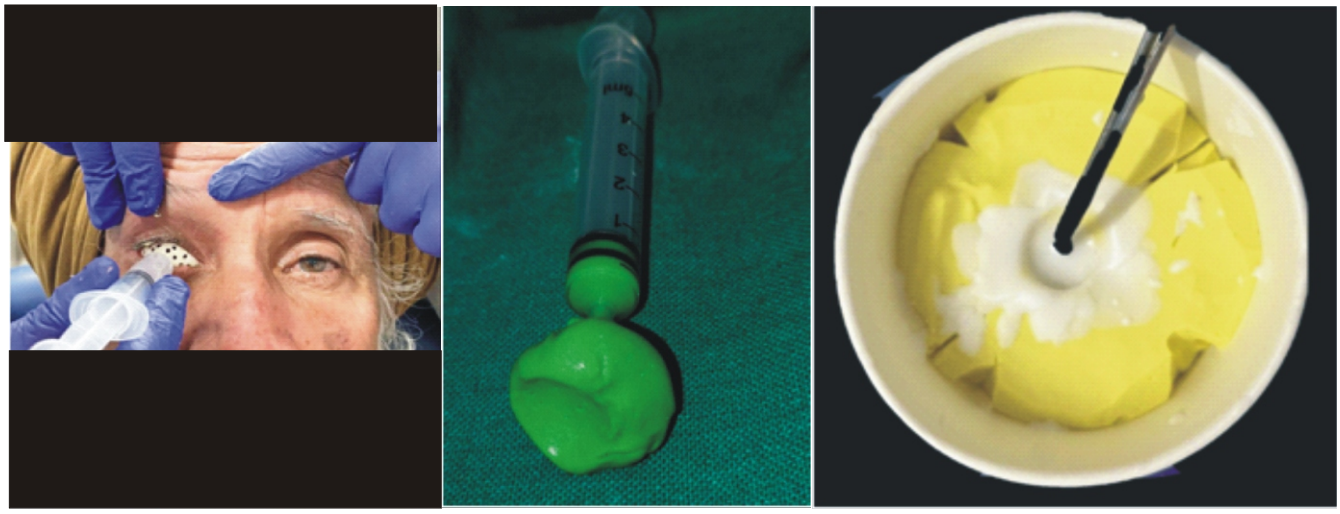

Figure 1: a) Customtray try-in **b)** Impression of ocular defect **c)** Preparation of ocular wax pattern

Figure 2:a) Iris centring **b)** and try -in

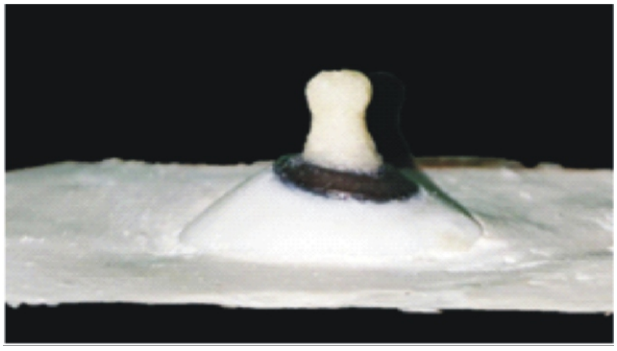

Figure 3 Handle atteched to iris button

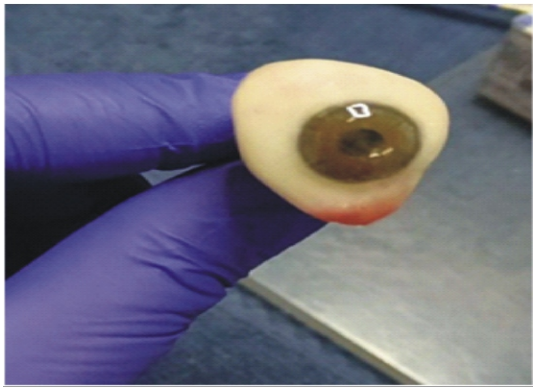

Figure 4: Ocular prosthesis after characterization and post-insertion photograph

Discussion

Customized ocular prostheses have the advantages over stock eyes, like, better contouring, colour matching, and coordinated movements with the contra lateral eye. Customizing the iris demands extra skill and time from the operator. It can be avoided by selecting the stock iris that closely resembles the patient's natural eye and can be characterized accordingly. In this technique, ceramic stains, bonding agent and optiglaze were used for characterization. To simulate red vessels, instead of threads micro nib pen was used to avoid the irregularities caused by threads on the surface of prosthesis. Use of optiglaze helps to avoid dual curing of the prosthesis, prevents the seepage of colours and gives a smooth surface.

Conclusion

This technique reduces laboratory and clinical time and provides a satisfactory result for the indicated patients.

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A Review

Application of PEEK in Implant Dentistry: A Review

Balavignesh S[1], Manu Rathee[2], Sarthak Singh Tomar[3], Pritish Dixit[4], Stalin M[5], Kritika Diwan[6]

Post Graduate Student[1]
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Rohtak, Haryana, India.

Senior Professor and Head[2]
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Pt. B.D. Sharma University of Health Sciences,
Rohtak, Haryana, India.

Post Graduate Student[3]
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Rohtak, Haryana, India.

Post Graduate Student[4]
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Rohtak, Haryana, India.

Post Graduate Student[5]
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Rohtak, Haryana, India.

Post Graduate Student[6]
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Rohtak, Haryana, India.

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Quick Response Code:

Corresponding Author:-

Dr. Manu Rathee
Senior Professor and Head,
Department of Prosthodontics,
Post Graduate Institute of Dental Sciences,
Pt. B.D. Sharma University of Health Sciences,
Rohtak, Haryana, India
Email: ratheemanu@gmail.com

Abstract

Background:

Currently, innovative techniques and materials are being developed in the field of dentistry. While each has its benefits and drawbacks, the primary challenge is selecting the most suitable materials based on their mechanical, physical, and biochemical properties. As there is a growing demand for esthetics, metal-free materials are needed to meet this demand. Recently, Polyetheretherketone (PEEK), a member of the Polyaryletherketone (PAEK) family, has emerged as a promising alternative material for fixed dental prostheses due to its impressive mechanical properties. Additionally, PEEK and PEEK-based compounds may offer viable alternatives to titanium in the field of dental implantology due to their biocompatibility and high-performance properties.

Keywords: Implant dentistry, Polyetheretherketone (PEEK), PEEK implant.

Introduction

Dental implants are widely regarded as the optimal solution for restoring teeth in patients who are either completely or partially missing their teeth.[(1)] The success of dental implants over the long term is heavily reliant on minimizing the amount of bone loss that occurs around the implant when it is subjected to functional loads. In contemporary dental practice, titanium and its alloys, as well as zirconium, are the most commonly utilized materials for dental implants.[(2)] Some disadvantages of titanium and its alloys include metal ion release and subsequent osteolysis, metal corrosion and poor compatibility with modern imaging techniques[(1,2).] To get around these restrictions and reduce biological issues that arise after implant placement, research has moved its focus to assessing titanium substitutes. Polyetheretherketone (PEEK), a partly crystalline poly aromatic linear thermoplastic material, is the most promising innovative substitute.[(2,3)] The materials from the Polyaryl-etherketone (PAEK) family belong to high-performancepolymers. They can be defined as materials that retain functionality even in extreme conditions,[(3)] Many uses for clinical dentistry have been investigated with PEEK. For instance, because PEEK and bone have more similar mechanical characteristics, PEEK dental implants have shown less stress shielding than titanium dental implants[(4)]. PEEK is a material that shows promise for both fixed and removable prosthesis, using post and core repair to reduce the likelihood of root fracture[(5)]. This article addresses the application of PEEK material in field of implant dentistry.

