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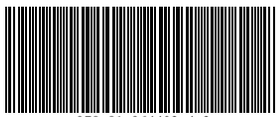

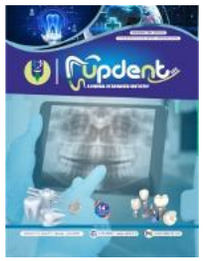

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Editorial

From The Desk of Guest Editor.....

Shaping Lifelong Oral Wellness through Pediatric and Preventive Dentistry

It is an honor to serve as Guest Editor for this special issue on Pediatric and Preventive Dentistry, a field that remains at the heart of lifelong oral health. Pediatric dentistry is unique not only because it addresses the evolving developmental needs of infants, children, and adolescents, but also because it shapes behaviors, attitudes, and habits that influence oral health well into adulthood. Preventive dentistry further strengthens this foundation by prioritizing early identification, timely intervention, and education driven care.

This issue brings together evidence based insights, innovative practices, and emerging trends that reflect the dynamic and expanding scope of pediatric and preventive dentistry. The contributions featured here examine essential topics such as early childhood caries management, minimally invasive treatment techniques, diagnostic advancements, behavior guidance strategies, and community oriented prevention programs. These articles collectively highlight the importance of integrating clinical expertise with public health perspectives to address both individual and population level needs.

As dentistry embraces new technologies from artificial intelligence and digital imaging to teledentistry and personalized risk assessment our ability to deliver precise, child centered, and preventive care continues to improve. The research and reviews presented in this volume underscore the significance of innovation, interdisciplinary collaboration, and patient centric approaches in elevating pediatric oral health standards.

I extend my sincere gratitude to the authors, reviewers, and editorial team whose dedication and scholarly contributions have enriched this publication. Their work reinforces our shared commitment to advancing knowledge and improving the quality of care for young patients.

It is my hope that this special issue inspires further inquiry, fosters collaborative clinical practice, and strengthens the preventive foundation of pediatric dentistry. By working together, we can continue to ensure that every child has the opportunity to achieve and maintain optimal oral health.

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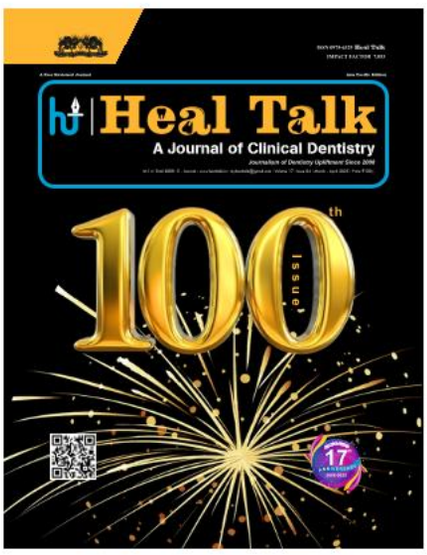

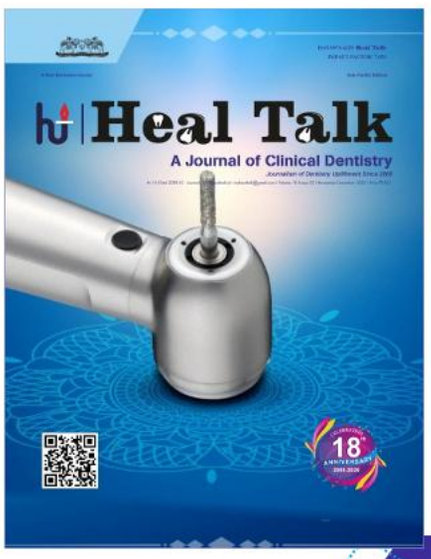

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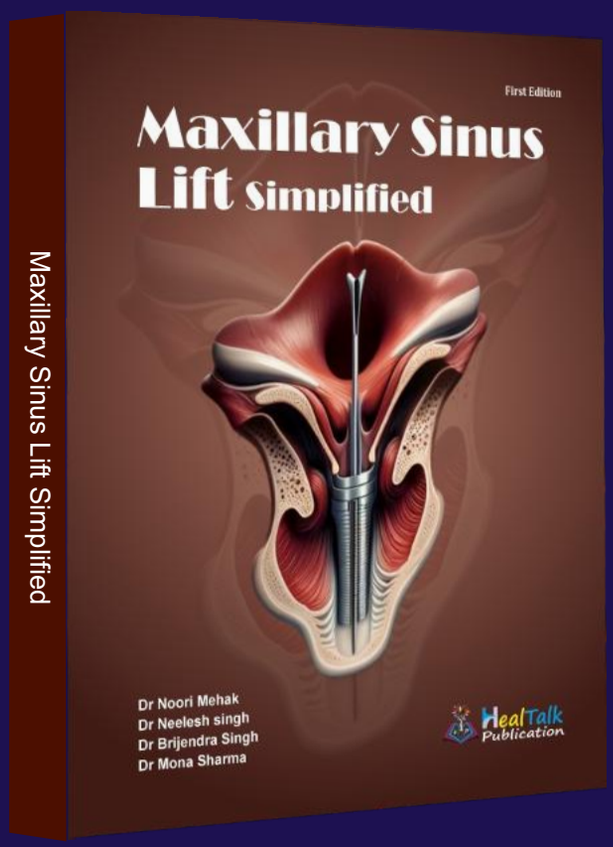

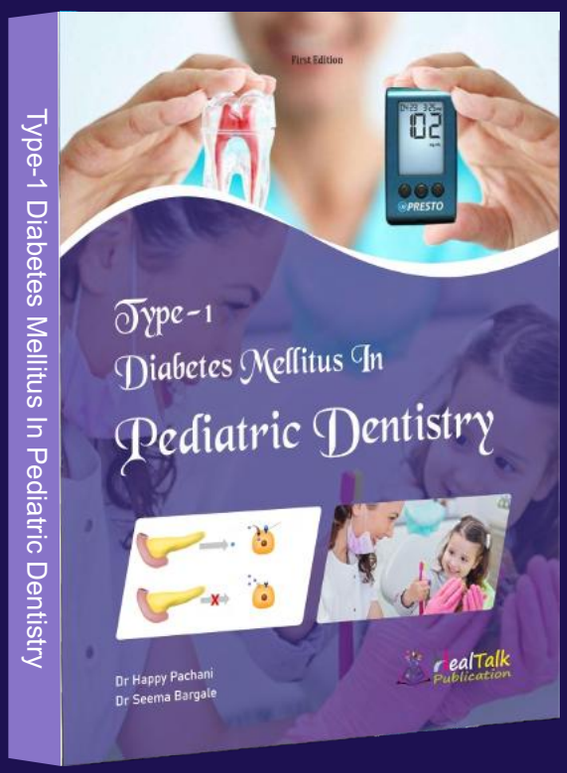

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Endo Talk

Recent Advances In Endodontic Access Preparation II

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Effect of Modern Access Cavity Designs on Fracture Resistance of Endodontically Treated Teeth

Compared with non-endodontically treated teeth, endodontically treated teeth exhibit reduced long-term survival and diminished resistance to fracture. Consequently, the role of root canal treatment as a contributing factor to tooth fracture primarily due to the loss or reduction of tooth structure has been the focus of numerous clinical investigations. Fracture resistance of teeth is commonly evaluated using a universal testing machine, in which simulated functional loads are applied until fracture occurs. Variables such as the point of load application, magnitude, direction, and fracture load can be controlled during testing.

Micro–computed tomography (micro-CT) enables high-resolution, three dimensional imaging of internal tooth structures and facilitates comparative analysis of pre- and postoperative images. This allows assessment of alterations in root canal morphology, including the volume of dentin removed and areas of the canal walls that remain untouched by instrumentation.

Endodontically treated teeth require definitive restorations that preserve aesthetics and function, protect the remaining tooth structure, and prevent microleakage. Advances in adhesive dentistry and the development of stronger bonding materials have made it possible to fabricate highly aesthetic restorations that bond directly to tooth structure and contribute to its reinforcement. Contemporary treatment philosophies therefore emphasize minimally invasive endodontic approaches that conserve maximum tooth structure without compromising treatment efficacy, thereby enhancing fracture resistance. In contrast, conventional access cavity designs have been associated with a higher incidence of irreparable tooth fractures, largely attributable to greater loss of coronal tooth structure compared with alternative access techniques.

Effect of Modern Access Cavity Designs on Occurrence of Mishaps during Root Canal Preparation

The primary objective of endodontic therapy is the thorough debridement and disinfection of the root canal system by removing diseased tissue, thereby allowing the canal to be properly shaped and subsequently obturated with an inert material to reduce the risk of reinfection. When endodontic procedures do not meet established clinical standards, procedural accidents may occur. Several factors have been identified as contributors to endodontic treatment failure, including procedural mishaps. Inadequate adherence to access cavity preparation guidelines or improper use of rotary instruments can result in instrument fracture.

Establishing straight line access (SLA) significantly reduces the likelihood of iatrogenic complications such as zips, elbows, and ledges, which commonly arise when large, relatively inflexible stainless steel instruments attempt to straighten within curved canals. SLA also facilitates easier and more controlled insertion of rotary instruments during canal preparation. When nickel titanium instruments are used, the presence of adequate SLA is particularly essential.

Although nickel titanium instruments are highly flexible, insufficient SLA may lead to file deformation and eventual separation due to cyclic fatigue. Ideally, these instruments should be able to reach the apical foramen, or at least the first canal curvature, without undergoing bending. Excessive instrument flexure compromises control and can result in multiple procedural errors. Attempts to clean and shape the canal without proper SLA often lead to complications such as ledge formation, canal transportation, and zipping. Conversely, an instrument that operates without undue bending provides improved tactile feedback of canal anatomy and enhances overall file performance within the root canal system.

Effects of Modern Access Cavity Designs on Irrigation Techniques Used

During Cleaning of Access Cavity and Root Canals

One of the most critical stages of endodontic treatment is biomechanical preparation. Given the well established role of intracanal microorganisms in the initiation and progression of pulpal and peri-radicular diseases, the principal aim of endodontic therapy is the complete removal of pulp tissue and effective disinfection of the root canal system. Various irrigation delivery techniques, including sonic and ultrasonic systems, have been introduced to enhance canal disinfection and debridement.

The EndoActivator is among the most extensively evaluated sonic devices; however, it operates at relatively low frequencies (0.166–0.3 kHz). In contrast, numerous studies have demonstrated that ultrasonic irrigation produces superior results, likely attributable to its higher operating frequency (approximately 40 kHz). Ultrasonic irrigation techniques are broadly categorized into two types: simultaneous ultrasonic instrumentation with irrigation, and passive ultrasonic irrigation (PUI), which functions without concurrent instrumentation. Owing to challenges associated with controlling dentin removal, the former approach has largely been discontinued in clinical practice. The non-cutting nature of PUI minimizes the risk of creating aberrant canal morphology.

In ultrasonic irrigation, energy is transmitted from a vibrating file or thin wire to the irrigant, generating two key physical phenomena: acoustic streaming and cavitation. Acoustic streaming refers to the rapid circular or vortex-like movement of fluid around the oscillating instrument, whereas cavitation involves the expansion, compression, and distortion of pre-existing gas bubbles within the liquid.

Laser activated irrigation represents a newer light based activation modality that has demonstrated promising efficacy. Its mechanism relies on the rapid absorption of laser energy by erbium: yttrium-aluminum-garnet and diode lasers, leading to micro-activation and subsequent rupture of irrigant bubbles. When applied for equivalent durations, photoactivated cavitation techniques have shown superior performance compared with ultrasonic methods, including greater debris removal, a more sustained and enhanced response, and increased irrigant temperatures. However, high cost and the risk of apical extrusion remain significant limitations.

Thermal effects also play a role in microbial elimination. Exposure to elevated temperatures significantly increases antimicrobial efficacy; heating solutions from 20°C to 45°C has been shown to result in a 100 fold increase in microbial killing. Using heating devices, a 20°C irrigant can reach temperatures of 45°C–60°C within 7–20 minutes. Nevertheless, limited data are available regarding the optimal temperature required to adequately heat the root canal system and eradicate microorganisms. Furthermore, heated obturation remains the only technique that directly evaluates heat transfer from the elevated intracanal temperature to the surrounding periodontal tissues.

Obturation Techniques Used With Modern Access Cavity Designs

After completion of cleaning and shaping, the objective of obturation is to fill and seal the root canal system as completely and effectively as possible. Recent studies have demonstrated a strong correlation between the quality of obturation and the overall success of endodontic treatment. Achieving adequate obturation of the root canal system, particularly its complex ramifications, presents several challenges, primarily due to the difficulty in achieving proper adhesion of the filling material to the canal walls.

To address these limitations, researchers introduced the concept of obturating root canals using injection molded thermoplasticized dental gutta-percha. It was observed that thermoplasticized gutta-percha, when used in conjunction with a sealer, is capable of producing an effective apical seal. Prior to the commercial availability of prefabricated alpha-phase gutta-percha or polycaprolactone based core carrier systems, metal carriers such as gold wires, silver points, and endodontic files were commonly coated with heat softened gutta-percha to achieve three dimensional obturation of the canal space.

Core carrier systems improve the adaptability of gutta-percha to canal walls and facilitate the flow of the filling material into lateral canals. However, plastic obturators have largely replaced metal carriers due to complications encountered during retreatment procedures and post space preparation. The Down Pak represents a novel advancement in obturation technology, enabling three dimensional obturation through the combined application of heat and vibration. It is a cordless endodontic device that functions as a heated, vibrating spreader and can be employed for both warm vertical and lateral condensation techniques.

Coronal Restoration of the Modern Access Cavity Designs

The success of endodontic therapy is influenced by multiple factors, with microbial infection being one of the most frequent causes of treatment failure. Coronal access cavities can permit leakage into the root canal system, compromising long-term outcomes. In fact, the quality of the coronal restoration is often more critical than the technical quality of the root canal procedure itself in ensuring peri-radicular health. Consequently, endodontically treated teeth should be restored as promptly as possible following root canal therapy to minimize the risk of coronal leakage.

Direct composite resin restorations represent a highly effective therapeutic option, as they preserve a greater amount of tooth structure in endodontically treated teeth. Compared with amal-gam restorations, composite resins provide superior resistance to tooth fracture and contribute to intracoronal reinforcement. Advances in adhesive techniques and composite restorative meth-ods have enabled the successful restoration of cavities involving three or more surfaces.

Early formulations of glass ionomer cement (GIC), how-ever, were unsuitable for permanent posterior restorations due to their brittleness and weak physicochemical bonding to enamel and dentin. In contrast, after several years of development, newer condensable GICs combined with innovative nanofilled resin coatings have demonstrated superior performance compared with microfilled hybrid composites in Class I and II cavities. Despite these promising findings, there is a lack of published evidence regarding the performance of these newer restorative materials in endo-dontically treated teeth. Therefore, their use in such clinical situations should be approached with caution.

Conclusions

"Conservative access," "ninja access," and "truss access" are collectively referred to as "contracted" access cavity designs and have been proposed as alternatives to traditional access. Conservative access is considered a viable option for root canal therapy, as it preserves tooth structure while still permitting a safe and efficient clinical procedure. Ninja access involves creating a very small opening near the center of the occlusal surface. How-ever, this approach appears to provide inadequate space for the proper execution of subsequent treatment steps, and there is currently insufficient scientific evidence to support its effectiveness. Truss access is intended for multi-canaled teeth, as it preserves a portion of the pulp chamber roof and an enamel dentin bridge while allowing direct access to each canal.

To be continued.....

(It's a review of literature and not an original article)

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Hemisection: A Minimally Invasive Strategy to Rescue a Mandibular Molar

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Abstract

Hemisection serves as a conservative and multidisciplinary surgical endodontic prosthodontic intervention aimed at retaining salvageable portions of multi rooted teeth compromised by localized disease. In this case, a mandibular first molar with an endo-periodontal lesion underwent hemisection successfully. Following endodontic therapy and surgical excision of the diseased root, prosthetic rehabilitation with a fixed bridge restored form and function. The favorable outcome highlights hemisection as an effective alternative to extraction in selected cases.

Keywords: Hemisection , Mandibular Molar , Endo-Periodontal Lesion ,Prosthetic Rehabilitation, Surgical Excision.

Introduction

Modern conservative dentistry prioritizes the preservation of natural dentition over extraction and artificial replacement. This paradigm shift is based on an understanding of the biological and functional advantages of retaining the natural tooth structure, periodontal ligament, and alveolar bone. In this context, hemisection, or root amputation, emerges as a valuable treatment option for multi-rooted teeth, especially mandibular molars, where one root is non-restorable due to caries, vertical fracture, or advanced localized periodontal disease, while the other remains healthy and structurally sound.

Hemisection refers to the surgical separa tion and removal of one root and the associ - ated coronal structure of a multirooted tooth, with the intent to preserve the remaining portion. The procedure allows the salvaging of a partially diseased tooth and provides a prosthetic foundation for long-term function and aesthetics. It is a multidisciplinary treat ment, integrating principles of endodon -tics, periodontics, prosthodontics, and oral surgery, and demands careful planning and execution for successful outcomes[1,2].

Indications for hemisection include irrepa - rable root fractures, localized vertical bone loss affecting one root, failing endodontic treatment of one canal and root caries.[3,4]. The retained root must exhibit sufficient bone support, favourable anatomy, and the ability to withstand occlusal loading. The patient's oral hygiene, motivation, and medical status also play a pivotal role in long-term success [5].

Compared to extraction and implant placement, hemisection offers several advan tages. It is biologically conservative, pre serving the alveolar bone, soft tissues, and pro prioceptive feedback mechanisms associated with the periodontal ligament. It is also economically favourable, avoiding the cost and surgical morbidity associated with implant therapy or bridge fabrication. Additionally, it maintains arch integrity, particularly important in younger patients or those contraindicated for implants[6,7].

Despite these advantages, hemisection is underutilized in clinical practice. A probable cause is the increasing reliance on implants and a general perception that resective procedures are technique-sensitive and less predictable. However, recent literature has shown encouraging results with hemisection when strict selection criteria are followed. In a 10-year follow-up study, Bühler (1988) observed that root-resected molars had satisfactory long-term survival, especially when periodontal and prosthetic principles were adhered to [8]. Fugazzotto (2001) simil arly reported that resected molars, when prop -erly restored, showed outcomes compar able to those of single implants [9].

Technological advancements have further

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improved the predictability of hemisection. CBCT imaging provides detailed assessment of root morphology, furcation anatomy, and bone support, enabling precise case selection and surgical planning. Microsurgical techniques, improved rotary instru mentation, and bio-ceramic sealing materials have significantly enhanced the endodontic phase, while modern flap designs and magnification improve surgical precision[10].

Nevertheless, hemisection requires a thorough understanding of occlusal dynamics, root morphology, and restorative planning. The prosthesis must be designed to evenly distribute occlusal forces, ensure accessibility for oral hygiene, and avoid overloading the retained root. Complications such as root fracture, periodontal breakdown, or caries in the remaining root can occur in poorly planned or maintained cases [11,12].

In the era of evidence-based, patient-centered care, hemis ection should be regarded as a viable, strategic alternative rather than a compromised solution. It aligns well with modern goals of minimally invasive dentistry, cost-effectiveness, and long-term fun ction. With proper execution and patient compliance, hemisection remains a valuable tool in the clinician's armamentarium for managing complex molar cases conservatively.

Case Report

A 59-year-old male presented with intermittent pain and mobility in the lower-left molar region. Clinical Examination revealed that tooth #36 was non-vital with Grade I mobility and deep pockets (8–10mm) on the mesial/buccal aspects. Radiographic examination showed that a significant Grade II furcation defect, periapical radiolucencyseen at the root apex. Vertical bone loss and root resorption present on distal aspect of mesial root. Distal root has adequate bone support.(fig.1,2

Diagnosis: On the basis of clinical and radiographic examination, Non vital tooth with periodontal lesion and bone defect present on the mesial root of #36.

Treatment Plan: Endodontic therapy followed by Hemisection (mesial root/crown removal) and PFM fixed partial denture from #35 to distal half of #36.

Fig-1 showing Preoperative clinical view

Fig-2. Preoperative Radiograph of #36

A- Working Length

B- Master Cone

C- Post Obturation

D- Post Endo Restoration

Fig-3

Procedure

Conventional root canal wasdone in distal root #36.(fig.3) After completion, the full thickness mucoperiosteal flap wasraised and sectioning of the tooth through exposed furcation area by long sank tapered bur was done.(fig.5)Mesial root along with its crown portion was removed.(fig.6,7)

Fig-4 Armamentarium for Hemisection

Fig- 5 Vertical cut i.r.t. 36

Fig- 6 & 7. showing Extracted mesial segment of # 36

Thorough debridement of extracted socked was done (fig.8) and odontoplastyof the remainingdistal root was done and sitewas sutured with 3-0 silk suture material (fig.9) After completion of procedure ,Post operative radiograph was taken.(fig10)

Fig- 8 Removal of granulation tissue

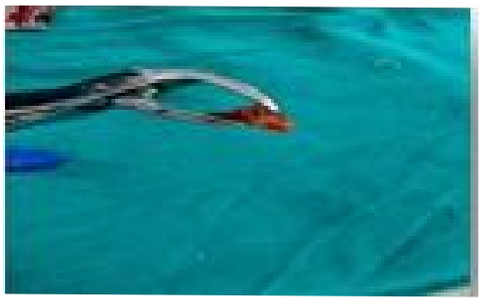

Fig- 9. Suture placed

Outcomes: After One-week, patient was asymptomatic and no pain and swelling were present, sutures was removed.(fig.12)

At one-month follow-up, surgical site healed well.

Tooth preparation of #35 and #36 was done and impression were taken.(Fig.14)

Fabrication of prosthesis were done by dental laboratory ,cementation of prosthesis were done on patient mouth.(Fig.16)

Oral hygiene maintenanceinstructions was given to patient.

Fig- 10. Post operative radiograph

Fig- 12. Follow up after 1 week (Clinical view)

Fig- 13. 1 Month follow up radiograph

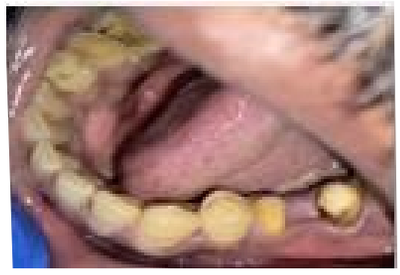

Fig- 14. Tooth preparation i.r.t. 35 & retained 36

Fig- 15. Prepared prosthesis

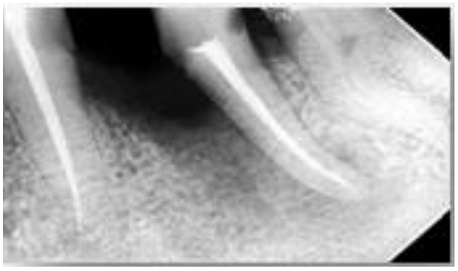

Fig- 16. Cementation of prosthesis in 35 & 36

Discussion

Hemisection, also referred to as root amputation or root resection depending on the clinical context, is a valuable and often underutilized treatment modality that enables the retention of part of a multi-rooted molar by removing the diseased or non-restorable root. This technique provides a conservative approach in situations where localized pathology affects a single root, such as advanced decay, vertical root fracture, or isolated periodontal destruction, while the remaining root remains healthy and structurally viable. The retained root, when properly treated, can continue to support occlusion and function effectively over the long term.