General characteristics of PEEK

Polyetheretherketone (PEEK) is a polycyclic, linear polyamide polymer. It was first developed in 1978 by a team of English researchers. Later, PEEK was commercially available for industrial uses. PEEK does not causes allergy. PEEK's mechanical properties remain unchanged during the

How to cite this article: Balavignesh S et al: Application of PEEK in Implant Dentistry: A Review. ***HTAJOCD.2024;Jan-Feb(3):59-61.***

sterilization process using steam, gamma rays and ethylene oxide. (Table 1) Polyether ether ketone has hydrolytic resistance, non-toxicity and one of the highest biocompatibility.[6]

S.NO	PROPERTIES	VALUES
1	Tensile strength	90-100 Mpa
2	Flexural strength	140-170 Mpa
3	Young's modulus	3-4 Gpa
4	Density	1300 kg/m³
5	Thermal conductivity	0.29 W/mK
6	Specific gravity	(g/cm3) 1.31
7	Vitreous transition temperature	143 °C
8	Melting temperature	343 °C

Table 1. Properties of Peek

PEEK in Implant Dentistry

Wolff's Law states that bone will adapt to the mechanical loads under which it is placed. The biomechanical phenomena known as stress shielding results in adaptive changes in the strength and stiffness of the bone surrounding metallic implants. It also causes a decrease in the volume of bone surrounding an implant since the implant shields normal loads, which may eventually cause the implant to loosen.[7] Zirconia and titanium have elastic modulus of 110 and 210 GPa, respectively, which is 5–14 times higher than the elastic modulus of compact bone, which is 15 Gpa.

A titanium implant's gradient difference in elastic modulus from the surrounding bone can lead to stress at the implant-bone interface during load transfer, which can induce peri-implant bone loss.[8] We need a material with an elastic modulus that is near to bone in order to overcome this. Polyetheretherketone (PEEK) has an elastic modulus of 3.6 GPa,[7,8] which is closer to that of bone.

By reinforcing it with carbon fibers, for instance, its modulus can be changed to 18 GPa, which is more in line with cortical bone. [8]An further issue with titanium implants is their hypersensitivity and poor esthetics due to lack of light transmission. In situations when there is gingival recession surrounding a titanium implant or thin biotype mucosa, this may cause a dark shimmering of the periimplant soft tissue.[2,8] High-performance polymer PEEK has a white hue, a suitable biological response, and fracture resistance.

It melts at 343 °C and has a vitreous transition temperature of about 143 °C.[7] Except 98% sulfuric acid, it is extremely resistant to heat deterioration, aquatic environments, and harsh etching conditions.[1,7]

However, PEEK has extremely limited intrinsic osteoconductive characteristics compared to titanium. As a result, a great deal of research has been done to increase PEEK implant bioactivity.[4] PEEK dental implants have surface coatings of hydroxyapatite, barium sulfate, titanium oxide, or calcium phosphate.

These coatings have been topographically changed through the use of acid treatment and airborne-particle abrasion, which has increased osteoblastic activity and improved bone-to-implant contact (BIC).[7] It has been demonstrated that treating PEEK with sulfuric acid ($H2SO_4$) increases its surface bioactivity and results in the creation of sulfonated porous layers. This process is easy to use, efficient, and doesn't significantly harm the material's mechanical qualities.[9] Graphene oxide enhances hydrophilicity, microroughness, nanostructure, and osteogenesis. Furthermore, it neither produces systemic toxicity nor is cytotoxic.

They say it's a good[10] BioHPP (Bredent GmbH Senden, Germany) is a modified PEEK that contains 20% ceramic fillers and is non-allergic. and is quite biocompatible. High-quality prosthetic restorations may be produced because of BioHPP's exceptional stability, great ideal polishable characteristics, and aesthetically pleasing white tone.[6]

The BioHPP frameworks broke with a compressive strength that was less than group Ti's, at a mean load of 1518 ±134 N. Still, the value remained more than the 600–920 N stated maximum molar masticatory force. This implied that the fracture resistance of the veneered BioHPP FDPs was suitable for employment in the future. It's possible that increasing the connector's surface area raised the fracture load.[11]

The polymer's bond strength to other materials, as the structure must be able to be coated with all common coating composites. Evaluating this material's bond strength about the Cr-Co alloy and metal-ceramic, as well as that of its modified version (BioHPP), leading to improved PEEK material adherence.

PEEK as an Implant Abutment

PEEK implant abutments are regarded as an alternative material even if they do not have the necessary biomechanical characteristics to completely replace the titanium abutment. Temporary abutments made of PEEK can be employed, particularly in the

anterior region where reduced masticatory forces are present. [9] Because PEEK breaks before the implant or internal screw, it serves as a "sacrificial material" absorbing all plastic deformation. On the other hand, as it Follows overloading, the implant's viability is compromised by the plastic deformation of titanium abutments, which is localized in the internal connection. The titanium abutments outperformed the PEEK abutments in terms of maximal mechanical performance, according to uniaxial compression testing. [7]

The loss of torque and microleakage were measured using methylene blue. For titanium abutments, the torque loss was around 10%, whereas PEEK demonstrated a far higher torque loss of up to 50% (P<.001). [7]

Limitation of PEEK

PEEK implant abutments don't meet the biomechanical requirements of titanium definitive abutments in terms of torque loss and microleakage. Nonetheless, the PEEK abutments could withstand light stresses for 1.2 million cycles, or five years of masticatory activity, without reaching 140 N.

PEEK abutments have several drawbacks, such as a greater vertical displacement than titanium abutments and plastic deformation at the abutment-implant interface, which can result in substantial torque loss and microleakage. PEEK abutments may be appropriate as temporary abutments, particularly in the anterior region and for patients without parafunction. Nevertheless, torque loss and microleakage concerns need to be taken into account. [7]

Conclusion

PEEK is a stylish contemporary material that can be used in prosthodontics. It is utilized to create both fixed and detachable prostheses because of its advantageous chemical, mechanical, and physical qualities. Out of all the features of PEEK, the one that is advantageous for its application in implant-based prostheses is that it has a low elastic modulus, comparable to bone. PEEK abutments might be utilized as anterior interim abutments.

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A Case Report

Innovative Management of Xerostomia in Edentulous Patients: A Case Report on the Fabrication of a Maxillary Salivary Reservoir Complete Denture

Lalit Kumar[1], Charnpreet Singh[2], Dr Puneet Sharma[3], Dr Komalpreet Kaur[4]

Associate Professor [1]
Dept. of Prosthodontics and Crown &Bridge
Dr HSJ Institute of Dental Sciences ,
Panjab University, Chandigarh

Post Graduate Student[2]
Dept. of Prosthodontics and Crown &Bridge
Dr HSJ Institute of Dental Sciences ,
Panjab University, Chandigarh

Assistant Professor[3]
Dept. of Prosthodontics and Crown &Bridge
Dr HSJ Institute of Dental Sciences ,
Panjab University, Chandigarh

Post Graduate Student[4]
Dept. of Prosthodontics and Crown & Bridge
Dr HSJ Institute of Dental Sciences ,
Panjab University, Chandigarh

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Abstract

Background:

Xerostomia, a prevalent condition impacting nutrition, dental health, and psychological well-being, often presents challenges such as glossitis, mucositis, and difficulty in oral functions.