This method aligns with modern principles of conservative dentistry by preserving natural tooth structure and supporting tissues, avoiding more invasive and costly alternatives like extraction followed by implant therapy or prosthetic replacement. The biologic advantages of preserving the natural tooth include maintaining proprioception, preserving alveolar bone, and minimizing changes to occlusal dynamics.[13]

Case Selection: The Cornerstone of SuccessThe prognosis of hemisection is highly dependent on careful case selection. Clinically, the most ideal cases involve mandibular molars with well-separated roots, favourable crown-to-root ratio, and limited bone loss surrounding the retained root. In contrast, maxillary molars often present greater challenges due to complex root anatomy, proximity of furcation, and difficulty in achieving an ideal emergence profile during prosthodontic rehabilitation.

Weine (1996) emphasized that a comprehensive assessment of root morphology, occlusal forces, periodontal status, and restorative possibilities is vital before proceeding.Cases with curved, fused, or short roots are generally contraindicated. Adequate interradicular bone support and accessibility for oral hygiene are essential for long-term success.[14]

Multidisciplinary Treatment Approach

Successful hemisection requires integration across multiple dental specialties:

Endodontic Phase: The retained root must undergo proper biomechanical preparation and obturation. Failure to create a hermetic seal may result in reinfection and treatment failure.

Surgical Phase: This includes flap design, precise root sectioning, and thorough debridement of granulation tissue. The resected surface should be contoured and smoothened to reduce plaque retention (DeSanctis and Murphy, 2000).[15]

Prosthodontic Phase: A full-coverage crown, often splinted to adjacent teeth, can protect the remaining structure and distribute occlusal forces. Proper emergence profile and hygiene access must be ensured.

Hemisection vs Implants and Extraction

Although dental implants have become the mainstream option for tooth replacement, hemisection offers several comparative advantages:

Preservation of Periodontal Ligament (PDL): Vital for proprioception and adaptive occlusion.

Alveolar Bone Maintenance: Hemisection maintains physiological stimulation to the bone.

Cost-effectiveness: Especially important in developing nations or for elderly patients.

Reduced Treatment Time and Risk: Avoids complications like sinus perforation or implant failure.

Dannewitz et al. (2006) showed that molars treated via respective periodontal surgery had favourable long-term outcomes. McGuire and Nunn (1996) supported the notion that many teeth performed better than their predicted prognosis if given appropriate follow-up and care.[16]

Restorative and Biomechanical Considerations

With the advent of modern adhesive dentistry, hemisection teeth can now be restored using fibre-reinforced posts, CAD/CAM-fabricated crowns, and precision occlusal adjustment. Periodontal splinting can enhance the longevity of compromised but restorable roots.

However, the altered biomechanics of the remaining root may lead to increased risk of fracture or overloading, especially in patients with bruxism. Occlusal guard therapy and regular occlusal monitoring are recommended in such cases.

Maxillary vs Mandibular Molars

Hemisection is more commonly indicated for mandibular molars, where straight mesial and distal roots are accessible and prosthodontic ally favourable. In maxillary molars, complex root morphology especially in the mesiobuccally and distobuccal roots may compromise the prognosis.In selected cases, however, retention of the palatal root can still be successful if anatomical and restorative conditions allow.

Long-Term Prognosis and Maintenance

Bühler (1988) demonstrated that with proper hygiene and follow-up, root-resected molars remained functional over a 10-year period. Common complications include:[17,18]

- Secondary caries
- Periodontal pocket recurrence
- Root fracture
- Occlusal trauma

Hamp et al. (1975) and Rosenberg & Cho (2011) emphasized the importance of tailored maintenance therapy and long-term planning. Patient education and motivation are critical components of treatment success.[19,20]

Conclusion

Hemisection represents a conservative, biologically sound, and cost-effective alternative to full molar extraction and prosthetic replacement. When executed with precise planning, strict case selection, and long-term maintenance, it offers excellent functional outcomes while preserving the natural architecture of the dentition. As dental professionals increasingly seek sustainable and patient-centered solutions, hemisection deserves renewed attention and wider inclusion in clinical decision-making. With emerging digital tools, improved materials, and interdisciplinary support, hemisection is poised for a well-deserved resurgence in the future of restorative and periodontal therapy.

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Heal Talk

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Non Surgical treatment of a Maxillary first molar with Orthograde Retrieval of an Unintentionally Separated File

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Abstract

Instrument separation is one of the most stressful endodontic mishaps, that can occur any time during the root canal treatment. Several techniques have been employed to facilitate instrument retrieval, however, most of them are technique sensitive, expensive and require great expertise. Through this paper, an economic and convenient technique is suggested to retrieve the fractured segment with a combination of both ultrasonic agitation and the file braiding techniques. This case report describes the non surgical root canal treatment of a maxillary first molar in which file separation occurred during the cleaning and shaping procedure. The separated file was successfully retrieved utilizing a combination of ultrasonic and braiding techniques. The field of ultrasonics has undergone a thorough investigation and has been demonstrated to be a conservative technique with minimal radicular dentin trephination. The braiding technique is also a conservative method that involves the use of several braided H-files to apply a gripping force, facilitating the removal of foreign bodies. The utilization of this methodology has been documented in the number of endodontic academic literature.

Categories: Dentistry
Keywords: Maxillary first molar, Braiding Technique, Ultrasonic Technique, Orthograde

Introduction

The intriguing anatomical variations of root canal not only increase the complexity of treatment but also predispose the procedure to a wide range of iatrogenic complications like missed canals, instrument separation, gouging, perforation and under or over preparation of the root canal. One such undesirable event is the breakage of an instrument, which may hinder the cleaning and shaping procedures resulting in continuous pain or discomfort.[1]

As a consequence, the prognosis of an endodontic therapy declines considerably. Clinical data suggests that the probability of separation of an instrument in a root canal during chemo-mechanical preparation is 2%-6%. There are various reasons for instrument separation such as over-instrumentation, improper filing techniques, inadequate access, lack of understanding of root canal anatomy and possibly manufacturing defects. The fracture of rotary files is usually caused by torsional stress and cyclic fatigue while stainless steel hand files fracture due to excessive torque application during instrument manipulation.[2]

The retrieval of instruments has no sure short formula, in-fact it is a hit and trial method. The choice of any particular technique is made after critically evaluating the pros and cons of each technique. Different techniques have been described to retrieve the obstruction from canal including the Masseriann kit, IRS kit, the Endosicherheits system, the braiding technique, ultrasonics, the combined technique, the wire loop technique and the endo-extractor technique, yet none of them is completely effective.[3,4]

Based on the majority of prior research, the utilization of nickel titanium rotary files is associated with a higher susceptibility to separations compared to manual stainless steel files. This is primarily attributed to the hindrance these rotary files pose in terms of effectively cleaning and shaping the apical root canal.[5,6] The management of separated endodontic instruments encompasses several approaches based on their location and relationship to the curvature. These approaches include non-surgical retrieval, bypassing, follow-up, and surgical treatment. There is a correlation between elevated rates of treatment failure and the presence of unremoved

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instruments obstructed within canals that already have underlying periapical lesions.

The retrieval of separated instruments is sometimes challenging and perhaps unattainable, as evidenced by a reported success rate ranging from 55% to 79% .[4,5]

This article presents a clinical case of file separation, which was subsequently retrieved through the utilization of ultrasonic and the file braiding approach.

Case Presentation

Chief Complaint

A 31 year old male patient reported to the Department of Conservative Dentistry and Endodontics at Chandra Dental College and Hospital, Barabanki, with the symptoms of the pain in his upper left tooth back region since 2 days back. The intensity of pain was throbbing in nature. On extraoral examination symmetrical face, normal TMJ intraoral examination deep proximal caries was found irt 26. T.O.P was also positive and vitality test showed that pulp was non vital. The measurements of periodontal probing depths were within the normal range. On the radiographic analysis indicated that tooth #26 had a periapical radiolucency. After a thorough evaluation of patient's clinical signs and symptoms and radiographic findings, tooth was diagnosed with a chronic apical periodontitis with non vital (Fig 1). Treatment plan was determined to do a non surgical endodontic root canal treatment followed by an all ceramic crown. The patient was provided with a detailed explanation of the treatment protocol and subsequently agreed to proceed. After administration of the local anesthesia and isolation with a rubber dam, access cavity was made and root canal orifices were located. Working length was established by 10k hand file. Bio mechanical preparation of root canal was prepared by Endo excellence NiTi rotary files, using a crown down technique upto #0.04/20. During cleaning & shaping, a size of #0.04/20 rotary file separated within the distobuccal canal. A radiographic image showed the separated instrument within the middle third of distobuccal canal [Fig 2(A)]. The proposed procedure was the retrieval of the instrument, which was accomplished by preparing a staging platform at the most coronal aspect of the fragment using modified Gates Glidden burs (no. 2-4). Ultrasonic tips number 6 (TALAL'S KIT) were utilized to effectively remove dentin and send vibrations to dislodge the separated fragment. The experimental protocol was conducted using magnifying loupes with a magnification factor of 2.5. Intermittent irrigation with normal saline was performed to effectively remove debris from the canal and provide a cooling effect. After applying ultrasonic tips and copius amount of irrigation, the instrument loosened but did not completely disengage from the canal. Consequently, we opted to utilize a different approach known as the file braiding technique which employs multiple H-files braided around separated files that would apply a strong grasping force, enabling the removal of a separated file. Two no. 20 H-files were introduced, one from the buccal side and the other from the lingual side. The files were then twisted together clockwise to secure the file section inside the canal. After rotating in a clockwise direction, they were extracted from the canal along with separated file segment emerged from the canal [Fig 2(B)] having measurement around 8 mm [Fig 2(C)]. The radiographic image was obtained after the successful retrieval of the separated file [Fig 2(D)]. After the application of calcium hydroxide (CH) paste as an intracanal dressing and acess cavity was sealed with temporary restorative material (Cavit) , the patient was scheduled for a follow-up appointment two weeks later. During the subsequent examination, there were no apparent indications of discomfort, tenderness, or edema on his second appointment. The root canals were treated using a combination of 2.5% sodium hypochlorite irrigating solution with ultrasound activation to effectively remove the calcium hydroxide paste from the root canals. All the canals were dried using a sterile paper points and obturated with gutta percha master cones [Fig 3(A & B)] and AH plus sealer. After the obturation procedure, the tooth was subsequently rebuilt using a resin composite restoration and crown was advised. A follow up radiograph taken after one month (Figure 4).

Fig : 1 Pre op irt 26

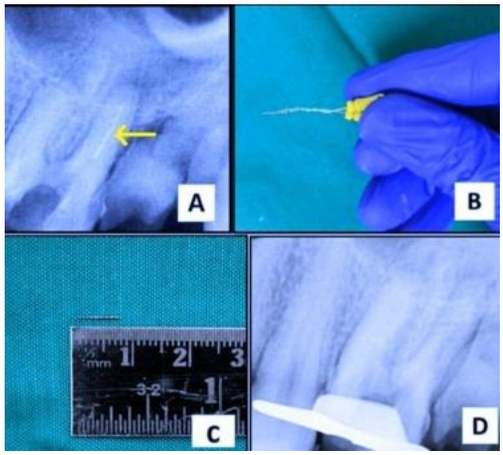

Fig 2: (A) Radiograph under rubber dam showing the separated instrument in the middle third of distobuccal canal
(B) Retrieval of the instrument seen clinically with the braiding technique
(C) Measurement of the separated file
(D) Post retrieval radiograph

Fig 3: (A) Mastercone radiograph
(B) Immediate post obturation radiograph

Fig 4: One month follow up radiograph showing sufficient healing

Discussion

The occurrence of file separation during endodontic therapy is a challenging event, with reported rates ranging from 2% to 6% in examined instances. The presence of a fragmented obstruction impedes the ability to perform a comprehensive root canal cleaning and shaping technique.[9] Various ways have been documented in the literature for the retrieval of split files, such as the Masserann kit, Endo Extractor, wire loop technique, braiding technique, and ultrasonic tips. The orthograde technique involves three distinct phases: bypassing the instrument, removing the instrument, and preparing the canal and obturating it up to the level of the separated instrument.[10] However, in our specific scenario, it is important to consider the presence of a periapical infection.[11] Therefore, it is required to bypass or retrieve the separated instrument. Simply by passing the fractured instrument will not effectively achieve the goal of proper disinfection and cleansing. Consequently, we decided to attempt the retrieval of a separated instrument.[12]

Ultrasonics are often regarded as the most conservative approach for elimination, making them the most extensively studied and utilized technique in both laboratory settings and living organisms. The technique frequently described involves the utilization of a modified Gates Glidden drill to establish a staging platform. This platform allows for adequate space, enabling specialized ultrasonic tips to perform trephination around the coronal aspect of the fragment. Consequently, this process agitates, loosens, and unwinds the fractured instrument. [13] The retrieval of the instrument using either the Masserann kit or the Endosicherheits system necessitates the construction of an access canal with a minimum diameter of 1.2 mm. These operations carry a significant risk of root perforation as a substantial amount of dentin must be removed to properly position the extractor to retrieve the separated file. This is due to the use of a relatively large diameter tube compared to the size of the canal.[14]

In this case report, employed ultrasonics as the initial method for accessing the separated instrument. This was achieved by creating a staging platform, followed by the retrieval of the instrument using a braiding technique that involves the insertion of numerous H-files, which are subsequently twisted around the foreign body. Throughout the procedure, careful consideration was given to preserving the integrity of the radicular dentin.

Clinical decision making algorithm in case of fractured instruments within root canal:

- If the instrument is fractured at the apical third of the root with a vital pulp, it is recommended to adjust the working length, prepare the canal up to the fragment, and employ sodium hypochlorite solution (NaOCl) agitation for proper cleaning and disinfection of the root canal. It is more desirable to perform obturation up to the fragment rather than attempting to retrieve it. In the case of non-vital (infected) pulp, fragment bypass is highly suggested. Instead of attempting fragment removal, if adequate cleaning, shaping and disinfection have been performed.
- If the fragment is separated in the middle third with vital pulp. It is advisable to bypass the file. If bypassing is not feasible, one can obturate the canal up to the instrument. Follow-up is required, and in the event of post-treatment endodontic disease, periapical surgery should be employed. In the case of non-vital pulp, one should attempt to bypass or to retrieve that file with minimal dentin removal. If it is not possible to bypass or retrieve the instrument, the canal should be completely obturated up to the instrument and further treatment should involve considering apical surgery.
- If an instrument becomes separated at the coronal third with vital or non-vital pulp, the broken instrument should be removed with minimal dentin removal.

Various forms of gripping equipment such as Stieglitz forceps or plier-type instruments can be applied for this purpose.[14]

Conclusion

The effectiveness of endodontic therapy is contingent upon several key factors, including the quality of the coronal restoration, thorough debridement and disinfection and the three dimensional obturation of a root canal. File separation in the root canal is very crucial factor for the success of the non surgical endodontic treatment. Instrument separation remains an unavoidable mishap during endodontic treatment, particularly in anatomically complex teeth. In the present case, timely recognition of the mishap and careful application of retrieval techniques facilitated successful removal of the separated file, preservation of canal integrity, and completion of the root canal therapy. This case highlights the importance of operator vigilance, knowledge of canal anatomy, use of a selection of suitable retrieval methods, and patient centered decision making to achieve favorable outcomes despite procedural complications.

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Smile Spectrum: A Case Series on the Use of Veneers, Laminates, and Componeers in Aesthetic Dentistry

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Abstract

The demand for an aesthetically pleasing smile has spurred innovative solutions in restorative dentistry.This case series highlights the clinical use of direct composite veneers, laminates, and componeers as minimally invasive and effective alternatives to traditional ceramic restorations.[1,2] These techniques not only conserve tooth structure but also provide cost effective, time efficient, and esthetically pleasing results. Through a series of three cases, this article explores their indications, treatment protocols and outcomes.

Keywords: Componeer, Ceramic, Laminates, Veneers, Debonding.

Introduction

In the realm of modern dentistry, the pursuit of achieving natural esthetics while preserving the integrity of tooth structure has driven significant advancements in materials, techniques, and overall clinical practice. Aesthetic dentistry is continuously evolving, providing patients with a variety of restora tive solutions for smile enhancement. Techni ques such as direct composite veneers, lamin ates and componeers have become popular due to their conservative approach and high esthetic value andhave emerged as principal modalities that cater to the growing desire for minimally invasive yet highly aesthetic restorative treatments.

Historically, full-coverage crowns were considered the standard for improving anterior esthetics, particularly for teeth affected by discoloration, minor malfor - mations, fractures, or diastemas. However, full crowns necessitate substantial reduction of sound dental tissue, which is at odds with the principles of conservative dentistry. Conse - quently, the development of alternative therapeutic approaches that facilitate maximum preservation of healthy structures and provide superior optical and functional results has led to the increasing adoption of various types of veneering procedures.

Direct composite veneers are restorations fabricated chairside using composite resin materials and applied directly onto minimally prepared or, in some cases, unprepared tooth surfaces. These veneers have gained acclaim for enabling single-visit smile makeovers, cost-effectiveness, and their capacity to mimic natural dental tissues reliably.[1] The evolution of adhesive dentistry and the introduction of nano- and micro hybrid resin composites have further enhanced the mechanical and optical properties, allowing clinicians to address indications such as tooth discoloration, malformations, minor positional anomalies, diastemas, and fractured or worn anterior teeth with great predictability.[2]

Beyond aesthetics, direct composites are valued for their minimally invasive approach; they require limited or no tooth preparation and can be repaired or modified relatively easily, prolonging the longevity of the restoration and safeguarding pulpal health.[3] Advances in layering techniques and new-generation composites have expanded their application and durability, diminishing the perception that they are suitable only as short-term or temporary restorations

Laminate veneers can be fabricated via direct or indirect approaches. Indirect laminates are typically created in a dental laboratory from ceramic or composite materials and subsequently bonded to the prepared tooth, while direct laminates are constructed in situ from composite resins in a single appointment.[4] Both variants offer substantial improvements in oral esthetics and function by correcting existing defects, enhancing appearance, and providing a

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protective layer for otherwise vulnerable teeth.[5]

Porcelain laminate veneers, in particular, are renowned for their superior esthetic results, wear resistance, and color stability, albeit at a greater cost and with the necessity for more invasive tooth reduction compared to direct approaches.[6] In contrast, indirect composite veneers serve as a middle ground, combining laboratory precision with the inherent repairability and adaptability of resin-based systems

Componeers are a recently developed category of prefabricated veneer systems made of highly filled nanohybrid composite resins.[7] These thin, pre-contoured enamel shells are designed to be adhesively bonded to minimally prepared teeth with ease, offering a high degree of customization and adaptability to individual cases. Componeers blend the esthetic appeal of ceramics with the reparability and conservative nature of direct composites, providing an innovative solution for anterior esthetic rehabilitation.

Key advantages of componeers include minimal thickness (often around 0.3 mm to 1 mm), which means less enamel removal, excellent color stability, and high mechanical strength due to advanced manufacturing techniques. The concept of "bio-esthetics" is embodied in these technologies, striving to achieve harmony between restoration and periodontal health with minimal biological cost.[8]

The choice among direct composite veneers, indirect laminates, and componeers necessitates careful consideration of multiple factors, including the clinical situation, esthetic demands, financial constraints, and patient expectations. As these modalities continue to evolve, sharing clinical experiences and observations through detailed case reports is crucial to guide practitioners in making evidence-based decisions, understanding limitations, trouble shooting complications, and optimizing outcomes for diverse patient populations.

This article seeks to provide comprehensive insights into the clinical protocols, indications, results, and follow-up of patients restored with direct composite veneers, laminate veneers, and componeers. By meticulously documenting the selection criteria, procedural steps, and clinical outcomes, this article illustrate the contemporary capabilities and nuances of each technique. Through such documentation, the ongoing development of adhesive and esthetic dentistry can be supported, fostering an enhanced appreciation of minimally invasive interventions as a cornerstone of restorative practice.

Indications

- Discolored teeth
- Minor malpositioning
- Peg-shaped lateral incisors
- Fractured or worn teeth
- Good oral hygiene and sound enamel

Contraindications

- poor periodontal health
- bruxism
- edge-to-edge occlusion
- insufficient enamel

Case 1: Diastema Closure Using Direct Composite Veneers

Fig 1. Preoperative

Patient Profile

A 36-year-old female with a 3 mm midline diastema between the maxillary central incisors.

- Treatment Summary:
- Alginate impression and wax mock-up performed
- Putty template used to guide composite placement
- Shade A2 was selected

Fig 2. Wax Mock Up On [11]

- Direct build-up done intraorally using putty index
- Final restoration polished and adjusted

Fig 3. Putty Impression For Template

Outcome

Natural closure of diastema with enhanced aesthetics and m inimal tooth preparation

Fig 4. Shade Selection

Fig 5. Post-operative

Case 2: Correction of Malaligned Anterior Teeth with Porcelain Laminates

Patient Profile

A 29-year-old male dissatisfied with the alignment of maxillary central incisors.

Treatment Summary

- Facial tooth preparation using depth-cutting burs
- Gingival retraction and impression via putty-wash technique
- IPS e.max veneers fabricated and bonded using Variolink II
- Inner veneer surface etched with HF acid, treated with silane
- Final cementation and occlusal adjustments performed

Fig 6: Pre Operative Bucccal View

Fig 7: Pre Operative Palatal View

Fig 8: Tooth Preparation Buccal View

Fig 9; Tooth Preparation Palatal View

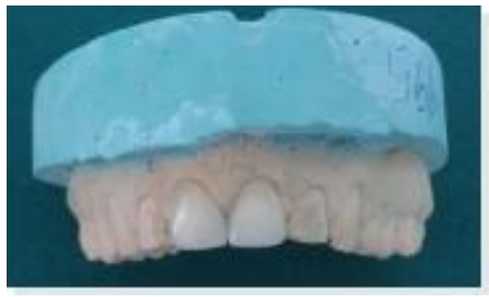

Fig 10: Fabrication Of Laminates

Fig 11: Cementation Of Laminate

Fig 12: Post Operative

Outcome

Highly esthetic, well-aligned anterior segment with improved confidence and function.

Case 3: Use of Componeers for Abraded Incisors

Patient Profile

A 23-year-old male presenting with incisal abrasion of maxillary central incisors.

Fig 13: Pre Operative

Treatment Summary

- Tooth preparation limited to 0.2–0.3 mm reduction
- Etching with 35% phosphoric acid
- One Coat Bond applied
- Componeers (L size, White Opalescence shade) selected
- Composite (Synergy D6) applied and light cured
- Finishing performed using fine burs and polishing discs

Fig 14: Componeer

Fig 15: Tooth Preparation

Fig 16: Post Operative

Outcome

Immediate and cost-effective restoration of shape, shade, and form with excellent esthetic appeal.

Modality	Material	Indications	Key Benefit
Veneers	Porcelain/Composite	Severe discoloration, minor misalignments	Long-lasting and stain-resistant
Laminates	Porcelain (e.g., IPS e.max)	Shape correction, minimal spacing	Ultra-thin, natural appearance
Componeers	Prefabricated composite shells	Abrasion, discoloration, cost concerns	Chairside application, less prep time

Comparative Analysis Between Veneers, Laminates & Componeers

Discussion

Aesthetic dentistry has seen significant advancements in recent years, with various restorative options available for enhancing the appearance of teeth.