The poor retention and tolerance of removable dental prostheses in xerostomic patients exacerbate these issues. This paper introduces an innovative technique, incorporating a salivary reservoir into the maxillary complete denture which provides effective lubrication of oral tissues and is easily cleansed by the wearer.

By addressing the fundamental issue of inadequate lubrication due to reduced salivary flow, this technique has the potential to revolutionize the management of xerostomia-related complications.

This practical and accessible solution offers promise for prosthodontic practitioners seeking improved outcomes in the care of xerostomia-affected patients.

Keywords: Salivary Reservoir Denture, Xerostomia Management, Edentulous Patient, Maxillary Salivary Reservoir

Introduction

Xerostomia as defined by the glossary of prosthodontic terms 10 is a person's perception and subjective symptom that there is a dryness across the oral cavity; this may occur in the presence or absence of hyposalivation.[1] It disrupts the normal homeostasis of the oral cavity, leading to changes in the taste, difficulty in speech, difficulty in swallowing, and decreased dietary intake.[2]These changes adversely affect the patient's health and overall quality of life. Moreover, the absence of saliva as a thin film between the dentures and the oral mucosa decreases retention of the dentures and increases inflammation and ulceration in the oral cavity. Hence, complete dentures are often poorly tolerated in patients with xerostomia .[3,4]

Several treatment options are available to the clinician depending on the etiology of xerostomia. Most cases require symptomatic treatment and include changes in dietary pattern, patient counseling, lifestyle modifications, salivary stimulants, and use of salivary substitute. A salivary reservoir denture is an effective solution in edentulous patients with xerostomia to deliver salivary substitute constantly into the patient's mouth without affecting the normal routine.[5]This article describes a simple and innovative technique for fabrication and designing of a functional maxillary salivary reservoir complete denture for a patient with xerostomia.

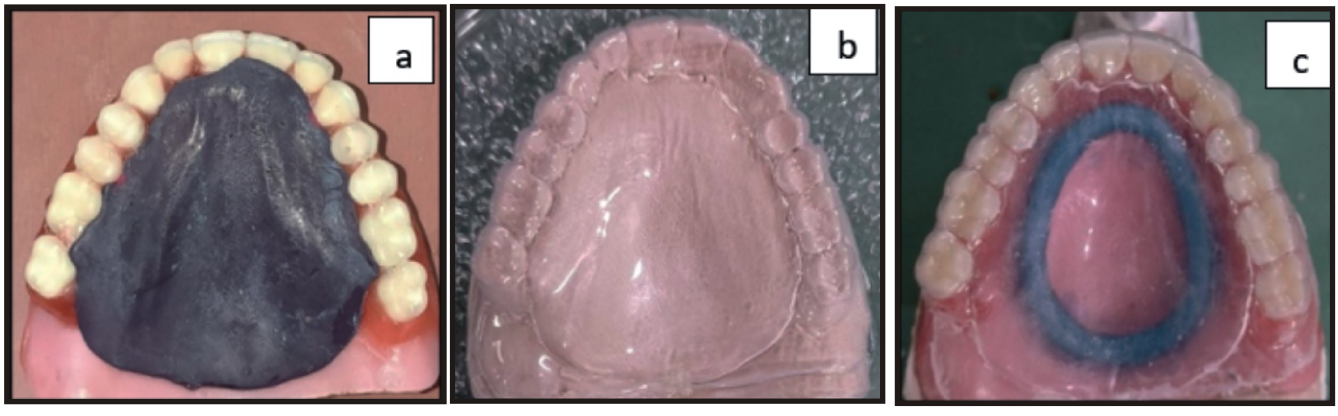
How to cite this article: Kumar L et al.: Innovative Management of Xerostomia in Edentulous Patients: A Case Report on the Fabrication of a Maxillary Salivary Reservoir Complete Denture, ***HTAJOCD.2024; Jan-Feb(3):62-65.***

Case Report

A 55 year old male patient reported to the Department of Prosthodontics complaining of dry mouth and difficulty in mastication and swallowing and desired replacement of missing teeth. Patient had been on anti-hypertensive medication since 30 years and was a chronic smoker. Intraoral examination revealed completely edentulous upper and lower arch. It was decided to fabricate a salivary reservoir complete denture in the maxilla containing salivary substitute to relieve xerostomia and aid the patient in the daily activities. Importance of using a modified form of denture was explained to the patient and this was well accepted by the patient.

Procedure

1. Till try-in stage, steps were similar as that for conventional denture fabrication i.e.Primary impression followed by secondary impression (in this case with Detaseal function, addition silicone for border molding), and then jaw relation were recorded.
2. Palatal contours (palatogram) were recorded in trial denture using impression compound mixed with green stick at the try-in appointment.Palatolingual consonant sounds were used with vowel "O",eg: SO, SHO, CHO, NO, KO, TO, DO etc. Vowel "O" was combined with other consonants to avoid multiple recordings of tongue to palate as tongue does not make any contact with palate during its pronunciation (Allen's protocol).[6](Fig. 1.a)
3. The trial denture with its modified palatal contours was duplicated in alginate and a working cast was poured in Type IV Dental Stone.
4. A template of 1-mm thick thermoplastic material (BIOPLAST®, India) was fabricated on this working cast which served as a guide for salivary reservoir designing. (Fig. 1.b)
5. The palatogram on the palatal surface of the trial denture was removed. The reservoir walls and lid rim were built with sprue wax. (Fig. 1.c) A slight undercut was made on the external surface of the lid rim using a carver to facilitate attachment for the flexible lid of the reservoir. The reservoir was filled with liquid and then aspirated with a syringe at this stageto assess the available volume for salivary substitute which was 4 ml in this case.
6. The trial denture with reservoir wall in sprue wax was processed in heat cure acrylic resin(DPI heat cure, Dental Products of India, Mumbai, India). (Fig. 1.d)
7. Putty impression was made of reservoir wall after refinement of undercut to obtain a second working cast made of Type IV Die stone. (Fig. 1.e,f)
8. The reservoir space was blocked out with the help of putty.The reservoir lid was fabricated with a 1.5-mm flexible thermoplastic sheet (BIOPLAST®) on the second working cast of the reservoir wall. (Fig. 1.g)
9. A 0.8- mm release hole was made on the most dependent portion using a straight fissure bur. This permitted slow and continuous release of the salivary substitute.
10. The reservoir was filled with salivary substitute (methyl cellulose – wet mouth, ICPA) using a calibrated 2ml syringe and was covered with reservoir lid. (Fig. 1.h) The salivary substitute was released when the tongue creates pressure in the anterior portion of the palate.
11. The functional maxillary salivary reservoir complete denture was inserted and post insertion instructions were explained to the patient. (Fig 2)



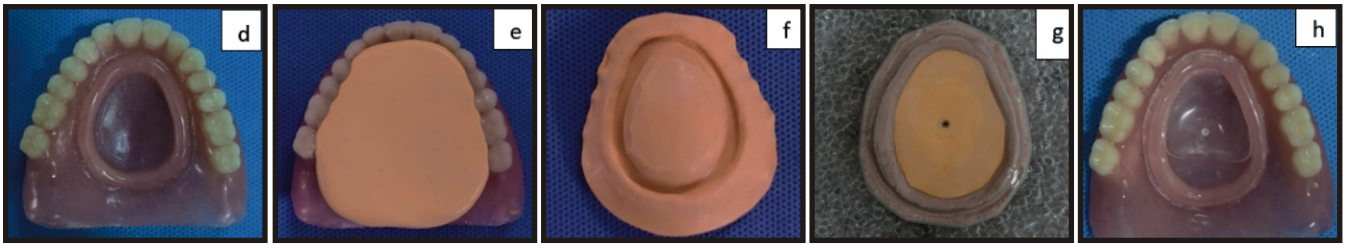


Figure 1. Steps in fabrication of maxillary salivary reservoir complete denture (a) Palatal contours recorded in trial denture (b) Template of 1- mm thick thermoplastic material fabricated on working cast as index © Wax-up of reservoir walls and lid rim with sprue wax. (d) Finished and polished maxillary denture with reservoir walls on the palatal aspect of the denture. (e) and (f) putty impression of reservoir wall after refinement of undercut for fabrication of reservoir lid (g) Reservoir lid fabricated with 1.5mm flexible thermoplastic sheet on duplicated cast of the denture. (h) Polished surface of maxillary salivary reservoir complete denture with salivary substitute and reservoir lid

Instructions to the Patient

- To clean the reservoir and the lid using soft bristled toothbrush and toothpaste daily.
- Refilling the reservoir with salivary substitute using 2ml syringe with due care.
- To make a conscious effort to consume at least eight glasses of water, lemon juice, or milk.
- Post insertionfollow up was scheduled on the next day and regular recall visits were planned every month.

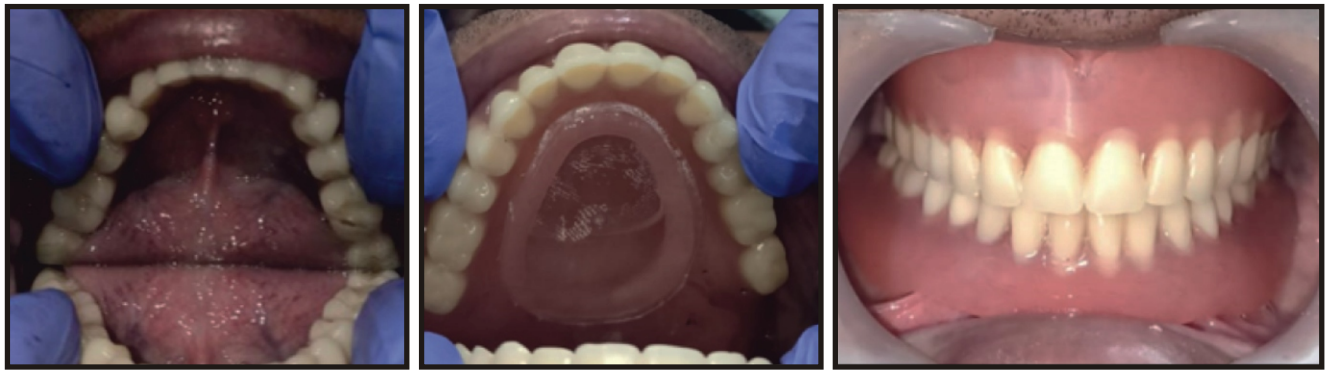


Figure 2. Intraoral view of maxillary salivary reservoir complete denture with salivary substitute and intraoral view of complete dentures in occlusion.

Discussion

Xerostomia can create an unhealthy oral environment and may contribute to or worsen painful oral conditions.[4]. The primary objective in managing xerostomia is to minimize the patient's discomfort and facilitate the comfortable use of dentures in performing regular oral functions.[5]

A reservoir denture with a salivary substitute provides an alternative method for treating xerostomia, ensuring a slow, sustained, and continuous release of the substitute.[7]Salivary substitutes can be categorized into carboxymethyl cellulose-based and mucin-based options, with the former being more commonly used due to cost-effectiveness and availability.[8] Examples of commercially available substitutes include Wet Mouth, Saliveze, Salivart, Moi-Stir, and Salix.

Several authors have proposed methods for integrating a reservoir into dentures using attachments like Lego blocks[9], magnets[10], or precision attachments[11]. While these approaches have proven successful, they come with drawbacks such as elevated costs, heightened complexity, and sensitivity to technique.

The technique presented here, however, is straightforward making it easy to implement and exclusion of attachments enhances its simplicity and renders it a cost-effective technique. This case report validates the fabrication technique for a maxillary denture with a salivary reservoir, offering significant benefits for xerostomicpatients.[12]The reservoir chamber allowed for a controlled flow of artificial saliva, with a volume of 4 mL and a working duration of 2 hours. Compared to a mandibular reservoir, a maxillary reservoir has advantages such as a larger size and saliva flow throughout the entire mouth rather than being restricted to the floor of the mouth. [13]

However, it's essential to note that incorporating a reservoir in the maxillary denture may increase its weight, potentially affecting retention and stability.[14]Another limitation is that Itmakes dentures bulky, and the patient must regularly introduce artificial saliva into the dentures. Additionally, extra laboratory steps are necessary, and both the dentures and reservoir demands meticulous cleaning.[14, 15]

Conclusion

This article reports a simple and innovative technique for the construction of functional salivary reservoir in maxillary denture. Xerostomic patients wearing prosthesis can benefit immensely from this as it will enhance the oral health and quality of life of such patients.

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Gingival Fibromatosis - An Uncommon Case Report

Sarika Pal[1] , Sanjay Gupta[2], Anupama Mahendra[3], Savista Naaz[4]

Post Graduate Student (Jr 3rd)[1]
Department of Periodontology
Career Post Graduate Institute of Dental Science & Hospital, Lucknow Uttar Pradesh

Professor & Head[2]
Department of Periodontology
Career Post Graduate Institute of Dental Science & Hospital, Lucknow Uttar Pradesh

Reader[3]
Department of Periodontology
Career Post Graduate Institute of Dental Science & Hospital, Lucknow Uttar Pradesh

Post Graduate Student (Jr 3rd)[4]
Department of Oral Medicine & Radiology
Career Post Graduate Institute of Dental Science & Hospital, Lucknow Uttar Pradesh

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Abstract

A peculiar and diverse collection of conditions known as gingival fibromatosis manifest as slowly developing, localized, or diffuse enlargements in the interdental papilla or the gingiva's margins and attachments. In extreme situations, the extra tissue may cover the tooth crowns, which could result in functional, cosmetic, and periodontal issues such bleeding and bone loss from pseudopockets and plaque buildup. It has an equal impact on men and women.A uncommon genetic disorder called hereditary gingival fibromatosis (HGF) is characterized by gradual gingival overgrowth. In addition to frequently delaying tooth eruption, gingival overgrowth can result in major functional and cosmetic issues. An odd disorder known as gingival hyperplasia affects the oral cavity's masticatory, functional, psychological, and cosmetic aspects. Gingival hypertrophy causes can in clude be due to plaque accumulation, due to poor oral hygiene, inadequate nutrition, or systemic hormonal stimulation.