Among these, veneers, laminates, and componeers are widely used to improve dental aesthetics.

Clinical Performance and Longevity

Extensive clinical trials and comparative studies show that both direct composite veneers and componeers offer highly conser - vative modalities for anterior esthetic rehabilitation, with minimal tooth reduction required. Componeers, in particular, are extremely thin (typically around 0.3–1 mm), minimizing enamel removal while still providing substantial esthetic improvement. Their fabrication as nanohybrid composite shells under controlled pressure and temperature grants them high surface hardness and flexural strength, nearly matching that of natural enamel (392 MPa vs. 384 MPa).[9]

Direct composite veneers, applied chairside, allow for imme diate correction of esthetic concerns such as discoloration, malfor - mations, diastemas, and minor fractures. Their major strengths include ease of repair, adaptability, and affordability compared to ceramic alternatives.[10] However, disadvantages include greater susceptibility to color instability, abrasion, and marginal deterioration although improvements in resin technology and layering techniques have notably enhanced long-term outcomes.

Esthetic Outcomes and Marginal Adaptation

Both direct composite veneers and componeers yield significant instant improvements in dental esthetics, often rivaling or approaching the performance of indirect porcelain laminates. Studies confirm that color changes, surface texture degradation, and marginal integrity loss remain minimal for both modalities over one-year follow-up periods with meticulous oral hygiene practices.[11] Componeers feature a micro-retentive surface, which ensures lasting bond strength and close adaptation, allowing the luting composite to flow without gaps.

Comparison with indirect ceramic veneers reveals interesting trade-offs: while ceramics boast superior hardness, color stability, and resistance to chipping, they require considerably more tooth reduction and are more brittle than componeers, which are elastic and rarely break under occlusal forces.[12] Moreover, componeers and direct composites can be polished and repaired more easily, providing renewed gloss and esthetic longevity as needed.

Clinical Considerations and Biologic Outcomes

Studies emphasize that both componeers and direct composite veneers display excellent gingival response if case selection and application protocols are strictly followed and patients maintain optimal oral hygiene. The Gingival Bleeding Index and other

clinical indices show significant post-operative improvement with both materials, corroborating findings that well-adapted veneers, whether direct or indirect, are not detrimental to periodontal tissues.[13] Marginal adaptation is particularly critical in preventing secondary caries, marginal discoloration, and maintaining soft tissue health. Both approaches require meticulous technique, though direct composites may display slightly better adaptation in the cervical margin region.[14]

Limitations and Future Directions

A key limitation remains the relative short duration of available comparative studies, usually spanning only one year or less. Although early results are promising, comprehensive multi-year studies are required to fully establish the survival rates, wear patterns, and color stability of componeers and advanced composites as compared to ceramic and traditional veneers. Additionally, careful case selection, individualized patient education regarding oral hygiene, and regular follow-ups are essential to ensure optimal outcomes regardless of veneering modality.

Technological progress in resin development, surface vitrification, and application protocols will likely further narrow any remaining gaps between composite and ceramic-based esthetics, offering patients a broader array of minimally invasive choices that do not sacrifice longevity or function.

This article illustrates how veneers, laminates, and componeers offer versatile, conservative, and predictable treatment options for improving dental aesthetics.

1. Veneers

Material: Porcelain or composite resin

Indications: Severe discoloration, minor misalignment, chipped teeth and spacing issues.

Procedure: Minimal enamel removal, custom-fabricated shells bonded to the front surface of teeth

Outcome: Natural appearance, long-lasting, stain-resistant

2. Laminates

Material: Ultra-thin ceramic or porcelain

Indications: Mild discoloration, shape correction, and minor spacing issues

Procedure: Minimal or no enamel removal, bonded to the enamel surface

Outcome: Highly aesthetic results with minimal invasiveness

3. Componeers

Material: Prefabricated composite shells

Indications: Quick aesthetic corrections, cost-effective alternative to porcelain veneers

Procedure: Direct bonding with minimal tooth preparation

Outcome: Immediate transformation with enhanced durability compared to traditional composite restorations

The selection of a specific modality should be patient-centered, considering aesthetic expectations, budget, and clinical indications.[14]

Conclusion

The integration of direct composite veneers, componeers, and ceramic laminate veneers into modern restorative dentistry provides clinicians with a diverse range of strategies to address esthetic and functional concerns affecting anterior teeth.

The principal advantage of these techniques lies in their ability to deliver aesthetic improvements with maximal preservation of sound tooth structure a hallmark of contemporary minimally invasive dental practice.

Direct composite veneers and componeers have shown comparable clinical performance in short-term and early long-term studies, with minimal changes in color, surface texture, and marginal integrity when patients maintain good oral hygiene and when clinicians adhere to strict application protocols.

Ceramic and porcelain laminate veneers, meanwhile, generally provide better color, stability and greater resistance to fracture and staining over longer periods. However, the necessity for increased tooth reduction and lab-based procedures can pose limitations for patients seeking the most conservative approach or rapid results.

Nonetheless, their durability, lifelike translucency, and broad applicability for severe esthetic challenges have made them the gold standard for major cosmetic corrections.

Critically, the decision to select one modality over another must be based on a holistic clinical assessment including the extent of esthetic concerns, periodontal health, patient expectations, economic considerations, and the likelihood of regular maintenance.

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Heal Talk

A Journal of Clinical Dentistry

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Role of Artificial Intelligence in Oral and Maxillofacial Surgery and its Ethical Challenges: A Review

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Abstract

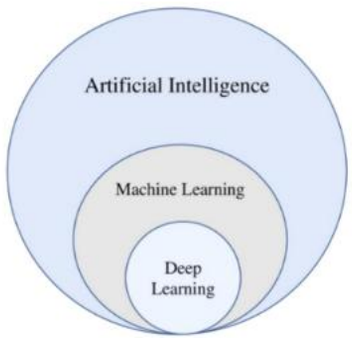
The field of artificial intelligence (AI) has emerged as a versatile health technology tool revolutionizing medical field over the past two decades. AI encompasses different concepts such as machine learning, neural networks and deep learning techniques that present a broad spectrum of purposes to assist surgeons with diagnosis, preoperative planning, therapeutic decisions as well as outcome prediction and evaluation. AI carries potential to advance the field of OMFS and generate novel solution for persisting clinical challenges. This algorithm should, however, be precisely evaluated clinically, and a systematic ethical consideration should be given regarding data protection and transparency. The purpose of this review is to present a comprehensive summary of the existing scientific knowledge of AI and describe its current and future applications in maxillofacial surgery.

Keywords: Artificial Intelligence; Oral and Maxillofacial Surgery; Deep learning; Machine learning

Introduction

Artificial intelligence (AI) is a branch of computer science which can be defined as a sequence of operations (software) designed to perform a specific task.[1] The term Artificial Intelligence was coined by John McCarthy, a mathematician, in 1955. MYCIN system (1980s) was the first AI implemented in healthcare that was trained to distinguish various bacterial infections.[2]

In medicine the most commonly used branch of AI is machine learning and, more recently, deep learning. Machine learning (ML) is a branch in which systems learn to perform intelligent tasks without prior knowledge of the given subject. Instead, the systems identify patterns from a large dataset without any human assistance.[3]Deep learning (DL) is a sub-branch of ML wherein systems attempt to learn pattern as well as hierarchy of composable patterns that build on each other. An extremely popular class of DL algorithms is the artificial neural network (ANN) which is a structure composed of many small communicating units called neurons organized in layers. In medicine, one of the most commonly used subclasses of ANN is the convolutional neural network (CNN) which uses a special neuron connection architecture and the mathematical operation, convolution, to process digital signals such as image, sound and video.[4]



AI is a rapidly evolving field that has made remarkable advancements in various healthcare specialties and has potential to revolutionize the ways of diagnosis, treatment planning, therapeutic decisions, and postoperative evaluation in OMFS. By using advanced algorithms AI systems analyze complex imaging data, such as CT scans and3D models, to aid in preoperative assessments, virtual surgical simulations, and personalized treatment plans. Further, AI can also assist surgeons in intraoperative decision making by providing real time guidance and feedback, improving surgical accuracy, and decreasing complications.[5]

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In this review article, we aim to provide a comprehensive overview of the diverse applications of AI in OMFS by analyzing recent advancements, challenges, and future prospects.

Radiographic Image Quality Improvement

Poor quality of radiographic image due to distinct interferences can interfere with the diagnostic process. Deep learning techniques have shown great potential in overcoming the limitations of conventional methods. AI has been employed in CT and CBCT images to reduce motion artifacts caused by patient or organ movements and metal artifacts. These artifacts can negatively impact the accuracy of diagnostic procedures.[6]

Diagnosis of Cysts and Tumors

Appropriate classification and diagnosis of various cysts and tumors of oral and maxillofacial region pose challenges for surgeons. Abdolali et al. proposed a model that uses asymmetry analysis to automatically segment radicular cysts, dentigerous cysts, and odontogenic keratocysts in CBCT images.[7] Rana et al. employed a surgical navigation program to segment keratocysts and measure their volume and concluded that the results were comparable with that of more established methods.[8] Santer et al. in a systematic review including 13 studies, found that AI carries promising potential in detecting suspicious lymph nodes in patients with head and neck squamous cell carcinoma with a mean accuracy of 86%.[9]

Orthognathic Surgery

Traditional surgical planning methods utilizing radiographs and models have limitations, especially for patients with extensive facial asymmetry. AI can be used to identify precise landmarks, analyze digital cephalometric data, make clinical decisions, and predict treatment outcomes using software enabled by AI.[5]Hong et al. in a study reported the accuracy of AI assisted cephalometric landmark detection in jaw orthognathic surgery cases to be 75%.[10] A study by Jeong et al. reported that CNN was able to accurately diagnose surgical patients based on facial photographs of frontal and lateral profile.[11]

Rhinoplasty

There are lots of technical challenges associated with rhinoplasty owing to its complexity and significant aesthetic and functional concern for the patient. A machine learning algorithm (ML)can recognize hidden patterns and accurately predict outcomes.[5] Zeng et al. developed a virtual planning system to correctly estimate the dimensions of forehead faps to be raised for nasal defect reconstruction through a combination of 3D image registration technology.[12]Chinski et al. developed an AI model that accurately simulates the outcomes of rhinoplasty surgeries with the help of perioperative photographs.[13]

Robotic Surgery in OMFS

Within the field of OMFS, AI has found application in robotic surgery. AI-aided surgical procedures, including dental implants, tumor resections, biopsies, and TMJ surgeries, have demonstrated successful and more precise results. Research has shown that use of AI improved the accuracy and safety of dental implant procedures as compared to conventional techniques and reduced the need for revision surgeries in some cases.[14]Moreover, AI-aided approaches have shown to enable more precise surgical resection of tumors and cysts, minimizing the requirement for adjunctive methods.[15]

Other uses- AI has also shown promise in improving efficiency amongst surgeons. It has shown to play a role in automated diagnosis making based on radiology, automated updates of patient records and improve patient safety by detecting drug interactions. This may improve efficiency for surgeons; however, there may be issues regarding accuracy of automated diagnosis based on radiology that still needs further refinement.[5]

Discussion: AI has made a significant impact within the field of OMFS in the past decade. This review analyzed the latest literature regarding use of AI in OMFS and found various applications within the field including radiographic image quality improvement, diagnosis of tumors/cysts, preoperative planning in orthognathic surgery, automated diagnosis making based on radiographic findings, automated update of patient records, detection of drug interactions etc.

Although AI holds promising potential in OMFS, several challenges need to be addressed for its successful execution. The sharing of clinical data and its management are major challenges in the application of AI systems in healthcare department. Personal data of patients are necessary for initial training of AI algorithms and its improvement. To integrate AI into clinical scenarios, systems must be adapted to protect patients' privacy.[16] Therefore, before considering broader implementation, personal data has to be anonymized.[17]

Mechanisms must be created to control the quality of the algorithms used as AI systems are associated with safety issues. To rectify this situation, the United States Food and Drug Administration has created a new drug category- "Software as Medical Device," which regulates safe innovation and patient safety. Furthermore, the quality of predictions performed by AI systems depends on the accuracy of annotations of the dataset used in initial training. Poorly labeled data will lead to poor results which is a substantial issue. Obscure accountability in the use of AI systems is another concern as to who will be held responsible for a patient who encounters unintentional consequences that may result from an error caused by the AI technology.[18]

Future directions include further development of AI based decision support systems, robotic assisted surgeries, and virtual reality technology in OMFS. AI will continue to assist the surgeon in the decision making process by providing information that would otherwise be difficult to gather and compare.[19] The role of the surgeon is not threatened in the short term, but we must make an effort to interpret the suggestions that arise from AI.[20]

Conclusion: Use of AI should be viewed as an adjunct to assist surgeons. Taking into consideration the current limitations, developing the AI model can assist surgeons in decision making and provide an additional tool for future diagnosis and treatment planning in Oral and Maxillofacial surgeries. It is crucial to ensure that AI is integrated in a safe and controlled manner. Identifying the study gaps will require more clinical research with use of AI by incorporating larger sample sizes, cross-validation, and inter-model comparisons.

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Role of Patient Specific Implant in Oral and Maxillofacial Surgery: A Review

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Abstract

Maxillofacial reconstructive surgeries of acquired or congenital defects in this era where the aesthetic concerns of patients are very high is considered as a challenge for any surgeon. Mode - rn alternatives for creating patient specific implants (PSIs) with increased accuracy have given a fresh and improved outlook in many maxillofacial defects like reconstruction of TMJ, orbital floor, orthognathic or mandibular defects. The purpose of this review is to present a comprehensive summary of the existing scientific knowledge of PSI and describe its current and future applications in maxillofacial surgery.

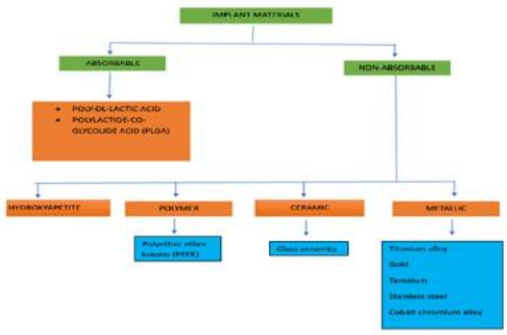
Keywords: Patient Specific Implant, Oral and Maxillofacial Surgery, PEEK.

Introduction

Even the most skilled surgeon may find reconstructive surgery to be quite difficult because of the intricate anatomy, delicate systems involved, and individuality of each lesion. And in order to improve the outcome of patient, it is imperative to restore the defect in the best possible way along with improving the amount of time needed for the surgical process. [1] In such cases, a patient specific implant (PSI) that is made to fit precisely into the anatomical abnormalities or anomalies may be an effective option. In the field of medicine, the necessity to create PSI has led to numerous breakthroughs and technical advancements. [2] In this review article, we aim to provide a comprehensive overview of the diverse applic -ations of PSI in OMFS by analyzing recent advancements, challenges, and future prospects.

Material Used

Over the past years, a variety of implant materials have been refined to restore damaged soft and hard tissue structures for PSI. The ideal implant material that is to be used should be radiolucent, biocompatible with tissues, lightweight, and have features that make it easy to modify. The morbidity donor site is one of the drawbacks associated with the use of autologous grafts, although this is not an issue because these materials are plentiful. These implants have been largely discussed in the flowchart mentioned below: (Flowchart 1)[3]



(Flowchart 1)

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PDLLA and PLGA are two absorbable polymers that are frequently used in paediatric craniofacial surgeries. However, it is possible for foreign body reactions to arise after implant therapy, and reports of material breakage have also been made in few situations.

In order to facilitate bone tissue engineering, hydroxyapatite (HA) has been used as a biocompatible scaffold. They have a significant capacity to cling to the bone and soft tissues, and they are non-resorbable and osteo conductive by nature.

Due to their desirable properties, such as higher mechanical strength and better resistance to friction, metallic implants have been widely used for both permanent and temporary prosthesis, such as dental implants or screws. However, because of their high strength and elastic modulus, which are not comparable to normal human bone, they create a stress shielding effect that causes the prosthesis to loosen.[4]

The least harmful materials are ceramics, which also mix quite well with bodily tissues. However, they are not appropriate for load bearing applications due to their decreased ductility and fracture toughness, as well as their higher elasticity modulus and brittleness. [5]

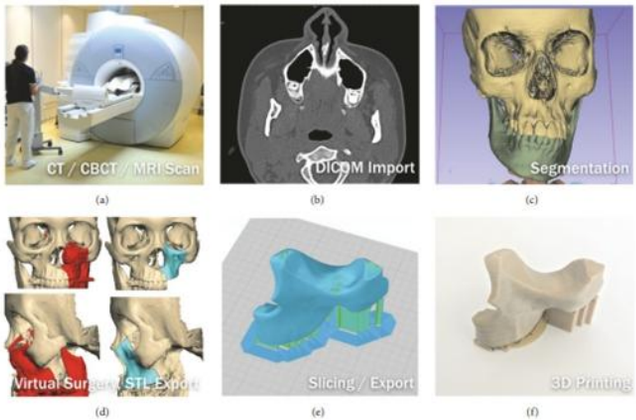
Polyether ether ketone (PEEK) has become a promising alloplastic material that could be employed as a workable substitute in the creation of patient-specific implants (PSI) due to recent developments in technology and material production. It is renowned for having a lower infection rate, increased resilience, and endurance to changes in the environment. Numerous researches on PEEK utilization have been done, detailing the benefits and the difficulties encountered when utilizing PEEK prostheses. [6]

To over these problems Porous polyethylene (PPE) and ultra-high molecular weight polyethylene (UHMW-PE) are two types of polyethylene that are used in the treatment of orbital deformities and facial development. PPE is easy to model, long-lasting, and allows for tissue ingrowth through its pores. However, there is a probability that infection will happen. Because of its solid structure, UHMW-PE is used to fabricate PSIs utilising CAD-CAM technology for the rehabilitation of temporomandibular or orbital joints. When compared to PPE, UHMW-PE is said to have a reduced incidence of infection rate. [7]

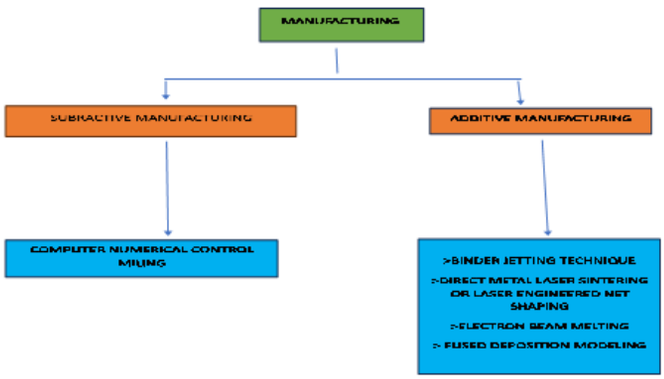
Work Flow

Using computed tomography/magnetic resonance imaging (MRI) 2D image data as digital imaging and communications in medicine (DICOM) files, the manufacturing process starts with the image acquisition. Since a 3D printer cannot interpret DICOM images, these DICOM files are then ready to be used with software (3D Doctor, MIMICS) to create a 3D model of the anatomical abnormality. For the 3D printer to interpret the DICOM images, they must be converted to a Surface file (STL file). The necessary software programmes for generating STL files and processing DICOM data are: (Figure 1)[1]

- Mimics Innovation Suite- paid
- Vitrea- Open Source
- Osirix- Open source
- Mesh Mixer- Open source



(Figure 1)



(Flowchart 2)

Manufacturing Techniques

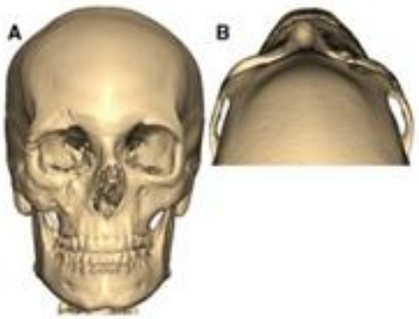
Manufacturing of this data in 3D shape for it to come to life can be done in following ways (Flowchart 2).

Previously, these patient-specific implants were made by subtractive manufacturing, in which material was cut into the desired shape by slicing off sections. Nevertheless, it was observed that a significant amount of material was wasted and that computer numerical control (CNC) could not accurately recreate complex anatomical structures. This made it possible to produce implants tailored to each patient through additive manufacturing, also referred to as rapid prototyping or 3D printing. In addition to overcoming subtractive manufacturing's drawbacks, this sped up the creation of these patient-specific implants. Using digitally controlled and operated material laying tools, AM builds a model from the ground up and deposits the material layer by layer. Layer-by-layer construction gives manufacturers of complicated products an unprecedented degree of flexibility. [8]

Mirroring

For craniofacial surgeons, exact symmetric repair of maxillofacial abnormalities is still an unresolved issue in the great majority of instances. The optimal prosthesis for reestablishing facial symmetry can now be created by preoperatively

"mirroring" the surgery using the healthy side as a template, thanks to the advancement of computational technologies in recent years.(Figure 2,3)



(Figure2)

Figure 3)

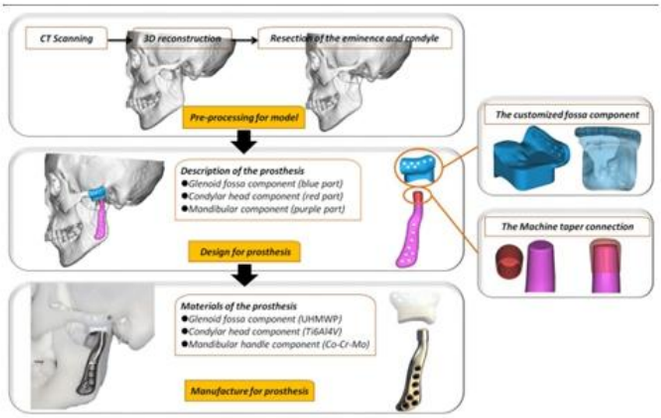
a. volumetric region of interest performed on three-dimensional (3D) images.
b. Digital template on the noninjured side (gray) superimposed
c& d. Face and axial view of the final CT resulting insymmetric positioning of the bone. [9]

Discussion

The current manufacturing process for implants customized for each patient takes several days to finish. It is anticipated that the production time for fabricating these implants will decrease and become more cost-effective with the introduction of newer 3D printing technology. Currently, a number of oral and maxillofacial surgery specialties, such as orthognathic surgery, maxillofacial skeleton reconstruction, and temporomandibular joint (TMJ) complete joint replacement, use PSIs. [10]

PSI as TMJ Joint Replacement

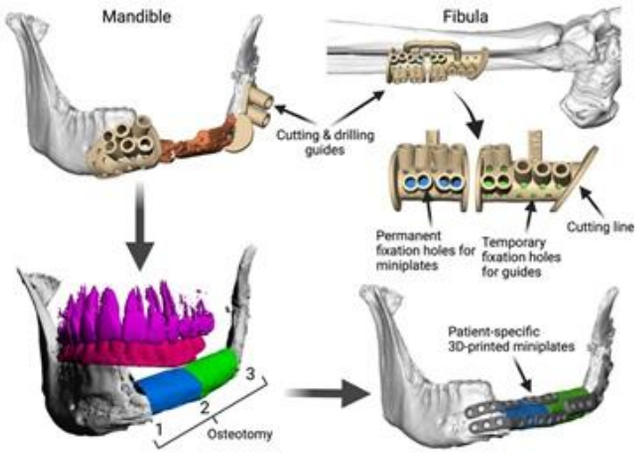
Temporomandibular joint (TMJ) is often affected by a wide spectrum of disorders, including extra articular and intra articular pathologies. These have to be treated by simultaneously removing the lesion and joint together, with primary joint reconstruction to restore its anatomic structure and function as much as possible. Total TMJ prosthesis is an effective and reliable method of joint reconstruction. Total allo plastic TMJ prosthesis is one of the effective and efficient methods of joint reconstruction, However, there is still an urgent need to design a new TMJ prosthesis because of no commercially available TMJ prosthesis appropriate for the clinical application.(Figure 4)[11]



(Figure 4)

Reconstruction of Maxillofacial Skeleton

Technically possible, highly accurate, and linked to low rates of plate related complications and a strong likelihood of bone heal - ing in the osteotomy gaps, fibula free flap fixation using patient-specific 3D-printed mini plates is a viable choice. (Figure 5)



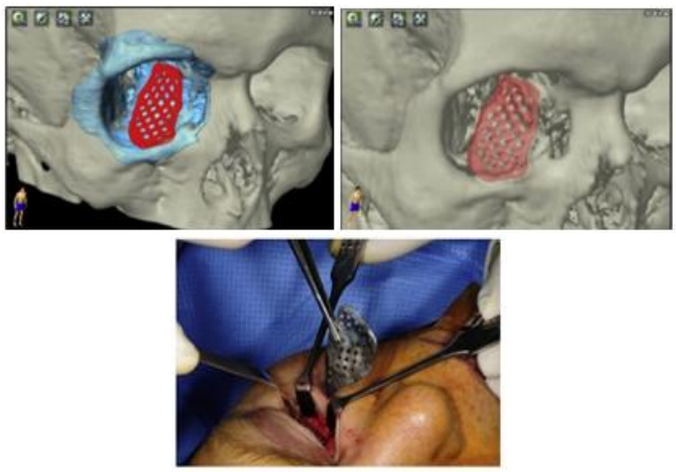
(Figure 5)

Workflow demonstration for CAD/CAM: Cutting and drilling guides positioned at the fibula segments (green and blue) and the mandible defect (orange). Both permanent and temporary holes are provided in the guides for the purpose of fixing miniplates. Bottom left: Dental setup of the lower dentition (pink) and visualisation of the upper jaw dentition (violet) for the purpose of implant insertion planning. Also displayed are osteotomy lines 1, 2, and 3. The bottom right corner displays the final reconstructive outcomes using 3D-printed miniplates customised for each patient. [12]

PSI in Reconstruction of Orbital Floor and Wall Fractures

With PSIs, ocular fractures can be precisely reconstructed thanks to a comprehensive digital workflow. Transferring the coordinate system from the planning programme to the production software is a prerequisite for the digital process in order to prevent the virtual implant from being placed incorrectly and laboriously. Despite the fact that PSI are dimensionally more

stable than manually bent titanium implants, a circumferential cushion is nevertheless advised. Moreover, PSI rigidity inhibits implant deformation during implantation.(Figure 6)[13,14]



(Figure 6)

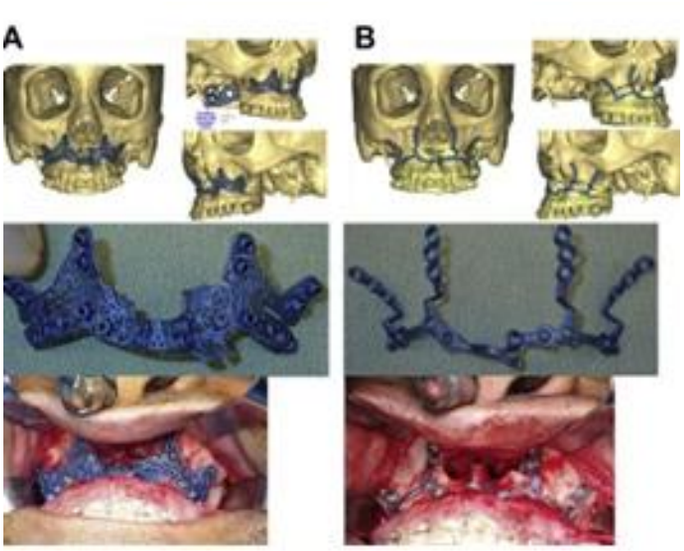
PSI in Treatment of Mandibular Fractures

Oral and maxillofacial surgeons treat maxillofacial injuries most frequently. Owing to its elasticity like bone, PEEK could be a good substitute material. The use of (PEEK) material for cranio maxillofacial reconstructions has gained recognition in recent years. At six months, follow-up radiological and clinical findings from the fixation of a mandibular fracture with a specially designed PEEK plate are satisfactory.(Figure 7)[15]

(Figure 7)

PSI in Orthognathic Surgery

The development of CAD/CAM technology and 3D imaging has completely changed orthognathic surgery. The potential mistakes resulting from autorotation of the mandible were removed by this procedure; however, the final maxillary position was fixed using the more traditional method of intraoperative plate bending, which is technique-sensitive and prone to error. For correction of this plates are first planned, then the holes are prepared and the final PSI plate is inserted after a post-guided osteotomy (Figure 8)[10]



(Figure 8)

Conclusion

Oral and maxillofacial surgery's response to personalised medicine is patient-specific implants. When compared to manually bent titanium mesh implants, PSIs are a more accurate and straightforward reconstruction option. Automation makes it possible to implement time and safety efficient daily procedures; as such, its use ought to be promoted. Any surgeon can readily plan an implant; it doesn't require specialised knowledge of certain software. The World Health Organisation has previously said that by 2020, PSIs should be a major part of daily activities and should eventually replace conventional implants. This industry will continue to develop as a result of advancements in CAD/CAM technology and falling costs, which will enhance accuracy, efficiency, and overall results.

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The Hidden Curve: A Morphological Mystery of Radix Entomolaris

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Abstract

Radix entomolaris (RE) is an anatomical variation characterized by the presence of an additional distolingual root in mandibular molars, most commonly the first molar. This supernumerary root presents significant clinical implications in endodontic diagnosis, treatment planning, and execution. Failure to recognize and manage this anatomical variation can lead to incomplete debridement, persistent infection and eventual treatment failure. The prevalence of RE varies among different populations and ethnic groups, necessitating careful radiographic examination and where necessary, advanced imaging techniques such as cone beam computed tomography (CBCT) for accurate detection. Clinicians must be aware of the root canal configuration anomalies associated with RE and adapt access cavity design and instrumentation techniques accordingly to enhance a successful treatment outcomes. This article presents a case report of mandibular first molar with extra root that was successfully treated using appropriate access cavity, instrument and techniques.

Keywords: Radix entomolaris, mandibular molars, anatomical variation, extra root, endodontic treatment, root canal morphology.

Introduction

Radix entomolaris (RE) refers to a dental morphological variation in which an additional third root, most commonly distolingual, occurs in mandibular molars especially the mandibular first molar[1]. The term "radix entomolaris" distinguishes this feature from radix paramolaris, which appears mesiobuccally [2]. The recognition of RE is crucial in endodontics, as undetected canals may result in incomplete cleaning, shaping, and obturation, thereby compromising treatment success [3].

The additional root often exhibits a small diameter, sharp curvature, and eccentric location, complicating detection on routine radiographs[4]. Failure to identify and treat RE can lead to procedural errors and poor prognosis [5]. Therefore, the use of advanced diagnostic tools such as angled radiographs and CBCT is recommended[6].

Epidemiological data reveal significant ethnic variation in RE prevalence. Mongoloid populations such as Chinese, Eskimos, and Native Americans show prevalence rates of 5–30%[7], while Caucasian populations report 0.2–4.2%[8]. Indian studies reveal incidence rates between 2.19–13.3%[9]. The etiology is linked to genetic and developmental factors, including disturbances in Hertwig's epithelial root sheath[10,11].

Classification systems by De Moor (Type I–III) and Carlsen & Alexandersen (Types A, B, C, AC) provide morphological categorization for clinical reference[1,2]. Modern magnification, ultrasonic instrumentation, and three dimensional imaging have enhanced detection and treatment[12].

Case Report

A 32 year old female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of severe pain in the right lower back tooth region since last three days. The pain was intermittent in nature and aggravated on taking hot food and beverages.

Examination

On clinical evaluation, it was seen that there was deep disto-occlusal caries in lower right mandibular first molar tooth. The tooth was hypersensitive to both hot and cold stimuli and was tender on percussion, although no pathologic mobility was observed.

Radiographically, revealed the presence of deep caries involving the pulp, widening of periodontal ligament space, loss of lamina

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dura and presence of an unusual root morphology (Fig. 1). Another radiographs were taken at 20° mesial and distal angulation to confirm the presence of additional root on the distolingual aspect(R.E).

Diagnosis was established as Symptomatic irreversible pulpitis irt [46]. Non-surgical endodontic therapy was treatment planned and patient consent was obtained.

Procedures

Local anesthesia was given.Rubber dam isolation was done.(Fig.2)

The pulp chamber was accessed and two mesial canal orifices and one distal canal orifice present eccentrically towards the buccal aspect of the tooth were initially located. The shape of the access cavity was modified from triangular to a trapezoidal form and following the laws of orifice location, another orifice was located on the distolingual side (Fig-3)

DG-16 endodontic explorer was used to locate the root canal orifices and 15 # K-file (Dentsply, Switzerland) was used to establish patency of the canals. Working length was determined using apex locator (woodpecker) and reconfirmed radiographically. (Fig-4) Biomechanical preparation was done with rotary ProTaper Next (Dentsply, Switzerland) file system. During instrumentation, 5.25% sodium hypochlorite solution was used as an irrigant and 17% EDTA solution was used as final flush.

Master gutta-percha points was placed and obturation was performed using cold lateral condensation technique with AH Plus sealer (Fig. 5). Restoration of access cavity was done with composite resin (tetric-N-ceram, ivoclar vivadent) and a post-obturation radiograph was taken.(Fig-6)

Fig-1. Showing Pre-Operative Radiograph (R.V.G)

Fig-2. Rubber dam isolation was done.

Fig-3.Access cavity preparation was done in relation to 46

Fig-4.Working length determination was done(R.V.G)

Fig-5. Master Gutta-Percha cones (R.V.G)

Fig-6. Post-obturation RVG confirmed presence of an additional disto-lingual root

Discussion

RE can occur in first, second, and third molars, with bilateral occurrence reported in 37–67% of cases[13]. Gender and side predilection remain inconclusive. The success of endodontic treatment depends on accurate diagnosis, thorough chemo-mechanical preparation, and complete obturation.

A prevalence of <5% in Indian populations means RE is often overlooked. Etiological theories suggest genetic predisposition or developmental disturbances. At least two angled radiographs, along with careful clinical inspection, are recommended for detection of missed canal and additional root. Modified trapezoidal access cavity help in locating the canal orifice.

Identification of missed canal can be aided by the law of symmetry, dentinal map visualization, methylene blue staining and champagne bubble test. Since RE canals often have severe curvatures, initial exploration should be with small files (size 10 or less) followed by glide path creation to avoid procedural errors[14].

Diagnosis & Clinical Approach

Indicators of RE include unclear root outline on radiographs, distolingual cervical convexity, and prominent distolingual lobe. Preoperative periapical radiographs with varied angulations are essential. CBCT provides superior three dimensional visualization. Magnification aids, angled probes (DG-16), and micro-openers assist in orifice location. Severe curvature necessitates flexible NiTi rotary instruments to maintain canal shape[15].

Conclusion

Radix entomolaris is a clinically significant anatomical variation, particularly in mandibular first molars. Its detection and management are essential for avoiding missed canals and treatment failure. Advanced diagnostic tools, classification awareness and modified clinical approaches increase the likelihood of endodontic success.

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Review Article for Different Smile Variables in Different Skeletal Growth Patterns

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Abstract

Background: Smile esthetics play a significant role in orthodontic diagnosis and treatment planning. Skeletal growth patterns i.e., horizontal, average, and vertical are associated with soft tissue balance, lip posture, dental and gingival display, and overall smile dynamics.

Objective: This review aimed to systematically assess the influence of skeletal growth patterns on different smile variables, including lip length and thickness, incisor display, interlabial gap, intercommissural widths, buccal corridor, smile arc, lip line, red ratio, smile index, gummy smile, and commissural height.

Methods: A comprehensive literature search was done in Google Scholar for studies published between January 2000 and June 2025. Keywords included "smile analysis," "smile variables," "skeletal growth pattern," "vertical growers," "horizontal growers," and "orthodontics." Eligible studies included original research with quantitative or qualitative assessment of smile variables, with subjects classified as horizontal, average, or vertical growers using cephalometric or photographic methods. Case reports, narrative reviews, and studies with incomplete skeletal classification were excluded. Data extraction included study design, sample size, classification method, and smile parameters assessed.

Results: A total of 30 studies were included. Vertical skeletal patterns were consistently associated with increased maxillary incisor display, gummy smile prevalence, larger interlabial gap, and exaggerated smile arcs. Horizontal patterns showed reduced gingival display, flatter smile arcs, and limited vertical mobility. Average skeletal patterns generally demonstrated balanced smile esthetics and served as the reference group. Inconsistent findings were observed for lip thickness and buccal corridors.

Conclusion: Smile variables demonstrate distinct associations with skeletal growth patterns. Vertical and horizontal growers often exhibit deviations from balanced esthetics that may necessitate customized orthodontic or surgical interventions. Comprehensive smile analysis, integrating static and dynamic imaging with skeletal evaluation, should be an essential component of orthodontic diagnosis and treatment planning.

Keywords: Smile Variables, Skeletal Patterns, Orthodontics, Smile Analysis.

Introduction

The smile is one of the most expressive facial gestures and plays a central role in facial aesthetics, social interaction, and perceived attractiveness[1]. Genuine, spontaneous (Duchenne) smiles are associated with positive emotions and are distinguished by the activation of specific facial muscles[2]. It has been seen that different cultural and social factors influence how smiles are interpreted across societies[3]. In orthodontics, although traditional focus was placed on achieving ideal occlusion and dental alignment, patients usually seek treatment to improve the appearance of their smile[4]. This shift in patient expectations has led to greater emphasis on smile analysis and smile design as essential components of orthodontic diagnosis and treatment planning[5].

Musculature plays a decisive role in shaping the dynamics of the smile across different skeletal growth patterns. Studies of masticatory muscles have shown that subjects with vertical (dolichofacial) facial patterns exhibit significantly reduced EMG activity in masseter and anterior temporalis both at rest and during maximal clenching compared to horizontal (brachyfacial) subjects, who show substantially higher activity6. Furthermore, measurements of resting vertical dimension (EMGRVD) are higher in dolichofacial individuals than in brachyfacial ones, indicating a posture of

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muscle elongation and possibly lower tonic contraction [7]. While direct EMG studies of smile muscles such as the zygomaticus major, orbicularis oris, or levator labii superioris across growth patterns are limited, recent work has demonstrated that these muscles display distinct activation amplitudes during different facial expressions in healthy adults[8]; and high resolution facial EMG mapping confirms reproducible patterns of perioral muscle recruitment during smiles (smile tasks) among individuals. Taken together, these findings support the model that in horizontal growers, perioral muscles (e.g. zygomaticus, orbicularis oris) function with greater efficiency and strength, whereas in vertical growers these muscles are relatively weaker, elongated, or less tonically active, leading to differences in lip competence, gingival display, and smile arc.

A number of parameters including the smile arc[9], smile line, dental and gingival display, buccal corridors[10], lip line, and symmetry have been identified as key determinants of an attractive smile. Researchers such as Hulsey[11] and Sarver[12] highlighted that incisor display, lip positioning, and the curvature of the incisal edges relative to the lower lip are fundamental features of smile esthetics. With advances in cephalometric and photographic analyses, orthodontics has moved towards a soft tissue oriented approach[13]. Importantly, skeletal growth patterns significantly influence smile variables, making it essential to adapt treatment goals according to individual growth patterns to achieve optimal esthetic outcomes[14]. Smile analysis encompasses a range of dental and soft tissue parameters that collectively determine esthetics.

Influence of Skeletal Patterns on Smile Variables

1. **Horizontal Skeletal Pattern (Hypodivergent)**

Individuals with a horizontal skeletal pattern typically exhibit reduced lower facial height and a relatively strong mandibular plane. Smile characteristics in this group often include minimal gingival display and a flatter smile arc. While smiles may appear broad, they generally demonstrate limited vertical dynamism. Additionally, upper lip thickness is often reduced due to the forward positioning of the mandible, which can influence the amount of incisor exposure during smiling.

2. **Average Skeletal Pattern (Normodivergent)**

Subjects with an average skeletal pattern present balanced vertical and sagittal facial proportions. Their smile variables tend to be harmonious, with consonant smile arcs and dental and gingival display falling within esthetic norms. Consequently, this group is frequently regarded as the reference standard in comparative studies of smile characteristics.

3. **Vertical Skeletal Pattern (Hyperdivergent)**

Vertical skeletal patterns are associated with increased lower facial height, a steep mandibular plane, and a tendency toward open bite. Individuals in this group often display greater maxillary incisor exposure, a higher prevalence of gummy smiles, and increased lip mobility and commissural height. While the smile arc is typically consonant, it is frequently exaggerated due to vertical disproportions, which can pose challenges for esthetic management in orthodontic treatment.

Materials and Methods

Skeletal Pattern Assessment

Skeletal growth patterns in the included studies were identified using established cephalometric and anthropometric techniques. Subjects were categorized as horizontal (hypodivergent), average (normodivergent), or vertical (hyperdivergent) based on lateral cephalometric measurements such as the mandibular plane angle (SN-GoGn), Frankfort mandibular plane angle (FMA), lower anterior facial height, and facial height ratios[15]. Additionally, some studies employed three dimensional imaging or facial indices to assess vertical and sagittal skeletal relationships. These methods provided a standardized approach for classifying participants, enabling systematic comparison of smile variables across different skeletal patterns. This framework facilitated the evaluation of deviations from balanced or aesthetically ideal smiles in relation to underlying skeletal morphology.

Smile Photography Protocol

Accurate smile analysis requires standardized photographic documentation to ensure reproducibility and reliability of measurements. Still photographs should be taken with the patient in a natural head position, lips at rest, and during a full smile. Frontal and lateral views are typically captured, with a consistent camera to patient distance and proper lighting to minimize distortion. High resolution images allow precise assessment of smile variables such as incisor display, lip lengths and thicknesses, intercommissural widths, buccal corridors, and gingival exposure.

Dynamic photographs or video recordings complement static images by capturing the smile in motion, providing information on lip mobility, smile arc progression, and soft tissue dynamics. Patients are instructed to perform a natural smile, and multiple recordings may be taken to ensure consistent and representative expressions. Integration of both still and dynamic imaging offers a comprehensive evaluation, combining quantitative measurements from static images with functional insights from motion analysis. This dual approach enhances diagnostic accuracy and informs treatment planning aimed at achieving optimal smile aesthetics and soft tissue balance.

The variables commonly assessed in orthodontic research and clinical practice include:

Upper lip length (at rest and during smiling)[16]: Vertical measurement from the subnasale to the stomion superius, both in rest and in smile position. Variations influence incisor and gingival exposure.

Lower lip length (at rest and during smiling): Vertical distance from the stomion inferius to the soft tissue menton. Alterations affect smile harmony and lip competence.

Upper lip thickness: Measured at the vermillion border or midline, influencing dental and gingival display during smiling.

Lower lip thickness: Impacts lip posture, contact with incisors, and the overall smile profile.

Incisor display (maxillary and mandibular): The amount of incisor crown visible during smiling, which is a critical determinant of attractiveness and youthfulness.

Interlabial gap: Vertical distance between the upper and lower lips during smiling, reflecting lip mobility.

Outer intercommissural width (at rest and during smiling): The horizontal distance between lip commissures, indicating the breadth of the smile.

Inner intercommissural width: The space between the inner vermilion borders of the lips, contributing to dental display assessment.

Buccal corridor: Negative space between the buccal surfaces of posterior teeth and the corners of the mouth; excessive corridors can reduce smile fullness.

Smile arc[17]: The relationship between the curvature of the maxillary incisal edges and the contour of the lower lip. A consonant smile arc is generally perceived as more esthetic.

Lip line[18]: The vertical position of the upper lip relative to the teeth and gingiva, classified as high, average, or low.

Red ratio[19]**:** The proportion of vermilion height of the upper lip to that of the lower lip, which influences smile balance.

Smile index[20]**:** Ratio of intercommissural width to the interlabial gap, used to quantify smile proportions.

Gummy smile[21]**:** Excessive gingival display (>2 mm) during smiling, often associated with vertical skeletal patterns.

Commissural height[22]**:** Vertical difference between the commissures, affecting symmetry and esthetics.

Together, these variables offer a thorough approach to evaluating the smile, enabling clinicians to recognize variations, associate them with underlying skeletal patterns, and plan orthodontic or surgical treatments more effectively.

Databases or Search Engines Used

A comprehensive literature search was conducted using Google Scholar to identify studies evaluating smile variables in relation to skeletal growth patterns. The search included publications from January 2000 to June 2025 and employed keywords such as "smile analysis," "smile variables," "upper lip length," "lower lip length," "incisor display," "buccal corridor," "smile arc," "gummy smile," "skeletal patterns," "hypodivergent," and "hyperdivergent." Only studies involving human subjects were considered. Duplicate records and studies lacking quantitative or qualitative data on smile variables were excluded. Relevant studies were screened, and data were extracted regarding study design, sample characteristics, skeletal classification, smile variables assessed, measurement methods, and key findings.

Inclusion and Exclusion Criteria

Inclusion criteria: Original research studies reporting quantitative or qualitative assessment of smile variables, studies classifying subjects according to skeletal patterns (horizontal, average, vertical), and studies using standardized measurement techniques such as photographic analysis, cephalometry, or 3D imaging.

Exclusion criteria: Case reports, narrative reviews (except for background information), and studies with incomplete or unclear data regarding smile variables or skeletal classification.

Data Extraction

For each included study, information was systematically collected on study design, sample characteristics (including size, age, and demographics), method of skeletal classification, and the specific smile variables evaluated such as upper and lower lip length and thickness, maxillary and mandibular incisor display, interlabial gap, inner and outer intercommissural widths, buccal corridor, smile arc, lip line, red ratio, smile index, gummy smile, and commissural height. Details regarding measurement techniques and principal findings were also recorded to facilitate comparative analysis.

Data Synthesis

The review was performed using a narrative approach, summarizing and interpreting trends in smile variables across different skeletal growth patterns. Variables were examined in relation to horizontal (hypodivergent), average (normodivergent), and vertical (hyperdivergent) skeletal types, with particular focus on deviations from a balanced or aesthetically ideal smile. The synthesized findings were used to discuss clinical relevance and guide orthodontic assessment and treatment planning.

Discussion

Vertical growth pattern is generally associated with longer and thinner lips, greater incisal display, larger interlabial gap, narrower intercommissural width, more frequent gummy smiles, and consonant smile arcs.

Horizontal growth pattern tends to show shorter but thicker lips, smaller interlabial gap, wider intercommissural width, and flatter smile arcs.