Introduction

One aspect of idiopathic fibrous hyperplasia of the gingiva is a gradual fibrous expansion of the gingiva[1]. Other names for GF include elephantiasis gingivae, familial elephantiasis, gigantism of the gingiva, gingivomatosis, gingival enlargement, gingival hyperplasia, and gingival overgrowth (GO)[2]. Idiopathic fibrous gingival fibromatosis is an uncommon inherited disorder for which there is no known cause[3].

In clinical practice, gingival expansion is frequently observed and can be caused by interactions with the environment, the host, or a variety of stimuli. These lesions may be more widely distributed, affecting broader regions of the oral cavity, or they may be limited to a specific area. Possible causes of this illness include systemic-induced manifestation, hormone abnormalities, or plaque[4].

Idiopathic gingival fibromatosis, also known as hereditary gingival fibromatosis (HGF), is an uncommon, benign, asymptomatic, non-hemorrhagic, non-exudative, proliferative fibrous lesion of gingival tissue that affects both men and women equally and occurs in both arches with differing degrees of intensity in members of the same family[5].

There is also a recessive version of the disorder, however autosomal dominant is the more common. There appears to be a higher chance of autosomal dominant inheritance in consanguinity. Consanguinity seems to increase the risk of autosomal dominant inheritance. It affects the marginal gingival, attached gingival and interdental papilla presenting as pink, non-hemorrhagic and have a firm, fibrotic consistency[6].

This illness can present as a standalone disorder or as a component of a syndrome. It can also have an autosomal dominant or, less frequently, an autosomal recessive mode of inheritance[7-9]. Gingival fibromatosis autosomal-dominant variants, typically nonsyndromic, have been genetically associated with chromosomes 5q13-q22 and 2p21-p222[10].

How to cite this article: Pal S et al.: Gingival Fibromatosis - An Uncommon Case Report,***HTAJOCD.2024;Jan-Feb(3):66-69.***

Although no conclusive connection has been made, a mutation in the son of sevenless-1 (SOS-1) gene has been proposed as a potential cause of isolated (nonsyndromic) gingival fibromatosis in the modern era [11].

Case Report

A 32 years old female reported to the Department of Periodontics, Career Postgraduate Institute of Dental Sciences and Hospital, Lucknow, Uttar Pradesh with a chief complain of gingival swelling in the left lower anterior region of jaw since 2 year.(Figure 1) The patient reported that the gingival enlargement was smaller in size earlier and increased gradually.The patient gave no medical history. There was no family history of GF.

Upon intraoral inspection, a pink, leathery-consistency, and hard-to-palpate region was found to have localized gingival overgrowth in the left mandibular lateral incisor, spreading into the vestibular and canine areas. The intra oral periapical radiograph showed that there was bone loss, grade II mobility, and tooth locations were compromised by swelling. (Figure 2)After routine blood work, results were found to be within the normal range.

Following the administration of local anesthetic (2% lignocaine hydrochloride mixed with 1:80,000 epinephrine), the growth in the mandibular arch was removed via an external bevel gingivectomy using a knife. The removed tissue measured 10 mm in diameter and 5 mm in length. To confirm the diagnosis, a biopsy of the tissue was sent for histological analysis. A periodontal dressing was used.

The patient was instructed to take B-complex vitamins, analgesics (ibuprofen 400 mg twice daily for five days) and antibiotics (amoxicillin 500 mg thrice daily for five days) in addition to rinsing their mouth with 0.2% chlorhexidine gluconate for two weeks. Postoperative instructions and advice on oral hygiene were provided.

Histological analysis showed irregularly organized collagen bundles inside dense collagenous connective tissue. There was little in the way of inflammatory cell infiltration and avascular connective tissue. The epithelium covering it had larger rete ridges and was hyperplastic. (Figure 4) shows that the histological picture was indicative of GF. The healing process after surgery went smoothly. After a week, the patient was brought back, the periodontal dressing was taken off, and the affected area was treated with regular saline and betadine. The patient was being monitored for a postoperative assessment. The patient was happy with the outcome.

Figure 1. Gingival Overgrowth i.r.t.31,32,33

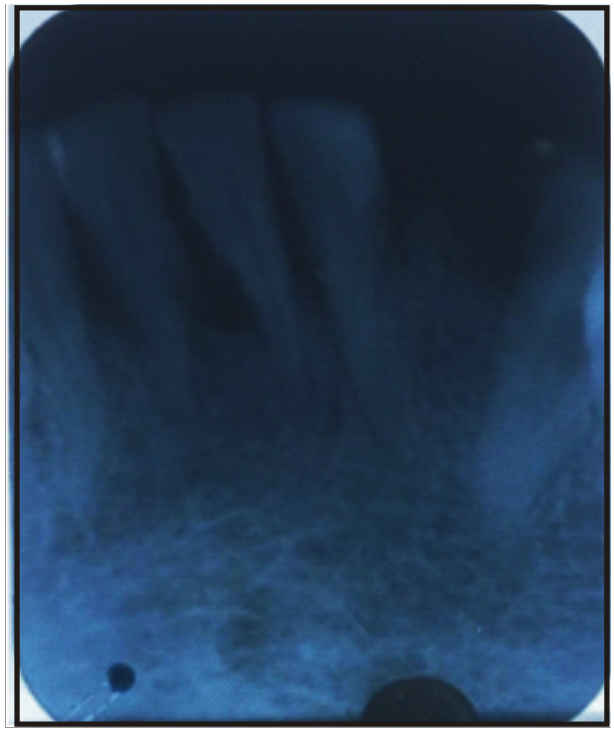

Figure 2. IOPAR i.r.t. 31,32,33

Figure 3. Post-op after 3 month

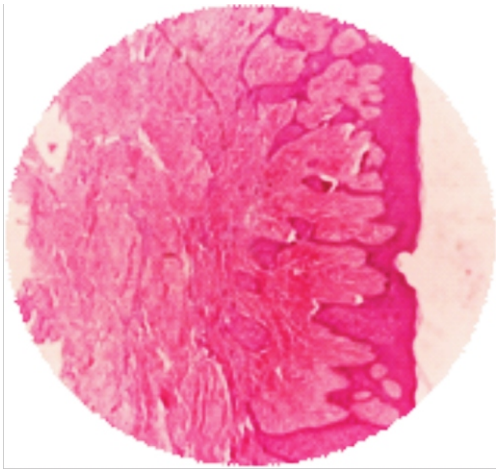

Figure 4. Histopathological Picture.

Discussion

The degree of gingival overgrowth varies, ranging from a small amount of expansion in one or both of the jaws to a segmental or uniform, noticeable enlargement[12] Hereditary Gingival Fibromatosis (HGF) is a non-dental plaque-induced gingival disease that progresses slowly.[13] Several writers have explained this clinical enlargement as the result of an excessive build-up of collagen and a considerable proliferation of fibroblasts in the gingival fibrous connective tissue, despite the fact that the exact mechanism of HGF remains uncertain.[14].

We diagnosed the patient with idiopathic gingival fibromatosis because the patient's medical, prenatal, and family histories did not support the diagnosis. Generalized gingival fibromatosis has several etiological factors. These include leukemia-induced gingivitis, drug-induced gingival hypergrowth, scurvy gingival hypergrowth during pregnancy, and mouth-breathing gingivitis, Canthosis nigricans, Wegener granulomatosis, hereditary gingival fibromatosis, idiopathic type. There are several disorders with different modes of inheritance that present with generalized gingival fibromatosis.which include the autosomal-recessive syndromes (Cross, Murray-Puretic-Dresher, and Ramon) and the autosomal-dominant syndromes (Laband and Rutherford).[15]

Idiopathic gingival fibromatosis's exact process is unclear, although it seems to be limited to the fibroblasts that are present in the gingivae. The hyperplastic reaction happens peripherally to the alveolar bone within connected gingival tissue and is not related to the periodontal ligament[16]. While severe, diffuse gingival enlargements necessitate surgical intervention, routine treatment for mild and local enlargements depends on maintaining proper dental hygiene and/or root scraping. Recurrences might happen months or years following surgery [17,18,19,20.]

Case reports by Dhadse et al.[21]Hereditary gingival fibromatosis affecting marginal and attached gingival to varying degrees of both arches, impeding esthetic, phonetic, and masticatory function,dictates the surgical intervention in the management of hereditary gingival fibromatosis. Quadrant-wise surgical excision was performed under local anesthesia, followed by oral hygiene reinforcement, and periodic follow-up. Recurrence is a common feature varying over a period and this dictates the importance of regular recall visits to evaluate the stability of periodontium.

Coletta RD[22],have also reported that the activated gingival fibroblasts in hereditary gingival fibromatosis produce more collagen, fibronectin than normal gingival fibroblasts under the autocrine control of TGF-β favoring the accumulation of extracellular matrix production.

Tipton DA[23],reported an increase in the proliferation of gingival fibroblasts in hereditary gingival fibromatosis than the normal gingival fibroblast. Elevated and prolonged expression of proto-oncogenes c-myc is implicated in increased proliferation of human gingival fibroblast cell line.

Bozzo and colleagues[24],in a four generation pedigree with 50 of 105 at risk family members developing gingival fibromatosis. In the present case, the gingival enlargement was a hereditary condition, probably autosomal dominant, due to its existence in siblings (sister), although her mother and father were phenotypically normal. Moreover it was unrelated to endocrine problems or use of medications.

Mastication issues, speech issues, tooth displacement, cosmetic consequences, and psychological issues for the patient are among the complications associated with GF; for this reason, proper therapy and postoperative care are essential.

Conclusion

The etiological heterogeneity of GF, an uncommon and slowly developing illness, is another characteristic. Furthermore, as recently revealed,this illness is a common sign of multiple genetic disorders and may also arise sporadically in various other syndromes and diseases. Diagnosis is made based on medical history,

clinical examination, blood tests and histopathological evaluation of affected gingival tissue. Since gingival overgrowth is disfiguring and can obstruct speaking and chewing, a complete understanding of the pathophysiology is crucial. It is plausible that the distinct characteristic of gingival cells stems from their anatomical position, or that moderate localized inflammation—even in clinically healthy tissue—activates the cells.

For an accurate diagnosis based on medical history, clinical examination, blood tests, and histological evaluation as well as for appropriate care, a thorough case history is necessary to ascertain the etiology and histopathological examination. Fibroma, peripheral giant cell granuloma, PG, peripheral odontogenic fibroma, and peripheral ossifying fibroma are among the clinical differential diagnoses for localized gingival overgrowths.Reducing the local microflora will aid in removing the primary site of infection in an oral environment that is quite healthy and is maintained by the patient and the dentist.

Patient compliance and motivation are essential components of a successful therapy outcome. The patient needs to be scheduled for routine dental checkups, during which time the entire state of their teeth should be described. This would enable the use of less intrusive therapeutic techniques than surgery in standard dental practice and enhance disease management. Creating awareness and educating patients regarding the influence of poor oral hygiene and behaviors to these gingival lesions are vital to avoid further recurrence.

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A Review

Dental Detectives: Unveiling the Forensic Symphony of Prosthodontics and Odontology in Swift Victim Identification

Arpit Sikri[1], Jyotsana Sikri[2], Vritti Piplani[3]

Associate Professor & PGTeacher[1]
Dept. of Prosthodontics & Crown and Bridge,
Bhojia Dental College & Hospital,
Baddi, Himachal Pradesh, India.

Associate Professor & Post Graduate Teacher[2]
Dept. of Conservative Dentistry & Endodontics,
Bhojia Dental College & Hospital,
Budh (Baddi), Teh. Baddi,
Distt. Solan, Himachal Pradesh, India

BDS[3]
Bhojia Dental College & Hospital,
Budh (Baddi), The. Baddi, Distt. Solan,
Himachal Pradesh, India

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Corresponding Author:-

Arpit Sikri
Associate Professor & Post Graduate Teacher,
Department of Prosthodontics and Crown &Bridge,
Bhojia Dental College & Hospital,
Baddi, Himachal Pradesh, India.
Email id - arpitsikri@gmail.com

Abstract

Background:

Forensic odontology, a discipline with historical roots dating back to 66 AD, plays a crucial role in identifying victims within the legal system.

The term "forensic" is derived from the Latin word 'forum,' meaning a court of law, while "odontology" refers to the study of teeth. This specialized field of dentistry contributes to justice by carefully examining dental evidence and presenting essential findings.

Dental records and the expertise of forensic dental surgeons are particularly important in identifying deceased individuals, especially in cases where visual or fingerprint methods are insufficient due to postmortem changes or injuries. Prosthodontists, specialists in dental prosthetics, are becoming increasingly indispensable in maintaining comprehensive records.

In situations where fingerprinting is impractical, dental identification becomes a critical tool. Forensic odontology focuses on scrutinizing dental evidence for legal purposes, highlighting the uniqueness of teeth influenced by various factors. Individually tailored dental prosthetics serve as primary identifiers in forensic cases involving unidentified bodies, filling crucial gaps where fingerprint databases fall short.

During major disasters like aviation accidents or natural calamities such as earthquakes, swift and accurate victim identification is imperative. Victims with intact or most of their teeth provide vital characteristics for effective forensic identification. Prosthodontists, equipped with diverse identification techniques, play a pivotal role in such investigations, particularly when victims have dental prosthetics, offering essential clues for identification.

Comparing postmortem dental remains with pre-death records, such as X-rays, is a common practice to confirm identities. Denture markings play a significant role in this process, providing a swift and reliable method of identification, especially when other methods fail.

While standardized methods may be lacking, dental practitioners are urged to maintain comprehensive records, including denture markings, emphasizing the importance of readiness for disaster identification. Materials like all-acrylic dentures can be inscribed with a patient's name before fitting, contributing to rapid identification.

Notably, in severe accidents where limbs are damaged, certain denture materials, particularly acrylic and metal-based types, often survive, enabling quick identification during calamities. Forensic odontology, an integral part of forensic science, has utilized dental findings for a century to aid the legal system.

Beyond traditional methods, salivary samples from prosthetics have emerged as valuable DNA sources for identification, adding an additional layer to the multifaceted role of dental evidence in forensic investigations.