Average growth pattern usually falls in between, with some variables (lip thickness, intercommissural width) being consis-tently thinner or smaller compared to vertical and horizontal extremes.

Smile Variable	Vertical Growth Pattern	Horizontal Growth Pattern	Average Growth Pattern
Upper lip length (rest & smiling)	↑ Increased (Siddiqui[23], Grover[24], Senthilkumar[25], Feres[26], Ahmed[27], Liang[28]) ↓ Shorter (Bhavsar[29], Demir[30], Bhadusha Sj[31])	↓ Shorter (Bhavsar[29], Demir[30], Bhadusha Sj[31])	–
Lower lip length (rest & smiling)	↑ Increased (Siddiqui[23], Grover[24], Ahmed[27] Feres[26]) ↓ Shorter (Bhavsar[29], Singh S[32])	↓ Shorter (Bhavsar[29], Singh S[32])	–
Upper lip thickness	↓ Thinner (Ashraf[24]: high angle cases thinner; Grover[24]: thicker in vertical & horizontal vs average; Feres[26], Senthilkumar[25]: NS)	↑ Thicker (Ashraf[23]: low angle cases thicker; Grover[24]: thicker in horizontal & vertical vs average)	↓ Thinner (Grover[24]: thinner than vertical & horizontal)
Lower lip thickness	↓ Thinner (Ashraf[83]: high angle cases thinner; Grover[24]: same trend; Feres[26])	↑ Thicker (Ashraf[83]: low angle thicker; Grover[24]: horizontal > average)	↓ Thinner (Senthilkumar[25]: average < vertical & horizontal)
Incisal display	↑ Increased (Jeelani[34], Singh S[32], Senthilkumar[25], Grover[24], Ahmed27, Bhavsar[29], Siddiqui23)	–	McNamara[35]: no sig. difference
Interlabial gap	Mixed: ↑ or NS (Ahmed[27], Grover[24], Siddiqui[23]; consistent; Bhavsar[29]: greater in average; Ahmed[27]: ↓ in low angle)	↓ (Ahmed[27]: low angle ↓)	↑ Greater in average (Bhavsar[29])
Intercommissural width	↓ Lower (Ahmed[27], Singh S[32], Jeelani[34], Grover[24], Siddiqui[23]: higher in low angle)	↑ Higher (Ahmed[27], Singh S[32], Jeelani[34], Grover[24], Siddiqui[23])	NS (Senthilkumar[25], El bialy[36])
Buccal corridor	NS (M. Alhakeem[37], Senthilkumar[25], Sarver & Ackerman[38], McNamara[36], Bhavsar[29])	NS (same studies)	NS
Gummy smile	↑ More frequent (Beltran[39], Sarver[38])	–	–
Smile arc	↑ Consonant arc more common (Siddiqui[23])	↑ Flat arc more common (Siddiqui[23])	–

Table 1- Smile variables in different Growth Patterns

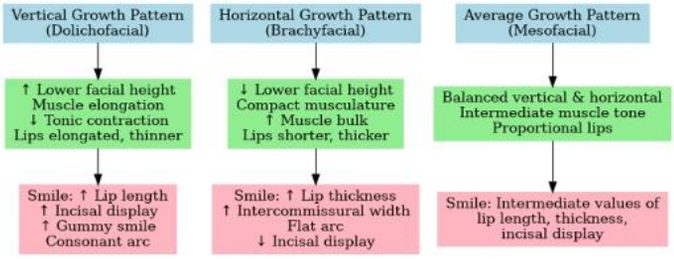

Table 2- Flowchart describing how skeletal patterns affect smile variables.

Conclusion

Smile variables are closely associated with skeletal growth patterns, with horizontal, average, and vertical patterns demonstrating distinct characteristics in lip dynamics, incisor display, smile arc, and gingival exposure. Average skeletal patterns generally reflect a balanced, harmonious smile, while vertical and horizontal patterns show deviations that may require tailored orthodontic or surgical interventions. Comprehensive evaluation using both static and dynamic imaging, coupled with an understanding of skeletal morphology, is essential for achieving optimal aesthetic and functional outcomes. Further research incorporating standardized methodologies, diverse populations, and advanced imaging technologies will strengthen evidence based approaches for smile analysis and treatment planning.

Limitations

Several limitations exist in the current literature on smile variables and their association with skeletal patterns. Many studies rely predominantly on two dimensional photographs or cephalometric analyses, which may not fully capture the dynamic and three dimensional aspects of the smile. Variations in measurement techniques and definitions of smile variables across studies further limit the comparability of findings. Additionally, sample sizes are often small, and study populations lack diversity in terms of ethnicity, age, and cultural background, restricting the generalizability of results. Longitudinal data assessing the effects of orthodontic or orthognathic interventions on smile aesthetics are limited. Finally, patient reported outcomes and subjective perceptions of smile attractiveness are underrepresented, making it difficult to correlate objective measurements with patient satisfaction and esthetic perception.

Future Research Directions

Despite considerable progress in understanding smile variables across skeletal patterns, several areas warrant further investigation. Dynamic smile analysis using three dimensional imaging and motion capture is needed to capture the natural variability and progression of smiles, which static photographs cannot fully represent. Standardized measurement protocols for variables such as incisor display, lip lengths and thicknesses, buccal corridors, commissural height, and smile arc are essential to improve consistency and comparability across studies. Longitudinal research tracking changes before, during, and after orthodontic or orthognathic interventions will clarify the long-term impact of skeletal and dental modifications on smile aesthetics. Additionally, studies integrating skeletal, dental, and soft tissue parameters, as well as diverse populations and age groups, are necessary to establish normative data and account for ethnic and cultural variations in smile perception. Finally, incorporating patient-reported outcomes and leveraging emerging technologies such as artificial intelligence and facial recognition software could enhance predictive accuracy and optimize individualized treatment planning.

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The Laboratory Authorization form for Implant Prostheses: A Critical Tool in Restorative Dentistry

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Abstract

The laboratory authorization form (LAF) serves as a legal, communicative, and technical bridge between the dental clinician and the dental technician, ensuring the successful execution of prosthodontic and implant supported restorations. In implant dentistry, where restorative precision, biological compatibility, esthetics, and mechanical performance converge, a comprehensive and well-structured authorization form is not merely administrative it is a clinical necessity. This review article aims to explore and critically analyze the essential components of the lab authorization form for implant prostheses, emphasizing its role in achieving optimal patient outcomes, minimizing errors, enhancing communication, and ensuring traceability. Furthermore, recommendations are made to improve and standardize such forms in modern dental practice.

Introduction

Implant prosthodontics has evolved into a highly sophisticated discipline, merging digital technologies with bio mimetic restorative principles. Amidst this complexity, the Laboratory Authorization Form (LAF) plays a pivotal role in transforming the clinical prescription into a functional and esthetic dental prosthesis.[1,2]

The LAF not only directs the technician rega -rding prosthetic design but also documents legal accountability, treatment planning details, materials requested, and laboratory expectations.[3] Failure to fill out the form accurately may result in prosthesis misfit, esthetic compromise, delays in delivery, and compromised patient satisfaction.[4]

Clinical Significance of the Lab Autho - rization Form

- Communication tool: It fosters mutual under standing between dentist and tech nician, promoting seamless delegation of respon- sibilities[5].
- Legal document: It serves as a written re- cord of clinical instructions and specifica- tions, legally binding in case of disputes.
- Clinical accuracy: Ensures translation of diagnostic and esthetic information into laboratory processes.[6]
- Quality control: Enables tracking, consis tency, and standardization in prosthesis fabrication.[7]

Core Components of an Ideal Lab Authorization Form for Implant Prostheses

1. Patient and Administrative Information

- Dentist's details: Name, address, regis - tration number.
- Patient's identification: Full name, age, gender.
- Case/job card number: For tracking.
- Teeth number: Marked using FDI or Universal system.
- This section ensures unambiguous case identification and streamlines communica- tion.[8]

2. Implant Site and Surgical Information

The accurate documentation of implant site and surgical details is crucial for the precise fabrication of implant-supported prostheses. This section of the lab author - ization form provides the foundational information upon which the entire restorative plan is constructed. A detailed and well documented implant site entry ensures that the laboratory technician understands the anato mical, functional, and prosthetic parameters of the clinical situation, minimizing the risk of mismatch or miscommunication.

a. Implant Position and Indication

The precise arch location (maxillary or mandibular, anterior or posterior, edentulous

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span or single tooth) should be indicated using the FDI (Federation Dentaire Internationale) or Universal numbering system. This helps in

- Identifying the exact site for prosthesis fabrication.
- Determining the type of prosthesis (single crown, bridge, full arch).
- Assessing the load-bearing requirements based on location (e.g., posterior implants require stronger materials and occlusal design).
- Facilitating alignment and contouring with the adjacent natural dentition for esthetics and function.
- Additionally, the clinical indication for implant placement (such as replacing a failing tooth, a previously extracted site, or supporting a fixed hybrid prosthesis) helps the technician understand the biological and functional expectations of the prosthesis.

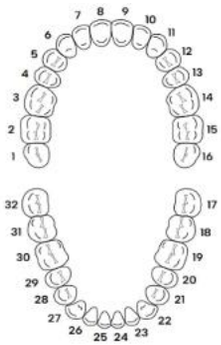


Figure 1: Implant position and indication

b. Surgical Approach Details

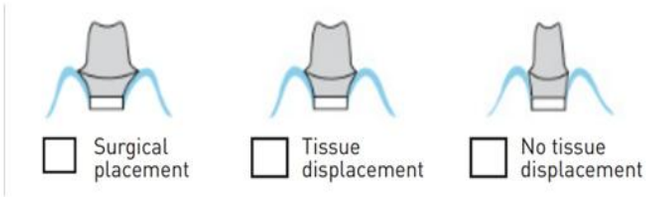
The surgical procedure directly affects soft tissue profiles, emergence contour, impression accuracy, and the final esthetic outcome.[9] Hence, the lab authorization form should include a clear description of the surgical approach, including:

Flap vs. Flapless Surgery

- Flap surgery
- Flapless surgery
- Flap surgery (with soft tissue reflection) is typically used when bone augmentation is required or for better visualization. It may lead to more soft tissue scarring and alterations in gingival contours.
- Flapless surgery (minimal invasive) preserves soft tissue integrity, but limits visibility. It generally results in better papilla preservation and esthetic outcomes, but requires precise preoperative planning (usually with CBCT-guided placement).[10]
- The laboratory should be informed of the method used, as it influences the expected gingival architecture and emergence profile of the prosthesis.[11]

Figure 2: Surgical approach a:Flap surgery b: Flapless surgery

Tissue Displacement vs. Non-Displacement



- Tissue displacement involves intentional manipulation of soft tissues during or after implant placement, such as in subepithelial connective tissue grafts or soft tissue sculpting with healing abutments. It is used to achieve optimal papillae formation or convexity in the buccal corridor.
- Non-displacement approaches maintain the natural soft tissue contours and are preferable in esthetic zones to preserve interdental papillae and gingival zeniths.

  The technician can use this information to customize the emergence profile and cervical contour of the prosthesis, ensuring natural blending with adjacent dentition.

Tissue Level / Bone Level Implant Placement

Bone level implant: Positioned at the alveolar crest, it allows for better esthetics and flexibility in prosthetic design, especially in cases with high esthetic demand.

Tissue level implant: Positioned above the bone with the smooth collar in the soft tissue, it simplifies restorative procedures and minimizes peri-implantitis risk due to reduced micro-gap exposure

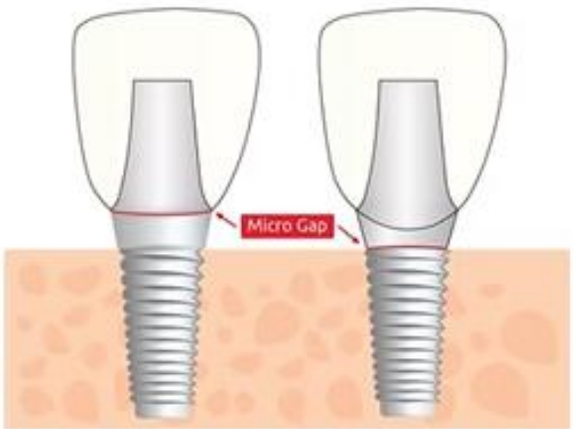


Figure 3: Bone and tissue level implant

Bone Grafting Details (if applicable)

- Guided bone regeneration
- Ridge augmentation
- Sinus lift
- Onlay graft
- The presence of guided bone regeneration (GBR), ridge augmentation, sinus lifts, or onlay grafts should be mentioned.[12] Such procedures may necessitate a staged loading protocol and influence the choice of abutment height, crown contour, and occlusal scheme.
- In cases of compromised or augmented ridges, the technician may need to adapt the prosthesis design to support soft tissues and avoid undue pressure on augmented zones.

3. Implant System and Platform Details

The implant system (e.g., Nobel Biocare, Straumann, BioHorizons, Zimmer, etc.) and the specific platform size and connection type (e.g., internal hex, conical connection, external hex, etc.) must be clearly specified.

- This information is vital for selecting the correct analog, abutment, scan body, and prosthetic components.
- Mismatched components may lead to improper fit, microleakage, or loss of preload, ultimately compromising osseointegration and long-term stability.[5,10]
- In a digital workflow, specifying the system ensures compatibility with the CAD libraries and virtual design protocols used by the lab.[6]

Failure to provide accurate implant platform and brand details can result in delays, remakes, and additional clinical appointments.

4. Prosthetic Details

Type of prosthesis, its mode of retention,the abutment selectionand other details each choice influences the functional longevity, retrievability, esthetic outcome, and maintenance of the restoration. [8,9]Clear documentation of these prosthetic preferences and clinical requirements is essential to guide the dental technician toward accurate fabrication and minimize adjustments during clinical delivery.

a. Type of Prosthesis

Figure 4: Type of prosthesis: fixed or removable or hybrid

The form must clearly specify whether the restoration is fixed or removable, and within those categories, the specific nature of the prosthesis:

Fixed Implant Prostheses

- Single crowns: Used for the replacement of individual teeth; requires precise alignment, emergence profile, and occlusal design.
- Implant-supported bridges (FPDs): Used when two or more implants support multiple missing teeth. Proper design of connectors, pontics, and occlusal load distribution is critical.
- Full-arch screw-retained prostheses (hybrid prostheses or All-on-4/All-on-6): Indicated in edentulous arches; involves multiple implants, often tilted posteriorly. Requires thorough planning of framework design, cantilever length, and occlusal scheme.

Removable Implant Prostheses

- Implant retained overdentures: Often supported by two to four implants with attachments like locators, bars, or ball abutments. These improve retention and stability but are removable by the patient.
- Implant-assisted partial dentures: Where implants provide support or retention to conventional partial dentures, improving function and reducing rotational movements.
- Each type of prosthesis entails different laboratory protocols, component selection, and framework design considerations. Therefore, specifying this clearly in the lab form ensures that both functional and esthetic expectations are met.

b. Retention Mechanism

The method by which the prosthesis is attached to the implant or abutment significantly affects retrievability, esthetics, and peri-

implant tissue health. There are three major retention types:

Cement-Retained Prosthesis

- Offers excellent esthetics due to the absence of visible screw access holes.
- Allows passive fit and easier compensation of minor angulation issues.
- However, retained cement can lead to peri-implantitis if not properly removed, especially subgingivally.
- Lab must be informed about margin depth and the type of cement preferred to allow for appropriate abutment contouring and restoration seating.[11]

Screw-Retained Prosthesis

- Preferred when retrievability is essential for maintenance, hygiene, or repair.
- Eliminates the risk of excess cement, improving peri-implant tissue health.
- Screw access hole must be strategically positioned (preferably on the occlusal or lingual surface) to preserve esthetics and function.
- May require angulated screw channel systems (ASC) when implants are not ideally placed.
- Laboratories must ensure precise torque values, material strength around access channels, and esthetic masking of the access hole.[3]

SCRP (Screw-Cement Retained Prosthesis)

- A hybrid approach that combines the advantages of both cement- and screw-retained designs.
- Typically involves cementation of the crown on a custom abutment outside the oral cavity, followed by screw insertion into the implant.
- Allows retrievability and improved emergence profiles, while minimizing excess cement within the sulcus.
- Requires precise alignment of the screw access channel and pre-fabrication coordination between dentist and technician.[2]

Figure 5: Retention mechanism a. Cement retained b. Screw retained c. Screw-Cement Retained Prosthesis

Choosing the correct retention type is case-specific and must be guided by prosthetic space availability, implant angulation, hygiene access, and esthetic zone considerations. Any ambiguity in this section of the lab authorization form can result in the fabrication of a prosthesis that may require chairside modification or remake.

c. Abutment Selection

The abutment is the intermediate component connecting the implant fixture to the prosthesis. Its design affects the emergence profile, soft tissue support, crown retention, and overall esthetics.[7,9] The lab form should specify

Standard/Cast Abutment

- ❑ Titanium
- ❑ Cast Gold

Stock Abutments

- Prefabricated and available in various heights and angulations.
- Economical and convenient for posterior restorations with ideal implant angulation and gingival contours.
- Limited in customizing emergence profile or accommodating deep tissue architecture.

Custom Abutments

- Designed using CAD/CAM technology or castable materials. Indicated when:
- Implants are placed suboptimally (angled, deep, or buccally). Soft tissue sculpting is needed to achieve a natural emergence.
- Crown margins need to be placed supragingivally for hygiene and cement removal.

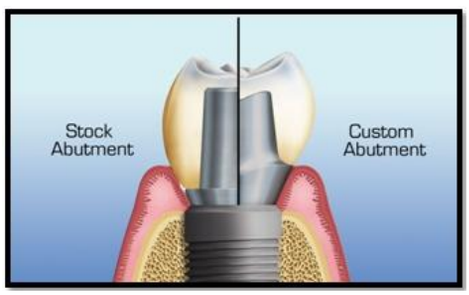


Figure 6: Abutment selection : stock or custom abutment

Types Include

- Castable: Made of burnout plastic patterns that can be cast in alloys, they allow customized abutment fabrication in complex angulations or limited interocclusal space, offering flexibility but with limitations in precision and long-term fit
- UCLA Abutments: A screw-retained design where a plastic burnout sleeve is cast with alloy or ceramic directly to the implant platform; indicated in cases with limited interocclusal space, unusual angulation, or need for custom emergence profile, but technique-sensitive and potentially less precise than milled abutments.
- DMLS (Direct Metal Laser Sintered) Custom Abutments: Additive manufacturing that allows complex geometries and cost-effective production.
  Milled Titanium Abutments: High strength, biocompatible, and ideal for posterior regions.
- Ti-base Abutments: A hybrid system where zirconia or other restorative materials are cemented to a titanium base, combining strength and esthetics.

The choice of abutment must be coordinated between the restorative dentist and lab technician to achieve the best possible fit, function, and esthetics.[12] It should be based on:

- Implant depth and angulation.
- Peri-implant tissue biotype.
- Esthetic zone requirements.
- Gingival margin position.
- Planned retention type (cemented vs. screw-retained).

In complex cases, the lab authorization form can also request a virtual or physical wax-up, or include STL files for digital planning of abutments in the software (e.g., 3Shape, Exocad).

5. Material Specification

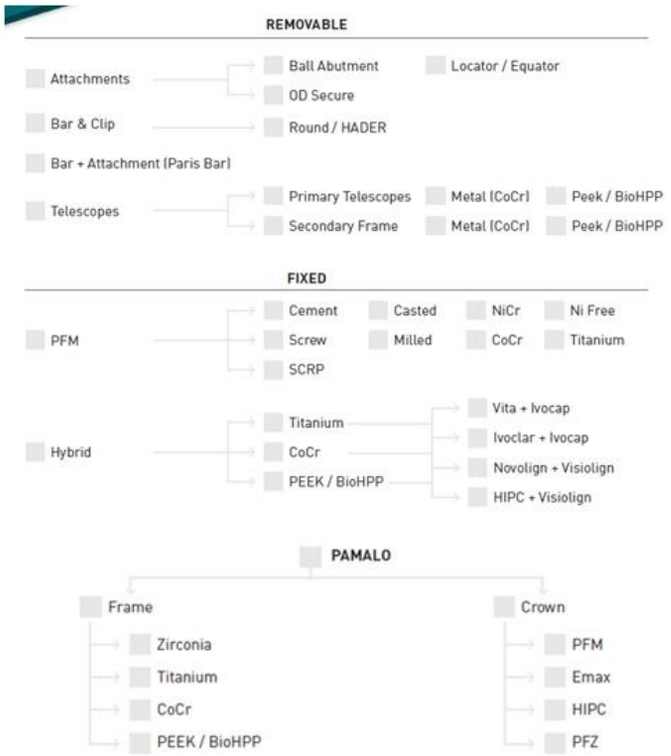
A critical section influencing both biological and esthetic outcomes[10,11]

Framework Materials

- Titanium: Biocompatible, commonly used for abutments.
- CoCr: High strength, used for frameworks.
- PEEK/BioHPP: Metal-free, lightweight.
- Zirconia: Esthetic, high strength, suitable for anterior restorations.

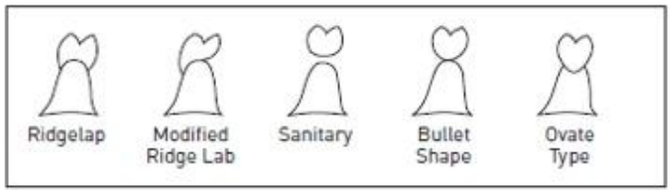
Crown Materials

- Lithium Disilicate: Superior esthetics with excellent translucency; ideal for anterior regions but less fracture-resistant than zirconia.
- Layered or Monolithic Zirconia: Highly durable and versatile; layered zirconia offers improved esthetics, while monolithic zirconia provides superior strength and is suitable for posterior regions.
- Acrylic Resin: Commonly used in implant-supported hybrid prostheses; inexpensive, easy to repair and adjust, provides shock absorption, but wears faster and has lower esthetic stability over time.
- Composite Resin: Offers better wear resistance and esthetics compared to acrylic; can be repaired intraorally, but still less durable than ceramics in the long term.
- HIPC (High Impact Polymer Composite): Laboratory-processed resin composite with high fracture toughness and improved wear resistance; combines resilience with esthetics, making it a good alternative to ceramics in cases where stress distribution and shock absorption are important.
- The choice should reflect occlusal load, esthetic zone, and patient-specific factors (e.g., bruxism).[5,6]



6. Design Considerations

a. Pontic Design

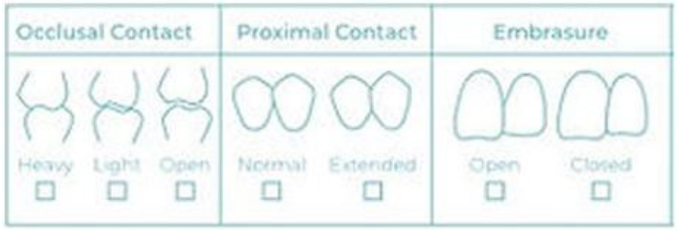


- Implant pontics influence both soft tissue architecture and hygiene[8]
- Ovate: Best esthetics and papilla preservation.
  Modified ridge lap: Good balance of hygiene and esthetics.
- Sanitary/bullet: High cleansability, posterior preference.

b. Connector Design

- Specify whether connectors are
- Rigid: Traditional cast or CAD/CAM.
- Non-rigid: Indicated when path of insertion differs between abutments.[9]
- Specify soldering sequence if applicable.