This narrative review article underscores the crucial role of a prosthodontist in identifying deceased

How to cite this article: Sikri A et al.: Dental Detectives: Unveiling the Forensic Symphony of Prosthodontics and Odontology in Swift Victim Identification. ***HTAJOCD.2024;Jan-Feb(3): 70-74.***

individuals when appropriately trained. It emphasizes the interplay between prosthodontics and forensic medicine, detailing how prosthodontists can employ various techniques for identification. Specifically, the article delves into denture identification methods, emphasizes the benefits of denture labeling for swift identification during major incidents, and underscores the importance of maintaining comprehensive patient records. It also highlights the synergy between Prosthodontics and Forensic Odontology, showcasing their combined potential to streamline forensic investigations.

Keywords: Antemortem records, Bite marks, Dental, Dental implant, Denture, Denture identification, Denture in disaster, Denture in investigation, Denture labelling, Denture marking, Denture naming, DNA matching, Engraving, Forensic dentistry, Forensic medicine, Forensic odontology, Inclusion methods, Interdisciplinary approach, Lip prints, Marking/labelling, Palatal rugoscopy, Postmortem dental profile, Primary identifier, Prosthetic appliances, Prosthodontics.

Introduction

Forensic odontology, a subdivision of forensic science focused on dental evidence within legal contexts, traces its origins back to 1897 with the pioneering work of Dr. Oscar Amoedo.[1] Its significance lies in human identification, particularly in challenging scenarios like mass disasters and aviation incidents. Dental structures, known for their durability, often persist longer postmortem compared to other tissues. Harvey and Keiser-Nielson defined forensic dentistry as the handling and examination of dental evidence for the purpose of justice,[2] underscoring its critical role in mass disasters and intricate identification situations. Forensic dentistry encompasses a range of identification aspects, including the use of dental records for comparative identification.

In cases where antemortem data is lacking, forensic dental surgeons become pivotal in the search for individuals. Moreover, forensic dentistry proves invaluable in mass disaster scenarios, leveraging dental evidence to provide crucial insights and contribute to resolving complex forensic cases. Prosthodontists emerge as key contributors to forensic dentistry, particularly when natural dentition is absent. Their involvement extends to patient identification through the analysis of dental features like restorations, prostheses, and bite marks. The durability of dental structures, coupled with advancements such as laser etching and RFID tags, enhances the precision of forensic identifications.[3] Throughout history, dental records, including radiographs, have played a significant role in high-profile identifications, such as those of Adolf Hitler and Saddam Hussein.[4] The continuous evolution of technology further refines the collaboration between forensic odontologists and prosthodontists, augmenting their capabilities in identification.

In conclusion, forensic odontology, supported by technological progress and interdisciplinary collaboration, remains a crucial component in justice systems worldwide.

The history of forensic dentistry is replete with instances highlighting the pivotal role of dental evidence in identification:

1. **US Revolutionary War (1775):** Paul Revere, a young dental surgeon, utilized the bridgework of war casualties for identification.[5]
2. **Countess of Salisbury (1835):** A gold denture played a crucial role in identifying her charred remains.[6]
3. **Dr. George Parkman (1849):** Despite a complete burn, a tooth fragment fused to gold in his removable partial denture facilitated his identification.[7]
4. **World War II:** Among 819 unidentified soldiers, only nine were recognized through their dentures due to the lack of proper antemortem record practices.[8]
5. **Modern Disasters and Events:** Dental evidence has been vital in identifying victims of various events, including the World Trade Center attack in 2001 and the tsunami affecting European tourists.[9]
6. **Historical Notable Cases:** In 66 AD, Agrippina identified a victim using a discolored front tooth,[10] and in 1191, M. Raja JayachandraRathore's artificial teeth post-battle in India marked an early instance of dental identification.[11]
7. **Leaders and High-profile Individuals:** The identification of Adolf Hitler after World War II heavily relied on dental records, radiographs, and prostheses, while Saddam Hussein's capture was verified using DNA from saliva samples.[12]

These examples underscore the enduring significance of dental evidence in forensic contexts throughout history. Table 1 summarizes the evolution of forensic dentistry.

S.No.	Event	Year	Significance
1.	US Revolutionary War	1775	Paul Revere used bridgework for identification of casualties
2.	Countess of Salisbury	1835	Gold denture identification charred remains
3.	Dr. George Parkman	1849	Tooth fragment in gold denture aided post-burn identification
4.	World War II	-	Only 9 out of 819 soldiers recognized via denture
5.	Modern Disasters and Events	Various	Dental evidence in identifying victims (e.g., 9/11)
6.	Historical Notable Cases	66 AD	Agrippina identified victim with a discolored front tooth
7.	Historical Notable Cases	1191	M. Raja Jayachandra Rathore's artificial teeth in India
8.	Leaders and High-profile individuals	World War II	Adolf hitler identified through dental records and radiographs
9.	Leaders and High-profile Individuals	-	Saddam Hussein's capture verified using DNA from saliva

Table 1 – History of Forensic Dentistry

Significant Points on Dental Identification in Forensics, with a Focus on Denture Marking:

1. **Comparative Dental Identification:** Postmortem dental remains are compared with antemortem dental records for identity confirmation, relying on meticulous record-keeping by dental professionals.[13]
2. **Intelligent Dental Identification System (IDIS):** Utilizes structured data analysis to integrate essential dental data for identification purposes.[14]
3. **Disaster Victim Identification Process:** Involves body tagging, fingerprinting, forensic pathology, and dental examination, with prosthodontists contributing significantly to the dental aspect of identification.[15]
4. **DNA Identification:** Teeth serve as an excellent source of DNA due to their resilience against environmental factors. DNA analysis, a complex and costly method, is employed when other identification methods are inconclusive.[16]
5. **Photographic Superimposition:** Challenges but effectively matches a denture to skeletal remains, especially when combined with other methods.[17]
6. **Palatal Rugae in Identification:** Unique palatal rugae patterns are used for identification, particularly in cases where fingerprints are unavailable.[18]
7. **Denture Labeling:** Crucial for victim identification, especially in disasters. Various methods, from surface marking to electronic microchips, exist. Lack of labeling can impede identification processes.[19]
8. **Methods of Identification:** Primary methods include dental features, palatal rugoscopy, and DNA analysis. Antemortem records, particularly detailing dental work, aid in identification.[20]
9. **Advantages of Denture Labeling:** Facilitates forensic identification, aids in lost and found incidents, and improves overall forensic processes.[21]
10. **Standards and Adoption:** Denture marking standards emphasize visibility, durability, and other factors. While some regions have incorporated denture labeling into academic curricula, broader adoption is recommended for efficient forensic identification.[22]

In essence, dental evidence, particularly from dentures, offers invaluable clues in forensic contexts. Proper record-keeping, technological advancements, and standardized practices can further enhance the reliability and efficiency of dental identification methods.