7. Occlusion and Contacts



- Occlusal contacts: Light, centric, balanced.
- Guidance: Canine guidance, group function.
- Proximal contacts: Normal, open, extended.
- Embrasures: Open/closed to aid hygiene.
- Ensuring proper occlusal scheme and contact design avoids overloading implants and enhances patient comfort.[1,7]

8. Shade Selection and Esthetic Mapping

- Use standardized tools: Vita Classic, Vita 3D Master, digital spectrophotometers.

Provide

Shade of adjacent/stump tooth.
9-zone shade map of crown.
Photographs under various lighting conditions.

Digital records enhance color matching and minimize subjectivity.[11]

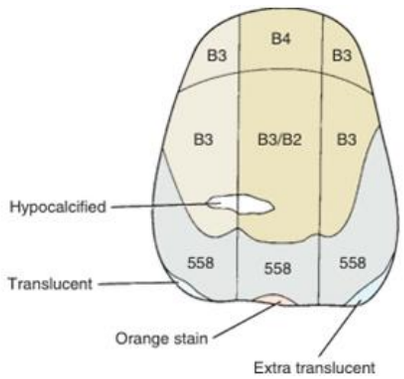


Figure 7 : 9 zones for shade selection

9. Enclosures Sent with the Case

- Impression Model
- J.R. / Bite Registration
- Impression Posts _____ pcs
- Abutments _____ pcs
- Analogs _____ pcs
- Other Specify _____ pcs
- Photograph

Checkboxes should confirm all essential items

- Upper/lower impressions or models.
- Digital scan files (STL/PLY).
- Bite registration.
- Facebow record.
- Impression copings, analogs.
- Previous crown/sample.
- Provisional index.
- Shade tab or photographic references.
- Articulator settings.

Any missing component can compromise prosthesis fit or esthetics.[12]

10. Delivery Schedule and Treatment Workflow

Metal / Frame Try-in:	
Biscuit Try:	
Setup Try-in:	
Finish:	

- Clinician must outline steps for fabrication:
- Jig try-in
- Metal/Framework try-in
- Bisque ceramic try-in
- Final delivery

Estimated timeline and patient's follow-up dates should be mentioned to maintain treatment flow and minimize delays.[3]

11. Additional Instructions and Warranty

- Special instructions (e.g., occlusal scheme, stain zones).
- Type of cement to be used (for cement-retained prosthesis).
- Warranty clause and duration ensures accountability.[4]

12. Future Directions and Digital Integration

Modern lab authorization forms should evolve with digital dentistry

- Integration with intraoral scanning software and cloud-based lab management systems.
- Use of prescription templates in design software (e.g., Exocad, 3Shape).
- Digitally generated STL with form-embedded metadata.

AI-driven prescriptions may soon assist in pre-selecting optimal designs based on uploaded case photos and patient data.[6,10]

Discussion

Studies have shown that incomplete or vague lab prescriptions lead to increased remake rates, communication errors, and unsatisfactory outcomes.[5,8] A standardized, detailed lab authorization form bridges the clinical-lab divide, promotes collaborative dentistry, and elevates patient satisfaction. It also plays a role in traceability and legal documentation especially in implant prosthetics where costs and complexity are higher.[7,9]

Conclusion

The lab authorization form for implant prostheses is an indispensable tool in modern prosthodontic practice. Beyond being a prescription, it is a clinical roadmap and a communication contract between dentist and technician. With growing reliance on digital workflows and patient-centric restorations, its standar - dization, comprehensiveness, and digital adaptability must be prioritized to ensure excellence in patient care.[10,12]

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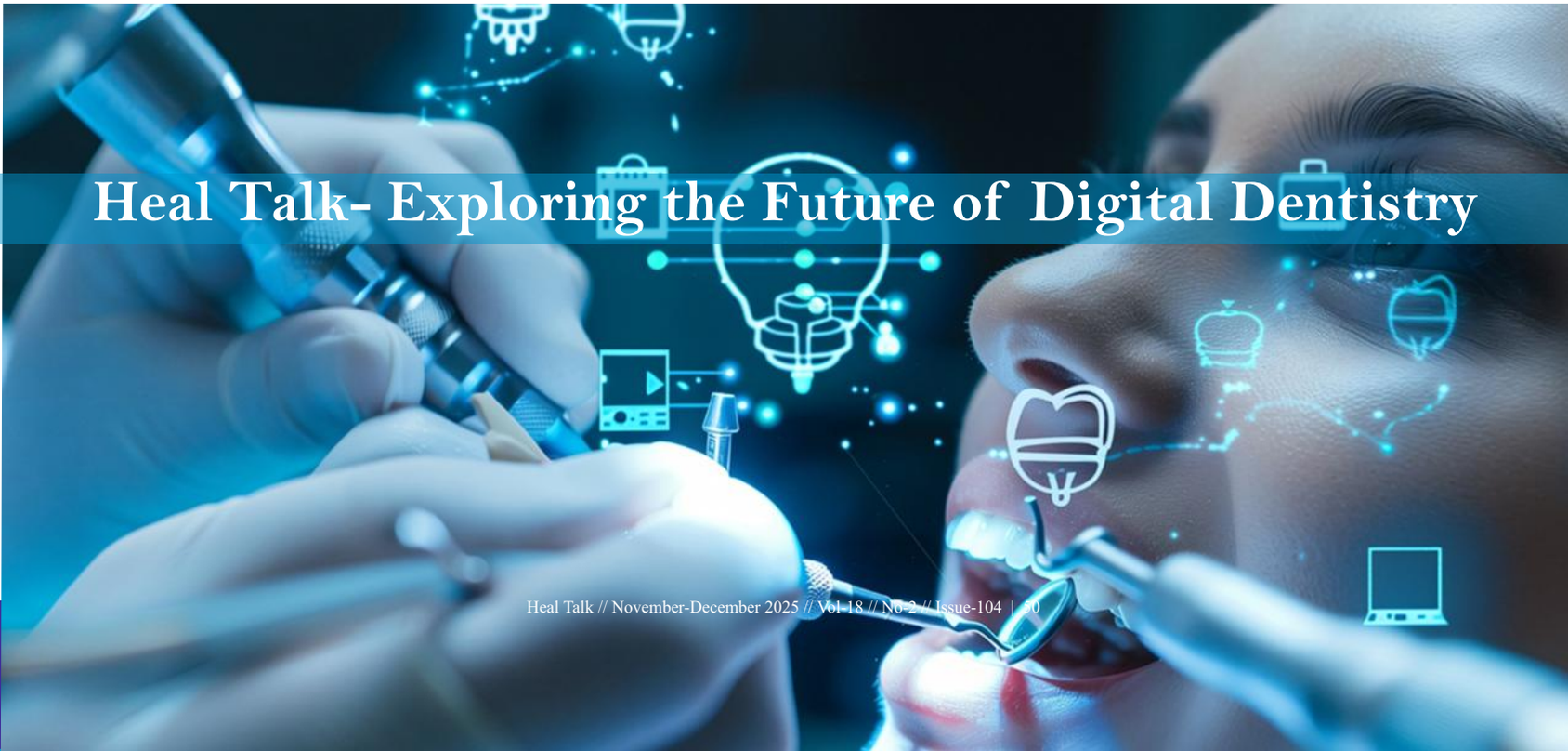

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Biomimetic Esthetic Rehabilitation of Anterior Teeth: A Case Series

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Abstract

Anterior esthetic rehabilitation plays a pivotal role in restoring both function and confidence in patients with compromised anterior dentition. This case series illustrates a biomimetic approach to the restoration of anterior teeth using minimally invasive techniques and adhesive ceramic restorations. Through careful diagnosis, smile design, and systematic treatment planning, natural esthetics and harmony with the surrounding dentition were achieved, enhancing patient satisfaction and self-esteem.

Introduction

The anterior dentition plays a pivotal role in facial esthetics, phonetics, and psychological well being. Discoloration, spacing, malalignment, or developmental anomalies in the anterior region often affect a patient's smile and self confidence. Excessive anterior teeth display during smiling may potentially influence the self perceived psychosocial impacts of malocclusion in adolescents.[1] Dental esthetics significantly affect a person's quality of life by shaping self perception, social behavior, and psychological well being .[2]

Modern adhesive dentistry allows for conservative and biomimetic restorations that preserve tooth structure while achieving lifelike esthetics. Biomimetic restorative approaches, combined with digital smile design, improved material science, and minimally invasive protocols, have made it possible to restore anterior teeth with excellent functional and esthetic outcomes .[3]

Case Series

Case 1 – Indirect Technique Using Lithium Disilicate Veneers

A 29 year old female presented to the Department of Prosthodontics with a chief complaint of discoloration in the upper anterior teeth (Fig. 1a, b). Clinical and radiographic examination revealed generalized brownish intrinsic stains consistent with dental fluorosis, with intact enamel, healthy gingiva, and normal pulp. Oral prophylaxis was performed, and shade matching was completed using the VITA 3D-Master guide (A2 enamel). A silicone putty index was fabricated to guide minimal tooth preparation (Fig. 1d). After preparation, an intraoral digital scan was obtained to capture tooth details and plan E-max veneer design for esthetic rehabilitation (Fig 1f).

Bonding Procedure: Teeth were etched for 20s using Smart Etch (ivoclar vivadent) followed by application of Universal adhesive (Ultradent) and light curing for 20 s. The E-max veneerswere etched with 5% hydrofluoric acid (Porcelain Etch, Ultradent) for 20 s, treated with Silane coupling agent (Ultradent) for 1 minute, and luted using RelyX U200 resin cement (3M). Excess cement was removed, and each surface was light cured for 40 s to ensure optimal polymerization and bond strength. [4,5]

Finishing and Outcome: Occlusal interferences were verified and adjusted, followed by final polishing using ceramic polishing kits (Diacera/OptraFine, Ivoclar Vivadent). The E-max veneers (Ivoclar Vivadent) demonstrated excellent shade match, translucency, and marginal fit, with minimal tooth reduction. The patient was highly satisfied with the esthetic and functional outcome (Fig. 1k, l). [6,7]

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Figure 1: Case 1. (a) Prerehabilitative smile view, (b) Prerehabilitative frontal view, (c) Diagnostic wax-up, (d) Putty reduction guide index, (e) Incisal preparation with guide in situ, (f) Intraoral scan of preparation (g,h) Digital designing of the veneers with incisal overlap design , (i) Emax veneers on digital cast (j) Etching and silanization of the ceramic veneers (k) Final prosthesis in situ, (l) Postrehabilitative view, (m) Pre- and postrehabilitative smile view

Figure 2: Case 2. (a) Prerehabilitative smile view, (b) Prerehabilitative intraoral view before and after removal of old composite restoration, (c) diagnostic wax-up, (d,e) EXACLEAR™ clear PVS material syringed onto a non-perforated mandibular tray to capture an accurate impression of the waxed up model (f) Selective enamel etch, one tooth at a time, with isolation using teflon (PTFE) tape to protect the adjacent teeth and bonding agent applied on tooth surface ,(g)Injection moulding with flowable composite EvoFlow (Ivoclar Vivadent),(h) Final intraoral view , (I) Post rehabilitative extraoral view, (j) Pre- and post rehabilitative smile view

Case Report 2 - Direct Veneers Using Injection Molding Technique

A 62 year old female patient reported to the Department of Prosthodontics with the chief complaint of yellowish discoloration of previously placed composite veneers on her upper front teeth. She desired replacement to improve esthetics.

Clinical examination revealed discolored, roughened composite veneers with no underlying caries or structural defects. Gingival health was satisfactory, and pulp sensibility tests were normal. Radiographs confirmed intact tooth structure and absence of pathology.

The old composite veneers were carefully removed, and the tooth surfaces were cleaned and polished. Shade selection was done using the VITA 3D Master guide (A2 enamel). A diagnostic wax-up was done on diagnostic cast , and an Exaclear index was made to accurately transfer the design intraorally.

Injection Molding Procedure: Teeth were isolated and etched using Smart Etch (Ivoclar Vivadent) for 20 seconds. The bonding agent (Ivoclar Vivadent), was applied and light-cured for 20 seconds (Fig f). Using the Exaclear (Ivoclar Vivadent) index, flowable composite EvoFlow (Ivoclar Vivadent) , Shade A2 (Fig d,e)was injected to precisely recreate the planned morphology. The index was removed, and excess composite was carefully trimmed.

Finishing and Outcome: Final contouring and polishing were performed using multi-step polishing discs (Sof-Lex, 3M) to achieve a smooth, glossy surface. The injection-molded composite veneers provided excellent shade match, anatomical form, and surface finish. The patient was highly satisfied with the improved esthetics and natural smile appearance.

Limitation: Injection molded composite veneers are technique sensitive, prone to staining, and may have reduced longevity compared to porcelain veneers (Tzimas, K2025). [8]

Case Report 3 – Resin Bonded Prosthesis

A 35 year old female patient reported to the Department of Prosthodontics with the chief complaint of a missing upper front tooth [11] following trauma, which had compromised her esthetics and smile.

Clinical examination revealed the absence of tooth 11, with healthy adjacent abutment teeth [12 and 21] and adequate space for replacement. Gingival health was satisfactory, pulp sensibility tests of the abutments were normal, and radiographic evaluation showed good bone support without pathology.

Tooth Preparation: For resin bonded fixed partial dentures (RBFPDs), tooth reduction was kept performed on 12 and 21 which was confined to enamel: about 0.3–0.5 mm on the lingual surface, a shallow 0.3–0.5 mm chamfer with supragingival margin to create space for the retainers while preserving maximum enamel to enhance bonding strength. The incisal end of the tooth preparation was kept 1mm cervical to the incisal edge. [9]

Framework Fabrication: In resin bonded fixed dental prostheses fabricated with lithium disilicate (E-max), the retainers should be designed with a minimum thickness of 0.7–1.0 mm on the palatal surface to ensure sufficient strength and resistance to fracture while maintaining a conservative approach limited to enamel. The connector to the pontic should measure at least 4 × 4 mm (≈16 mm^2) to resist functional stresses. This design achieves a balance between mechanical reliability and esthetics, since unlike metal retainers, ceramic retainers require slightly greater thickness for durability but still allow a minimally invasive preparation ideal for RBFPDs . [10]

Bonding Procedure: The lithium disilicate retainer wings were etched with Porcelain Etch (5% HF, Ultradent) for 20 s, rinsed, dried, and treated with Silane (Ultradent). Abutment enamel was selectively etched with Smart Etch (35% phosphoric acid, Ultradent) for 20 s and bonded using 3M Universal Adhesive. The

prosthesis was luted with RelyX U200 resin cement (3M), excess cement removed, and light cured for 40s . This protocol ensures optimal bond strength for lithium disilicate resin bonded FDPs.[11]

Finishing and Outcome: Occlusion was verified and adjusted, followed by polishing. The resin bonded FDP provided excellent esthetic integration, functional stability, and a minimally invasive replacement for the missing anterior tooth. The patient was highly satisfied with the natural result.

Figure 3: Case 3. (a) Prerehabilitative smile view, (b) Prerehabilitative intraoral view, (c) Prerehabilitative intraoral occlusal view, (d) Cast after preparation , (e) Cast with prosthesis , (f)Buccal and palatal view of resin bonded restoration (g) Final intraoral view with prostheis ,(h) Post rehabilitative smile view

Discussion

Anterior esthetic rehabilitation is one of the most challenging aspects of restorative and prosthodontic dentistry because it requires restoration of both appearance and function while preserving the natural integrity of tooth structure. The cases presented in this series demonstrate that a biomimetic, adhesive, and minimally invasive approach can provide predictable, long-lasting, and natural looking outcomes. The biomimetic concept emphasizes conserving enamel to achieve reliable adhesive bonding and maintain the natural biomechanical properties of the tooth. Adhesive protocols have evolved substantially, allowing durable adhesion to enamel and dentin and eliminating the need for aggressive mechanical retention.

Lithium disilicate ceramics (E-max) were used for veneers and resin bonded fixed prostheses (RBFDPs) due to their high flexural strength, optical translucency, and long-term success rates. Several studies confirm the excellent longevity of lithium disilicate restorations, with survival rates above 95% after 10 years [12]. In this case series, the E-max veneers effectively masked intrinsic discolorations associated with fluorosis, while maintaining translucency and marginal integrity. The RBFDP made of lithium disilicate served as a conservative solution for a single missing anterior tooth, providing esthetic harmony without extensive tooth reduction or biological compromise. These outcomes are consistent with previous clinical evidence showing the reliability of lithium disilicate RBFDPs in the anterior region over medium- to long-term follow-up periods. [13]

The injection molding technique for direct composite veneers used in one of the cases provided a cost-effective and reversible option for smile enhancement. The use of a transparent silicone (Exaclear) index derived from a diagnostic wax-up ensured accurate reproduction of tooth anatomy and controlled material placement. Although composites provide good esthetic results initially, their surface roughness and susceptibility to discoloration may reduce long-term performance compared to ceramics.[14] Regular finishing and polishing are therefore essential for maintaining their gloss and longevity.

Digital workflows such as intraoral scanning, computer-aided design, and 3D printing have further improved the precision and predictability of anterior esthetic treatments. The digital approach minimizes human error, enhances the fit of ceramic restorations, and enables accurate visualization during planning. These technologies support the biomimetic concept by facilitating minimally invasive preparations guided by digital indices and by allowing direct communication between clinician, laboratory, and patient.[15]

Overall, this case series reinforces that anterior esthetic rehabilitation can achieve natural harmony and long-term durability when based on conservative tooth preparation, appropriate material selection, and sound adhesive principles. Although technique sensitivity and maintenance requirements are limitations, the biological and esthetic benefits outweigh these challenges. The results confirm that adhesive, biomimetic restorations can restore not only the form and function of anterior teeth but also the patient's confidence and smile esthetics.

Conclusion

Conservative, adhesive based biomimetic restorations provide an effective and predictable approach for anterior esthetic rehabilitation. By integrating advanced ceramics, modern composite resins, and digital workflows, clinicians can achieve esthetic excellence while preserving maximum tooth structure. Lithium disilicate veneers offer superior long-term esthetics and strength for discolored or defective anterior teeth, injection-molded composite veneers serve as a minimally invasive and economical alternative for moderate corrections, and resin bonded fixed prostheses present a conservative option for replacing a single missing tooth. The key to success lies in precise diagnosis, careful planning, and strict adherence to adhesive protocols. Respecting biological limits, maintaining enamel preservation, and using materials that mimic natural enamel and dentin ensure restorations that are esthetically pleasing, functionally stable, and biologically sound. Biomimetic adhesive dentistry thus represents a paradigm shift from conventional mechanical retention toward a more conservative, functional, and lifelike esthetic restoration philosophy, embodying the future of modern restorative and prosthodontic practice.

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Periodontal Regeneration in Mandibular Intrabony defects using DFDBA with chorion membrane vrs DFDBA with collagen membrane and I-PRF augmentation in mandibular supra-bony defects: A Split Mouth Case Report

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Abstract

This split mouth case study evaluates the regeneration effectiveness of injectable platelet rich fibrin (I-PRF) augmentation for related suprabony lesions and demineralized freeze dried bone allograft (DFDBA) in conjunction with either chorion or collagen membranes in mandibular intrabony defects. Clinical and radiological characteristics were assessed at baseline and six months after regenerative treatment for a systemically healthy patient with bilateral periodontal abnormalities. The DFDBA chorion membrane site showed marginally better tissue integration and radiographic bone regeneration, although both membrane assisted DFDBA techniques produced significant decreases in probing depth, increases in clinical attachment, and considerable defect fill. In suprabony deformities, concurrent use of I-PRF improved early soft-tissue healing and supported overall surgical results.This paper emphasizes the combined effects of membrane selection and biologic augmentation in promoting periodontal regeneration.

Introduction

The American Academy of Periodontology (AAP) has defined regeneration as the reproduction or reconstitution of a lost or injured part to restore the architecture and function of the lost or injured tissues.[1]

Intrabony defects, one of the many signs of periodontitis, are a limited vertical loss of bone next to teeth that can be very difficult to treat clinically. If treatment is not received, these defects which are categorized according to the number of residual bone walls (one, two, or three wall defects) are linked to an increased risk of tooth loss and disease development. For such osseous defects, a variety of therapy options have been investigated, most likely including autogenous grafting or bone substitutes such xenografts, allografts, and alloplasts. Guided tissue regeneration (GTR) for selective cell development, stimulation of cells with various growth factors, hormones, or extracellular matrix proteins, and modification of the tooth root surface using various materials are other methods that have been studied.[2]

GTR involves covering the region surrounding the injured tooth root surface with a barrier membrane, which may be resorbable or nonresorbable. This will enable the periodontal wound's progenitor cells to repopulate in a targeted manner.[3]

Despite the serious drawbacks of non resorbable membranes, type I collagen based membranes are the most widely employed of the several biodegradable natural and synthetic membranes now on the market.[4] The minimal immunological response, capacity to promote cellular development and attachment, homeostasis, and the ability of collagen solutions to reconstitute into the microfibrillar structure found in natural tissues are all specific benefits of resorbable collagen membrane.[5]

Derived from the fetal membrane, chorion membranes provide a wealth of growth hormones and extracellular matrix components that promote angiogenesis, differentiation, and cell proliferation, all of which aid in periodontal regeneration. Growth factors such as Vascular Endothelial Growth Factor (VEGF) and Platelet Derived Growth Factor AA (PDGF-AA), together with chemokines and anti-inflammatory cytokines, are released by the chorion membrane.[6] CM has angiogenic, anti-inflammatory, antifibrotic, antimicrobial, and anti-inflammatory properties.[7]

Demineralized Freeze Dried Bone Allograft (DFDBA), which has been used extensively as a bone graft material in conjunction with these membranes, offers osteoconductive scaffolding and osteoinductive potential through bone morphogenetic proteins to speed up the creation of new bone. It is made by

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extracting cortical sections of bovine bone in 100% ethanol and ethyl ether for one hour. After that, it is ground up in a liquid nitrogen mill, demineralized for three hours in 0.5 N HCl, and cleaned with water, anhydrous ether, and absolute ethanol until the pH is neutral.[8]

Clinical studies have demonstrated that the combination of collagen or chorion membranes with DFDBA leads to superior regenerative outcomes compared to either approach alone. Parameters such as probing pocket depth reduction, clinical attachment level gain, and radiographic bone fill have consistently shown improvement, particularly in well contained two and three wall intrabony defects. The synergistic effect of the membrane as a barrier and the graft as a scaffold creates an environment conducive to periodontal regeneration, minimizing postoperative complications and enhancing the predictability of the treatment. Thus, the management of periodontal intrabony defects using collagen membranes, chorion membranes, and DFDBA represents a cornerstone in regenerative periodontics, combining biological principles with clinical efficacy to restore form and function to the periodontium.

Case Presentation

A 35 year old male patient came to the OPD of periodontics and oral implantology, Santosh Dental College, Ghaziabad with the chief complain of food lodgement in lower right and left posterior region of the jaw in the last 3 months. After clinical examination a pocket of 5 and 7 mm was found in lower left(figure 1) and right(figure 2) first and second molars respectively. A 5mm pocket was found in the lower anterior region. A Cone Beam Computed Tomography was planned and intrabony defects was found in lower left (figure 3) and right(figure 4) first and second molars and suprabony defect was found in the lower anterior region. To rule out systemic problems and find out if the patient has been taking medication for a long time, a comprehensive medical history was taken, a thorough hematological examination was carried out. Patient was adviced regenerative mucoperiosteal flap surgery.