Discussion

Dental records and prosthodontics are integral components of forensic identification, especially in medico-legal investigations where conventional identification methods may be unavailable.[23] The role of dental examinations in such contexts cannot be overstated, with prosthodontists playing a crucial role in forensic identification efforts.[24] Their responsibility includes maintaining comprehensive dental records, proving invaluable in various identification methods such as comparative dental identification, prosthesis labeling, and DNA identification.[25] Denture labeling, a specific aspect of prosthodontists' involvement, employs multiple techniques like surface modification, inclusion, laser etching, and RFID tags, enhancing the accuracy and reliability of dental evidence in the identification process.[26]

In forensic dentistry, prosthodontics plays a pivotal role in identifying unidentified victims, addressing scenarios involving both dentulous and edentulous individuals.[27] For dentulous victims, dental features such as missing teeth and restorations become essential markers for identification. The historical cases underscore the enduring value of maintaining comprehensive dental records in forensic investigations.[28] In cases involving edentulous victims, prosthodontics aids in identification, employing methods like denture marking and palatal rugoscopy to establish identity and provide valuable clues in the absence of natural dentition.[29]

Denture labeling legislation is addressed, with some countries implementing regulations mandating denture marking as part of forensic protocols.[30] However, there is a gap in awareness and implementation, emphasizing the need for increased attention to ensure compliance with legal requirements and enhance the effectiveness of forensic identification processes.[31]

The significant role of prosthodontists in forensic odontology is highlighted, contributing to the field in various ways to enhance the accuracy of identification processes.[32] Denture labeling methods, including surface methods like scribing and advanced techniques such as ID bands, laser etching, and electronic microchips, ensure comprehensive marking, providing critical information for identification purposes.[33] Additionally, prosthodontists utilize other identification methods such as chelioscopy, rugoscopy, bite mark analysis, and DNA extraction, further amplifying their contribution to achieving accurate identification, especially in challenging and complex scenarios where traditional methods may fall short.[34]

In conclusion, the expertise of prosthodontists significantly enhances the efficacy of forensic odontology, proving invaluable in achieving accurate identification, particularly in challenging scenarios.

Conclusion

The synthesized summary and detailed exploration both underscore the pivotal role of forensic odontology and denture marking in the identification of individuals. Key insights from Forensic Prosthodontics include:

1. **Collaborative Approach:** Forensic odontologists and prosthodontists collaborate to leverage advancements and specialized techniques for accurate identifications, especially in complex situations.
2. **Denture Marking's Crucial Role:** Denture marking is a cornerstone in forensic dentistry, facilitating precise identification when traditional methods fall short. The use of various marking techniques is integral to ensuring accuracy.
3. **Technological Advancements:** Integration of cutting-edge technologies and a deep understanding of dental materials continuously propels forensic odontology forward, enhancing its capabilities in identification.
4. **Organizational Backing:** Entities like BOLD, ABFO, ASFO, and IOFOS provide essential support, fostering the growth, standardization, and advancement of forensic odontology globally.
5. **Historical & Contemporary Significance:** Denture marking is emphasized in both historical and contemporary contexts, with heightened importance in victim identification, especially after disasters.
6. **Regulatory Landscape:** While some countries enforce legislation mandating denture marking, a lack of international consensus underscores the necessity for standardized practices and global collaboration.
7. **Educational Imperatives:** Incorporating denture marking techniques into academic curricula and continuous education for dental professionals are pivotal for widespread adoption and understanding of its significance.
8. **Documentation & Databases:** Comprehensive record-keeping and establishing databases for marked dentures are crucial for facilitating rapid identifications and streamlining forensic processes.
9. **Future Directions:** Ongoing research and development efforts are imperative to refine denture marking methodologies, ensuring they remain robust, reliable, and aligned with evolving forensic needs.

In summation, the combination of collaborative endeavors, technological innovation, regulatory frameworks, educational initiatives, and research pursuits solidifies the critical role of denture marking within forensic odontology. It stands as an invaluable asset, bolstering the accuracy and efficacy of forensic investigations and offering solace and closure to families worldwide.

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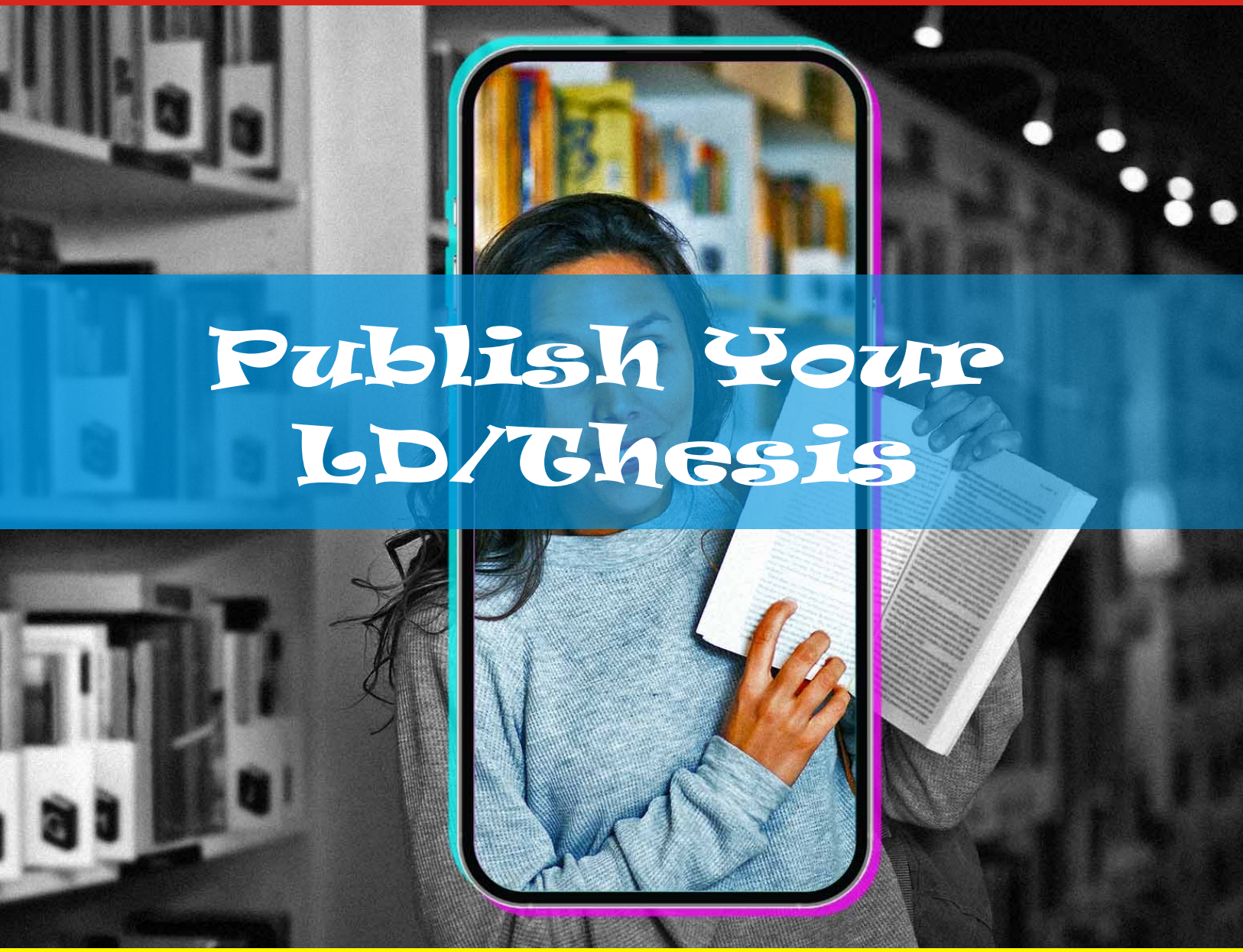

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