Surgical Intervention

After obtaining informed consent from the patient, local anesthesia, Xicaine 2% with adrenaline (one in 80,000) was administered, and a sulcular incision was given extending from 35 to 37 region. After reflection of full thickness flap, thorough root debridement with area specific Gracey curettes was done, the defect was visualized. (figure 5a and b) Demineralized Freeze Dried Bone Allografts (Tata Memorial Tissue Bank, Mumbai) was mixed with saline and was condensed inside the defect (figure 6 a and b). Collagen membrane (Collaguide) was used to cover the graft as a barrier membrane (figure 7). The same was followed for 45 to 47 region and Chorion membrane (Tata Memorial Tissue Bank, Mumbai) was used to cover the graft as a barrier membrane (figure 8). 3-0 silk (Lotus)sutures were used. (figure 9a and b)

Figure 1: probing pocket depth with 36 and 37 is 5 mm.

Figure 2: Pre-operative probing depth with 46 and 47 is 7mm

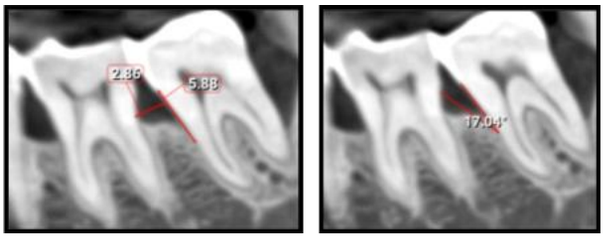

Figure 3: Pre-operative CBCT measurements with 36

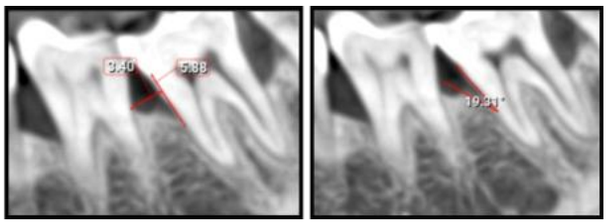

Figure 4: Pre-operative CBCT measurements with 46

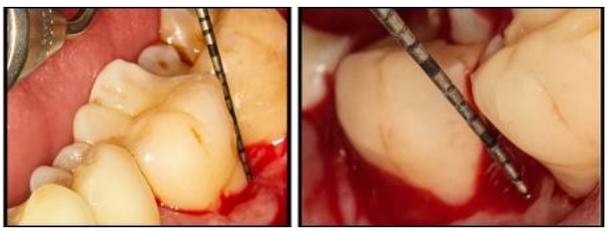

Figure 5: exposing the defect with 36,46

Figure 6 a: Before graft condensation with 36

Figure 6 b: Before graft condensation with 46

Figure 7: Collagen membrane placement with 36

Figure 8: Chorion membrane placement with 46

Figure 9 : Post-operative suture with 36

Figure 10: Post-operative suture with 46

Figure 11: 9 months Post-operative probing pocket depth measurement = 4 mm

Figure 12: 9 months Post-operative probing pocket depth measurement = 3 mm

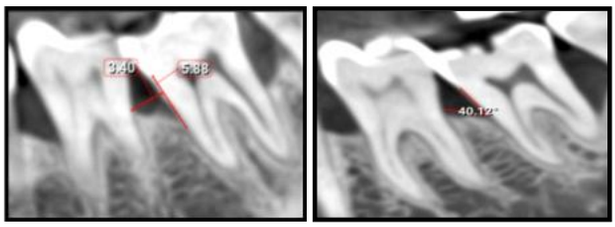

Figure 13: 9 months Post-operative CBCT measurement with 36

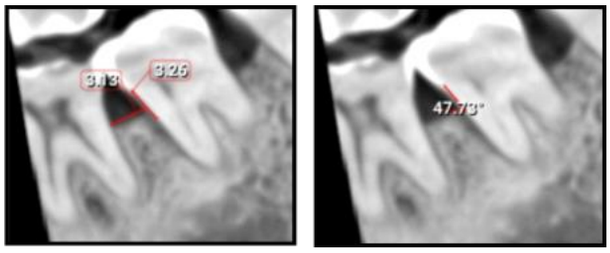

Figure 14: 9 months Post-operative CBCT measurement with 46

The Lower anterior region had a probing pocket depth of 5mm (figure 15). This anterior suprabony/horizontal defect was treated by giving sulcular incision from 13-23 and full thickness flap was reflected. Thorough root planning and root debridment was done with area specific gracy curettes (figure 16). Under aseptic conditions 10ml of venous blood was withdrawn from the cubital fossa and was transferred into plastic EDTA tubes with a counterweight of betadine. Choukran's method was used to make I-PRF that is 700rm for 3 minutes with the help of centrifuge machine (Remi) (figure 17). This I-PRF was injected onto the supra-bony defect in the lower anteriors (figure 18). 3-0 silk sutures were used to close the flap (figure 19).

Figure 15: Probing Pocket Depth of 5mm

Figure 16: Reflection and debridement

Figure 17: Centrifuge machine with plastic EDTA tubes

Figure 18:Injecting I-PRF after Open Flap Debridement (OFD)

Figure 19: Post-operative sutures

Post-operative Care

The appropriate antibiotics and analgesics (amoxicillin 500 mg three times a day and piroxicam twice a day for five days), respectively were recommended, along with 0.2% chlorhexidine mouthwash twice daily for two weeks. Sutures were removed one week postoperatively. Patients were instructed on oral hygiene maintenance and recalled on a weekly basis for the first month, followed by six and nine month recall protocol.

Discussion

Both treatment modalities DFDBA with collagen membrane and DFDBA with chorion membrane produced clinically and radiographically substantial improvements in the management of mandibular intrabony abnormalities, as the current split-mouth case report showed. On the other hand, locations treated with the chorion membrane showed better increases in clinical attachment level and somewhat larger decreases in probing pocket depth. These results are consistent with the physiologic benefits of placental derived membranes, which are rich in extracellular matrix proteins, growth factors, and intrinsic anti-inflammatory qualities. Chorion membranes are superior to traditional collagen barriers because of their high tensile strength, delayed resorption, and favorable matrix that promotes periodontal ligament and bone cell growth (Aziz et al., 2016)[9] Gurinsky (2009)[10] reported enhanced regenerative potential with amniotic/chorionic tissues due to their intrinsic bioactive components that support wound healing and reduce postoperative inflammation.

Collagen membranes, on the other hand, lack the biological stimulatory qualities of chorion tissues and serve mainly as passive barriers that maintain space, despite being widely employed and well documented. Collagen membranes are biocompatible and useful in directed tissue regeneration, according to studies by Mellonig (1992)[11] and Murphy et al.[12](1995) However, their quick rate of resorption may restrict long-term space maintenance in specific defect shapes. Therefore, the structural constraints and absence of intrinsic bioactive chemicals in collagen membranes may be the reason for the very small gains seen in this work.

All treated sites showed significant radiographic decreases in defect breadth and depth together with an increase in defect angle, indicating good bone fill and defect resolution. This is in line with research by Lekovic et al. (1998)[13] who showed that intrabony defect architecture, including width and angle, directly affects regeneration results, with smaller and more acute flaws generally providing greater spatial stability for clot and graft development.

Over the course of the nine months, the graft matured and the osteoconductive environment improved, as seen by the significant rise in defect angle in this instance.

Soft-tissue healing was also enhanced by the supplemental use of injectable platelet rich fibrin (i-PRF) for suprabony lesions. i-PRF stimulates angiogenesis and fibroblast proliferation by continuously releasing growth factors like PDGF, TGF-β, and VEGF. According to Miron et al. (2017),[14] i-PRF's liquid fibrin network speeds up maturation and improves soft-tissue healing when compared to conventional PRF formulations. Therefore, the clinical benefits shown in this case's suprabony regions are consistent with previous research showing that i-PRF can enhance both soft-tissue stability and early wound healing.

Overall, the chorion membrane's physiologically active matrix, which promotes periodontal regeneration beyond mere barrier function, may be responsible for the better results observed with it. This is consistent with the general agreement that membranes with structural integrity and natural growth factors might enhance regeneration predictability. Although this case report's sample size restricts its generalizability, the findings support the body of research that suggests placental derived membranes and biologic adjuncts are potential agents for periodontal regeneration.

Conclusion

The combination of DFDBA and barrier membranes produced clinically and radiographically significant periodontal regeneration in mandibular intrabony defects, within the constraints of this split mouth case study. Although both collagen and chorion membranes supported positive results, the chorion membrane showed relatively better improvements in defect morphology, clinical attachment gain, and probing depth reduction. This is probably because of its inherent bioactive qualities and increased capacity for wound healing. Effective bone fill and maturation over the assessment period were further validated by radiographic decreases in defect breadth and depth as well as an increase in defect angle. Additionally, early stabilization and better soft-tissue healing were facilitated by the supplementary use of i-PRF in suprabony defects.

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Heal Talk

Esthetic Rehabilitation of a Post Burn Unilateral Auricular Defect Using Adhesive Retained RTV Silicone Prosthesis: A Case Report

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Abstract

A 25-year-old female presented to the Department of Prosthodontics, S.B. Patil Dental College and Hospital, Bidar, Karnataka, with a long-standing post-burn defect of the left auricular region, secondary to an accidental fall into a boiling milk bath at the age of 10 years. Examination revealed well healed scar tissue and a rudimentary auricular tag in the tragal area. Hearing was normal bilaterally. A non-surgical prosthetic rehabilitation was planned using an adhesive retained, room temperature vulcanizing (RTV) silicone auricular prosthesis. This case report describes in detail the impression technique, wax sculpting procedures, three piece mould fabrication, shade-matching, silicone processing, and adhesive retention. The innovative use of brown skin colored sculpting wax enhanced esthetic visualization during fabrication, providing a realistic pre-silicone trial. The case achieved excellent esthetic and psychological outcomes for the patient.

Introduction

Loss of the auricle due to trauma or burns leads to significant functional and esthetic impairment. When surgical reconstruction is contraindicated due to scarred tissues or declined by the patient, prosthetic rehabilitation using silicone provides an esthetic, non invasive option. Silicone elastomers offer excellent flexibility, colour adaptability, and life like appearance. Among the available retention methods adhesives, anatomical undercuts, spectacle attachments, or osseointegrated implants adhesive-retained prostheses remain cost-effective and ideal for post-burn cases.

Case Report

A 25-year-old female reported for rehabilitation of her missing left ear. She sustained thermal burns after falling into boiling milk at age 10. Examination revealed a healed scar area with a rudimentary auricular tissue tag near the tragus. The contra lateral (right) ear was normal. Hearing was unaffected bilaterally. Considering the stable tissue and patient's preference for a non-surgical solution, an adhesive retained RTV silicone auricular prosthesis was planned.

1. Impression Procedure

Hair around the defect was lubricated with Vaseline, and the external auditory canal was blocked with cotton. Three orientation lines were marked on the normal ear and transferred to the defective side. Impressions of both defect and donor ear were made using irreversible hydrocolloid (alginate), reinforced with gauze, and backed with quick setting plaster. Type IV dental stone was used to pour the master casts.

2. Wax Sculpting

A life sized wax pattern of the missing ear was sculpted using the cast of the normal ear as a reference. This stage is crucial in determ - ining the prosthesis esthetics and marginal adaptation.

Types of Wax Sculpting Techniques

1. Freehand sculpting- based on visual estimation.
2. Mirror-image duplication-duplicating donor ear impression and mirroring it.
3. Layered wax buildup- sequential formation of auricular components.
4. Template-guided sculpting- using acrylic templates from donor ear.
5. Digital sculpting- using 3D scanning and CAD CAM replication.

Technique used in this Case

A mirror image duplication method combined with freehand refinement was used. The donor (right) ear cast served as reference, and sculpting was performed using brown skin-coloured sculpting wax instead of the

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conventional pink wax. This wax allowed enhanced visualization of surface contours, improved evaluation of feathered margins, and gave the patient a near natural preview during wax try in. The wax pattern was adjusted for orientation and symmetry, and margins were thinned to feather edges for natural blending post processing.

Advantages of Brown Skin-Coloured Wax

- Enhanced visual realism approximating natural skin tone.
- Improved daylight colour assessment and surface contour evaluation.
- Better contrast for marginal feathering.
- Psychological comfort to patient seeing a realistic wax ear.
- Superior photographic clarity for clinical documentation.
- Valuable educational and publication benefit due to high visual contrast.

3. Three Piece Mould Fabrication

A three piece mould was fabricated using dental stone sections for easy retrieval and precise silicone packing.

4. Dewaxing, Shade Matching, and Silicone Processing

The mould was dewaxed in boiling water. Shade matching was done under natural light using intrinsic and extrinsic pigments. RTV silicone was packed into the mould and allowed to polymerize at room temperature for 24 hours.

5. Finishing, Insertion, and Retention

After curing, excess silicone was trimmed and margins refined. The prosthesis was retained using water-soluble adhesive. Patient instructions included daily cleaning and careful handling.

Discussion

Auricular defects due to trauma or burns present both esthetic and psychological challenges. Surgical reconstruction is often limited by scar tissue and poor vascularity, making prosthetic rehabilitation a preferred, predictable option.

In this case, an adhesive-retained RTV silicone prosthesis was chosen for its non-invasive nature and high esthetic potential. RTV silicone provides softness, flexibility, translucency, and easy pigmentation, closely replicating human skin. Adhesive retention offers adjustability and simplicity, though it requires patient compliance with hygiene and maintenance.

A key distinguishing feature of this case was the use of brown skin coloured sculpting wax instead of conventional pink wax. This enhanced visibility of fine anatomical details, improved marginal thinning, allowed realistic shade evaluation under daylight, and helped the patient visualize the likely outcome during try in. It also provided superior photographic clarity for documentation valuable advantage in clinical and academic contexts.

The three piece mould technique ensured dimensional accuracy and easy prosthesis retrieval, minimizing marginal distortion. Intrinsic and extrinsic pigmentation allowed seamless blending with the patient's natural skin tone.

Psychologically, the prosthesis restored confidence and self-image, aligning with prior studies emphasizing the rehabilitative impact of maxillofacial prostheses. Although adhesive-retained prostheses may experience gradual colour fading and margin wear, they remain practical, affordable, and highly acceptable to patients

Conclusion

The present case demonstrates a simple, effective, and esthe - tically pleasing approach to rehabilitating a post-burn auricular defect using an adhesive retained RTV silicone prosthesis. The innovative brown sculpting wax improved visualization and clinical precision, contributing significantly to the natural esthetic outcome.

This method offers an economical, non-surgical alternative to reconstructive surgery, delivering high patient satisfaction and psychosocial benefit. With proper maintenance and periodic review, adhesive retained silicone prostheses continue to serve as a reliable and artistic solution for auricular rehabilitation.

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Legends

Figure 1: Pre-operative missing ear

Figure 2: Alginate impression and plaster backing

Figure 3: Beading and boxing of impression

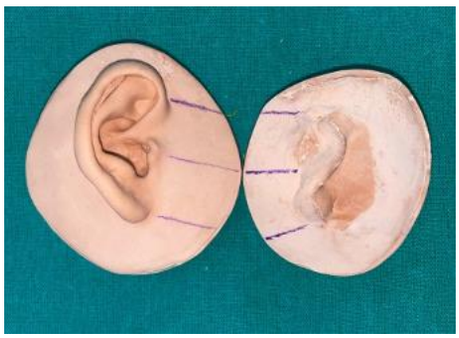

Figure 4: Casts with markings

Figure 5: Wax try-in on model

Figure 6: Wax try-in on patient

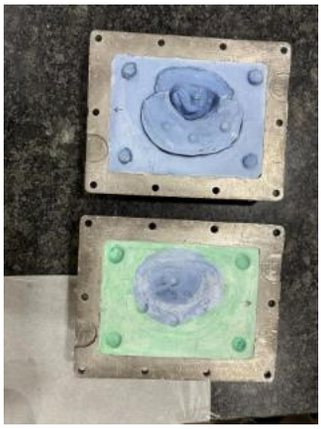

Figure 7: Dewaxing

Figure 8: Shade matching procedure

Figure 9: Post-insertion view showing prosthesis

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Heal Talk

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Basal Implant In Prosthodontics and Crown & Bridge

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Abstract

Background

Basal implantology is an emerging concept in dental implantology that utilizes the basal cortical bone of the maxilla and mandible to achieve bicortical anchorage. Unlike conventional crestal implants, basal implants are single piece systems that allow immediate loading and eliminate the need for bone augmentation procedures, making them suitable for compromised clinical situations.

Objective

This article aims to review the evolution, design principles, clinical applications, and prosthodontic considerations of basal implants in crown and bridge rehabilitation.

Materials and Methods

A comprehensive narrative review of published literature was conducted to evaluate the historical development, implant designs, treatment philosophies, surgical protocols, and prosthetic loading concepts associated with basal implantology. Indications, contraindications, advantages, disadvantages, and biomechanical considerations in maxillary and mandibular restorations were analyzed.

Results

Basal implants demonstrated high primary stability through engagement of cortical bone, enabling immediate functional loading. Advantages included flapless placement, reduced treatment time, minimal surgical trauma, avoidance of ridge augmentation, and a lower incidence of peri-implantitis due to polished implant surfaces. Successful outcomes were reported in patients with atrophied ridges and medically compromised conditions. However, technique sensitivity and limited aesthetic outcomes in single-tooth restorations were noted.

Conclusion

Basal implantology represents a reliable alternative to conventional implant systems, particularly in cases with severe ridge atrophy and systemic limitations. Further long-term clinical studies are required to establish standardized protocols and wider acceptance in routine prosthodontic practice.

Keywords

Basal implants; Bicortical anchorage; Immediate loading; Atrophied ridge; Implant prosthodontics.

Introduction

Basal implantology is a modern implantology system that engages the basal cortical bone of both the jaws for achieving retention of the implant. It is the fixed unalterable frame-work of maxilla and mandibular bone and provides excellent bicortical anchorage, hence basal implantology is also referred to as bicortical implantology. They are used for multiple unit restoration. The advantages of basal implants over conventional implants are that, it is done in a single appointment using a flapless procedure, simple, cost effective procedure which utilizes minimum armamentarium. It provides an infection free zone of bone for implants, greater stress bearing area, lesser resorption rate and a possibility to provide immediate prosthesis, which cannot be achieved with the conventional crestal implants. Moreover, Basal implantology does not require ridge augmentation procedures and they are single piece implants that can be loaded immediately so, the strength provided by the implant is excellent.

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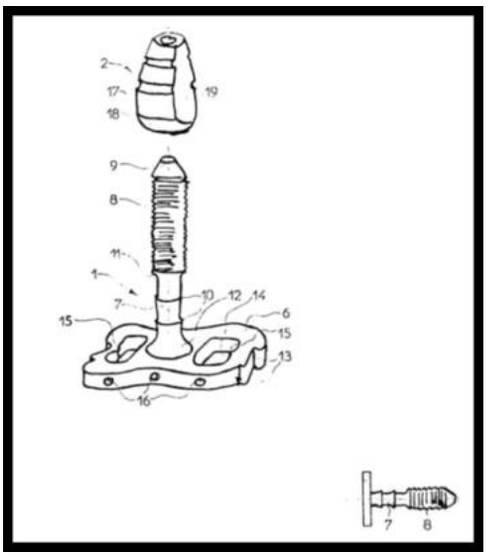
The aim of this library dissertation is to throw light on the newly developing branch of implantology, called the basal implants, which is are volution in the treatment of edentulous space with atrophied ridges.

History

The German and the French dentists were the pioneers in the development of basal implants. The first endosteal implant design that had a lateral insertion path was devised in Italy by Lobello. It had a disk and threaded pin that were inserted separately by lateral insertion path, gaining its stability from the inner and outer cortical bone. It is connected with the help of a screw. The development and the use of single unit implant was done first by Jean-Marc Julliet in 1972. The pin was threaded completely providing no resilience. It was available in only one standard length, with no homogeneous cutting tools available were limited to areas where the base plate anchors both cortical structures. [13]

Later in 1975 Dr. Clunet-Coste manufactured the technique of T-shaped single unit implant. The Eugen Kuhlman company and their subsidiary Zercahad marketed these implants. After the death of Julliet, Zerca had discontinued the production of these implants.

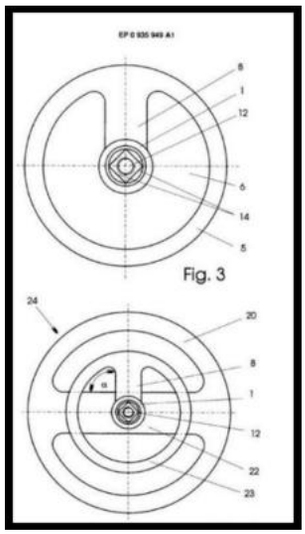


Implant design by Dr. Clunet Coste, France

Scortecci developed cutters and rotationally symmetrical design implants called disk implants. This design included the cutter flutes and a turbine of diameter 1.6mm. Scortecci's company Victory pro

- **ED Series -** with external thread and delicate ribs along shaft. It is available in diameter 5- 15mm. All the implant features round disks with single-, double-, triple- and quadruple disk design with a inter disk distance of 3mm.
- **In 1990 Spatin –** implants with multiple disk design EDD12/8G4 and EDD15/9G4. They were most com-monly used in maxillary restorations.

A major voidin Scortecci concept was of compromised blood supply above the implant, therefore causing inflammatory osteolysis.



Over the years, the basal implants were improved into a single piece implant with a polished surface which helped reduce peri-implantitis and reintegration of implants was possible in case of loosening which could not be done in roughened implant surfaces. This design has an advantage of providing enough elasticity for the development and functional stimulation of the bone. The lateral implants were further modified in 2005, from cemented constructions to screw designs, which are important for maxillo-facial fixation of epitheses. [8,10,14,15]

Materials and Methods

The treatment plan must consider both clinical and economic factors. Currently two distinct philosophies of Basal Osseointegrated Implants can be applied. Treatment philosophy advocated by Idhe, Haas, and Spahnex plains that only four implants should be inserted at strategic positions per jaw. This philosophy does not impede any flexion of the bone that is present in between the implants. Other philosophy by Scortecci, Heuckmann and Maier, aimed to create a rigid implant restoration system by placing maximum number of implants. Both are clinically successful with specific advantages and disadvantages.

Maxillary Restorations

The position of canines and second molars are the strategic are as for implant placement in maxilla. An additional implant can be placed in the nasal spine for anchorage. In the canine position single disk implants with high value, of 9mm disk diameter are placed or triple disk implants of 7mm diameter or larger can be placed EDAS implants of dimension 9×12, 9×14 and 10×14mm are generally used at second molar. Additional support can be gained from pterygoid implants.

Mandibular Restorations

Mandible in general under heavy torsion, a multi-implant strategy would reduce the elasticity of bone. Hence, 4 to 6 implants with one digital implant on either side is preferred.

Mandible should be treated first since

- Retention of complete denture is better in maxilla than mandible
- Implant treatment in maxilla is redundant once mandible is restored.

- Morphological changes in the mandible are substantial due to several adjustments that used to be made.

If both the jaws are inserted with implant, then there is a risk of overloading. Considering the several reasons, the mandible should be restored first.

The prosthetic loading should be done within 8-12days but an attachment is to load the implant after 6-8 weeks of bone healing and repair is completed. A temporary restoration can be placed in the maxilla whereas, the mandible can be restored immediately. [4, 10]

Result

Advantages

1. One piece implants: This concept of one piece implants has led to reduction in the failure of implants due to interface problems between the connection between different parts of the implant.
2. Basal cortical support: these implants take support from the basal bone which has stable and fast repair capacity along with increased resistance to resorption.
3. Compromised ridges: Basal implants are the best treatment modality for atrophied ridges, as the augmentation procedures can be avoided, the outcome of which is unpredictable.
4. Distribution of masticatory forces: The masticatory forces are directly transmitted to the cortical bone, which is the load bearing and distributing area.
5. Peri-implantitis incidence: Peri-implantitis is often seen as a complication of conventional implants due to the rough-ened surface and multiple parts of the implants. The incidence of peri-implantitis is reduced to 98% in case of basal implants due to the polished surface that decreases the accumulation of plaque and bacteria onto the implant surface.
6. Medically compromised individuals: Basal implants have shown great results in patients with diabetes, chronic smokers and chronic periodontitis.
7. Immediate loading: The advantage of basal implants is that the prosthesis can be given immediately within 72 hours of surgery.
8. Minimally invasive: The surgery is minimally invasive with fast healing and less post- operative complications. [14,15]

Disadvantages

1. Compromised aesthetics in case of single tooth replacement.
2. Technique sensitive: A skilled surgeon with good knowledge of the anatomy is required to perform the surgery successfully.
3. May lead to excess bone loss in case of good bone support.[19]

Indications

1. Several missing teeth or indicated for extraction.
2. Failure of Bone augmentation or 2 stage implant placement.
3. Bone atrophies like very thin ridge with crestal Bucco-palatal thickness is less than 2 mm and insufficient bone height. [19]

Contraindications

Absolute Contraindications

1. Patients on drugs like high dose of IV bisphosphonates for osteoporosis / cancer, anti-coagulants, etc.
2. Epileptic patients
3. Patients undergo in radio therapy for cancer.
4. Severe heart disease or stroke within 6 months.
5. Allergy or hypersensitivity reaction to titanium alloy.
6. Acquired immuno suppressive syndrome (AIDS)
7. Age<15 years. [19]

Relative Contraindications

1. Bruxism, clenching, malocclusion, history of fracture of tooth associated with psychological problems.
2. Facial or Trigeminal neuropathy.
3. Uncontrolled diabetes.
4. Lesion of the oral mucous 3 membrane.
5. Smoking
6. Poor oral hygiene
7. Infection of the surrounding teeth (Periodontal pockets, Cysts, Granuloma, etc)[19]

Summary

The demand for the restoration of function and aesthetics of the edentulous patients has kept the branch of implantology in the spotlight in the recent past. Modern dentistry has adapted to restore the various characteristics necessary for masticatory function and proper nutrition intake. The shift in the use of crestal implants to basal implants for the rehabilitation of the edentulous patients was necessary, as there were complex restorative conditions in the geriatri c patients. The several drawbacks of crestal implants and the need for ridge augmentation procedures in the areas with a deficit in bone height has convinced the implantologists for the development of new implants that can be placed using the available bone height, called the basal implants.

Dr. Stefan Idhe in 1997 first developed the lateral basal implants and further made modification to it as it was not completely successful. Basal implants gained excellent bi cortical anchorage from the cortical bone. The various forms of basal implants available are: screw form, disk form, plate form and others like the Tubero pterygoid and the zygoma screw implants. There are two types of known basal implants called the Basal Osseo integrated implants and the Basal cortical screw implants.

The edge of basal implants over the crestal implants is that they are one piece implants, provide bicortical anchorage in compromised ridges, effective resistance to the masticatory load, reduced incidence of peri-implantitis, a minimally invasive procedure with an immediately loaded prosthesis within 72 hours. One of the major applications of basal implants is in medically compromised conditions like diabetes, chronic periodontitis and also in patients with a history of habits such as smoking and consumption of alcohol, wherein the conventional implants are contraindicated. During the placement of these implants, the analysis of the stress distribution is necessary in order to have a thorough knowledge about the amount of load the region can withstand. This is carried out using a finite element analysis.

The armamentarium used are the Periotome (for the uneventful extraction of the teeth), vertical cutters, lateral cutters, twin cutters, combo cutters, Periotest (to access the amount of primary stability achieved) and Osseotensors for the initial bone activation with a diphasic osteogenic effect prior to the implant placement.

The basal implants pose an array of complications like allergic reaction, periimplantitis, risk of infection, intra-operative bleeding, injury to the vital anatomical structures, fracture of bone, swelling, post operative pain, exposure of the disk of the implants, accumulation of the subgingival plaque and calculus due to improper prosthesis and functional overload osteolysis.

Despite the several advantages of the basal implants, the complications overshadow their use in the field of implantology. Hence further research is necessary to overcome these complications and to provide a better and efficient treatment for the

rehabilitation of edentulous ridges.

Conclusion

Basal implantology aligns with the principle of "Primum nihil nocere" ("First, do no harm") and has emerged as a preferred alternative to conventional implants, especially in severely atrophied ridges where bone augmentation would otherwise be necessary. These implants offer advantages such as flapless placement, minimal surgical trauma, and avoidance of critical anatomical structures like the inferior alveolar nerve and pterygoid plates. Their design allows for immediate loading and reduces post-operative complications, including infection. Despite their clinical benefits and versatility, basal implants remain underutilized and are met with skepticism among traditional implantologists, highlighting the need for further research to establish their efficacy as a mainstream solution.

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Campus Talk
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Celebrating World Radiology Day 2025 at DJ Dental College: Honoring Röntgen's Legacy and the Unseen

Oral Medicine and Radiology Department, DJ Dental College, Modinagar

World radiology day celebrated on 8 th November, 2025 marks the anniversary of German physicist Wilhelm Conrad Röntgen's discovery of the existence of X-rays on November 8, 1895.

This groundbreaking discovery, for which he received the first Nobel Prize in Physics in 1901, revolutionized healthcare by allowing doctors to see inside the human body.

Radiologists can see the unseen. Glimpses of the celebration of this day by dept of oral medicine and radiology at DJ dental college. Modinagar .

News

IDST CELEBRATES THE "UNSEEN" POWER OF IMAGING: IGNITING INNOVATION ON WORLD RADIOLOGY DAY 2025!

Basic to Brilliant: Oral Medicine & Radiology Dept. Organizes Power-Packed Day of Learning and Competition

The Department of Oral Medicine & Radiology celebrated International Radiology Day on 10 th November, 2025 under the guardship of Respected Dr. Vikram Gandhi sir (Secretary, DMET) and Principal Dr. Nidhi Agarwal at Institute of Dental Studies & Technologies.

On this occasion, numerous activities, like commencemet of webinar by Dr.Vaishali Keluskar on Basic of Radiology followed by Quiz, Photography & Debate competitions were organized for undergraduate students to break the monotony which saw an enthusiastic response of over 116 participants.

The event was concluded by certificate distribution to the respective winners in each category.

The department of Oral Medicine & Radiology under the leadership of Dr. Upasana Sethi Ahuja is thankful and obliged to the management for giving us the opportunity and supporting us in all endeavors.

47th IDA UP State Dental Conference: A Landmark Event at BHU, Varanasi, India

Varanasi, India – December 7, 2025

The 47th IDA UP State Dental Conference, a significant academic and professional event for the dental community of Uttar Pradesh, successfully concluded its three-day session at the esteemed KN Udupa Auditorium, Institute of Medical Sciences (IMS), Banaras Hindu University (BHU) from December 5th to 7th, 2025. The conference was organized by the Indian Dental Association (IDA) Varanasi branch.

The event saw an impressive turnout, drawing clinicians, academicians, postgraduate and undergraduate students, and industry representatives from across the nation.

Inauguration and Dignitaries

The inaugural ceremony set an inspiring tone, attended by distinguished dignitaries. These included the Chief Guest, other dignitaries from the IDA Head office and IDA state office bearers, and a minister of the UP State Government. Opening remarks highlighted the importance of professional collaboration, research-oriented learning, and continuously evolving clinical standards.

Scientific and Professional Highlights

The core of the conference was a meticulously designed scientific program featuring a diverse combination of sessions, hands-on workshops, interactive exhibitions, and academic presentations.

Key features included:

- Scientific Program: Lectures focused on emerging concepts, evolving methodologies, and innovations aimed at enhancing everyday clinical workflows.
- Academic Presentations: Enthusiastic participation was seen in the paper and poster presentation sessions, which contributed significantly to the academic value.

  Prestigious oration lectures were also delivered by eminent professionals.
- Workshops & Exhibition: Hands-on workshops offered practical exposure to new materials and techniques under expert guidance. A spacious exhibition zone showcased stalls from prominent dental companies, introducing advancements in materials, instruments, and digital solutions.

Special Meetings and New Leadership

A significant feature of the event was the Women Dental Council (WDC) Meeting, where discussions centered on mentorship, leadership pathways, and support initiatives for women in the dental profession.

The conference concluded with the General Body Meeting (GBM) of the IDA UP State branch. The session, which included an overview of the year's achievements and future plans, culminated in the crucial election of the next UP State President.

The Organizing Committee ensured a memorable and successful experience, providing well coordinated hospitality and accommodation for outstation delegates. The cultural programs and Gala Night further enhanced the event, promoting camaraderie and strengthening professional connections.

Dr. TP Chaturvedi, Senior Professor at the Faculty of Dental Sciences, IMS, BHU, served as the Scientific Chairman for the 47th IDA UP State Conference.

Dr. Brijendra Singh, Associate Professor, Department of Periodontology, BBDCODS has won 1st prize in paper presentation entitled " Boosting Gum Health" in the 47th IDA U.P. state Dental Conference organised at B.H.U. Varanasi , U.P. from 5th to 7th December 2025.

Impacting Generations:

Santosh Dental College Celebrates Children's Day with Massive Oral Health Initiative

(11th&15th November 2025)

Ghaziabad, Uttar Pradesh- The Department of Pediatric and Preventive Dentistry at Santosh Dental College and Hospital, Ghaziabad, marked this year's Children's Day (celebrated from November 11th to 15th, 2025) with a comprehensive, five-day event focused on enhancing child oral health and hygiene awareness.

The initiative successfully engaged over 850 participants, including children, parents, and school teachers.

Clinical Interventions and Community Reach

The event moved beyond simple celebration to deliver significant community impact through direct clinical care and extensive outreach

Clinical Care: The department provided preventive dental services to more than **590 children.** This included:

- Over **500 Oral Health Examinations** for early detection and counseling.
- **350 Oral Prophylaxis (Scaling)** procedures to improve oral hygiene.
- **240 Topical Fluoride Applications** to enhance remineralization potential.

Awareness Programs: An intensive, multi-level awareness program was conducted on November 13th, 2025, to educate students, parents, and school educators on critical oral hygiene maintenance and newer preventive dentistry techniques.











Education and Engagement Activities

A multi-faceted approach was used to reinforce learning and evaluate knowledge acquisition across all participant groups.

Quiz and Survey: Competitive and assessment-based activities were organized for BDS students, school children, and teachers to assess their understanding of oral hygiene fundamentals, proper brushing techniques, and preventive dentistry concepts.

Educational Materials: Participants received coloring books, certificates of participation, and comprehensive educational pamphlets featuring evidence-based tips on brushing, flossing, and oral care for family reinforcement.

Slogan Competition: A competition among postgraduate students yielded the winning slogan: **"Celebrating Childhood: One Smile at a Time"**

The Department of Pediatric and Preventive Dentistry highlighted that the event successfully demonstrated **Institutional Excellence** through professional organization and engaged student participation, contributing to the goal of long-term health behaviour change.

Dr. Natasha Gambhir,
Professor & Head,
Dept. of Pediatric and Preventive Dentistry,
Ghaziabad.

Jio Talk

Heal Talk

Save The Girl Child

"Girls are Diamonds. Shape them for the Betterment of the Generation" - Afzal A. Zaidi

The Journey of a Woman: From Small Town to Smiles

In the heart of a modest town, where dreams often seemed distant, a young girl dared to envision a future where she could make a tangible difference. Her story is one of resilience, passion, and the unwavering belief that one's roots do not define their potential. Determined to pursue her dream, she faced numerous challenges. Limited resources, societal expectations, and financial constraints tested her resolve. However, with the support of her family and an unyielding spirit, she excelled in her studies, earning a place in a dental school.

Her journey was not without sacrifices. Late nights of studying, and navigating the complexities of dental education were hurdles she overcame with grace. Each challenge strengthened her commitment to her goal.

In a quiet town wrapped in routine, lived a woman whose dreams flickered like stars in the night distant but always visible. She wasn't born with a silver spoon or grand opportunities.

What she did have was something rarer: an unwavering spark within her, the kind that refuses to dim even in the darkest moments.

Her journey wasn't paved in straight lines. Life threw obstacles doubt, rejection, fear, societal expectations. At times, she questioned her worth. People told her to stay small, to settle, to be "realistic." But every time the world tried to box her in, she pushed back just a little harder. Not with noise, but with quiet resilience.

She began to grow stronger not in loud declarations, but in the silent discipline of early mornings and late nights. She read, learned, worked, failed, and tried again. She discovered that strength isn't just about muscle or bravado. It's in the ability to keep going, to believe in yourself when no one else does, and to rise after falling.

There were sacrifices relationships that didn't understand her ambition, comforts she gave up, moments of deep loneliness. But there was also power in the progress. She met mentors, built allies, and slowly, her dreams began to take form not overnight, but like a sculpture shaped by persistent hands.

Her journey is not unique, and that is its power. It's the story of many women those who rise, grow, and choose their dreams over comfort. She proves that strength is built, not inherited, and that every woman has within her the power to become the hero of her own story.

And so, her journey continues not just as a dreamer, but as a doer. Not just for herself, but for every girl who watches her and thinks,

"If she can do it, may be I can too."

Dr. Akanksha Singh
BDS, MDS
Department of Periodontist & Implantologist
ITS Centre of Dental Studies & Research
Muradnagar, Ghaziabad

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ART & SCIENCE OF SOLVING MCQS

Two schools of thought prevail in regard to the MCQ system of examinations:

School-A: MCQs are the easiest form of conducting an examination because the examiner is kind enough to write the correct answer also along with the question.

School-B: MCQs are the toughest form because the correct answer is well surrounded by closely related other options.

In our MDS entrance exam systems, the examiner clearly asks for the 'most suitable option' in every MCQ.

Art of Solving an MCQ !!

For every MCQ, there are two possible methods of solving it, viz.

Method - 1: Solve the problem directly.

Method - 2: The Process of elimination.

Let's discuss the first option. In general, solving the problem might always be faster than the process of elimination. But, if you are not so comfortable with the topic or the question then choosing elimination will be the best choice.

Method - 1: Solving the Problem Directly

Solving the problem is the most straight forward way to reach your answer as long as you feel comfortable with the lesson or the subject being tested.

It's mainly a two step process:

a. Read the question but don't look at the answer. Try to understand the question. Rephrase it if you don't understand the question and then devise a concrete plan to solve it.

b. Solve the problem.

In simpler words, the first instinct / gut-feeling / Dimaag-mein-Ghanti bajna / Pehla-Khayal etc. etc is basically nothing but the First Correct Answer which comes to our mind immediately after looking at the question – without looking at the options. The success rate with this method accounts for 75-100%. The only critical parameter is the syllabus coverage-extensive coverage means more correct attempts.

Method - 2: The Technique of Elimination

Every MCQ has options in which one is correct. So you need to check each option which one works. On certain occasions working backwards could actually be the faster method then just solving the problem directly.

Do work backward when the question describes an equation of some sort and answer choices are all rather simple numbers. Don't work backwards when dealing with answer choices that contain variables or complicated fractions. This technique can only be mastered by regular practice.

Smart MDS Aspirants follow these kinds of simple strategies right from the beginning which are taught and discussed in reputed institutes like Dr Lall's BDS-2-MDS (www.bds2mds.com) where the faculties come with a strong background of producing Govt. MDS Rankers for 20+ years.

Keep reading this column only in The Heal Talk for more useful information on

- How to Become Rich – Famous – Successful in Dentistry?
- How to Achieve Govt MDS Rank in First Attempt?

Dr Sumit Goel
MDS-Oral Medicine & Maxillofacial Radiology
Proffesor, Department of Oral Medicine & Radiology,
Subharti Dental College,
Meerut, UP.
Mentoring-eaching MDS Aspirants
with Team BDS-2-MDS since 12+ years

Reimagining Dentistry with Artificial Intelligence – An Exclusive with Anurag Gupta

"DRIVING THE FUTURE OF INTELLIGENT DENTISTRY THROUGH INNOVATION AND EMPATHY."

1. KrinosAI is preparing for its U.S. launch soon. What's the larger vision behind this global expansion, and what does it represent for the company?

● Our upcoming entry into the U.S. market marks a defining milestone in KrinosAI's journey. The U.S. is one of the world's most advanced dental ecosystems-entering this market will not only validate our technology globally but also bridge innovation between Indian R&D and international clinical standards.

This expansion reflects our vision of making AI-powered dental diagnostics accessible worldwide, positioning KrinosAI as India's first company to pioneer state-of-the-art AI innovation in dentistry.

2. What inspired the creation of KrinosAI? What gap did you see in the dental industry that led to its inception?

● KrinosAI was founded after realizing a major gap in dental diagnostics-despite having high-end imaging tools like RVG and CBCT, clinicians often face interpretation inconsistencies.

We wanted to create a platform that offers AI-driven precision, speed, and reliability, assisting dentists rather than replacing them. Our goal has always been to bring clinical decision support into every dental clinic, empowering practitioners with confidence and consistency.

3. How do you see the role of AI transforming dentistry over the next 5-10 years?

● AI will become an indispensable partner in dentistry.

From early caries detection to predictive treatment planning and patient management, AI will evolve from a supplementary tool to an integral component of daily clinical practice. Over time, it will redefine workflow efficiency, patient outcomes, and personalized oral care.

Anurag Gupta

Co-Founder & CEO, KrinosAI | Director, Golden Bird Healthcare Pvt. Ltd.

4. What differentiates KrinosAI from other AI platforms in the dental space?

● KrinosAI is built exclusively for dentistry-our deep learning models are trained on diverse, high-quality Indian and global data sets.

Unlike generic imaging solutions, KrinosAI's algorithms interpret both 2D and 3D (CBCT) scans with explainable accuracy. Each diagnostic suggestion is traceable, transparent, and designed for real clinical workflows, maintaining HIPAA and Indian Data Protection compliance throughout.

Heal Talk has been a strong platform for healthcare innovation. Why do you see it as valuable for KrinosAI's journey?

● Heal Talk plays a vital role in bridging science, technology, and clinical practice.

It provides a credible space for innovators and practitioners to share ideas and success stories.

We deeply value platforms like Heal Talk that amplify indigenous innovation and help Indian healthcare startups gain global visibility.

5. How does KrinosAI support clinicians and dental institutions?

● For clinicians, KrinosAI reduces diagnostic uncertainty and identifies early-stage lesions, bone levels, and pathologies with precision.

For dental colleges and institutions, it serves as a powerful educational tool-enabling students and faculty to study radiographs with AI-driven annotations and real-time diagnostic overlays.

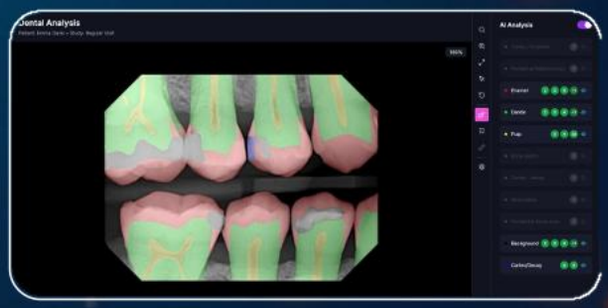
Our collaborations with leading dental institutes in India are helping bridge research and clinical AI adoption.

Reshaping Dentistry With Artificial Intelligence

krinosAi

The Future of Dental Imaging Intelligence

Visionary 2D: Radiograph Analysis



Caries and lesion Detection

Precise detection of caries decay and lesions.

Anatomy Mapping

Differentiates enamel,dentin, pulp, restoration and bone regions. Enhances diagnosis and patient communication.

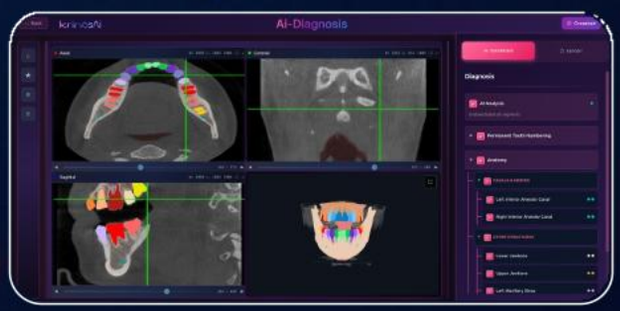
Periapical Analysis

Identifies periapical radiolucency and root anomalies. Improves endodontic planning.

Bone Loss Analysis

Advanced AI algorithms provide precise bone height measurements. Color-coded heatmaps offer intuitive understanding of periodontal conditions.

Visionary 3D: Advanced CBCT



Anatomy Mapping

Precise 3D mapping of teeth, roots, bone and sinuses from CBCT scans.

Nerve & Canal Mapping

Identifies nervesand mapsrootcanals in 3D for enhanced procedural safety.

Empowering clinicians with state-of-the-art analysis of dental RVG X-rays and CBCT scans

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In India, where radiology resources are stretched thin and often impact timely diagnostics, KrinosAI could fill a crucial gap in dentistry. The platform presents an opportunity for countries like India-which is estimated to have just one radiologist for thousands of patients-to access faster, AI-assisted interpretations. Moreover, it's highly cost-effective, making quality diagnostics more accessible and scalable across both urban and rural regions.

6. Many clinics fear new technology adoption. How user-friendly is KrinosAI?

● Our platform is designed for simplicity. Dentists can upload radiographs or CBCT scans and receive structured AI reports within minutes.

No complex setup-just a web-based, intuitive interface with full technical support and onboarding training. Even non-technical users can seamlessly integrate it into their workflow.

7. Tell us about your collaboration with Golden Bird Healthcare and how it strengthens KrinosAI's capabilities.

● Golden Bird Healthcare, through its Dentakris brand, brings over two decades of experience in dental material manufacturing and international exports.

This foundation gives KrinosAI a unique advantage-we combine clinical materials expertise with cutting-edge software innovation, creating an ecosystem that bridges diagnostics, treatment, and education.

8. What challenges do you foresee as KrinosAI enters international markets, and how do you plan to overcome them?

● The biggest challenges include navigating regulatory frameworks, ensuring region-specific compliance, and building local trust.

We're addressing these through strategic partnerships with clinics, universities, and distributors while maintaining rigorous adherence to HIPAA and global data protection laws.

Our approach is not just to expand geographically but to build sustainable collaborations that strengthen local clinical ecosystems.

9. What upcoming features or developments can we expect from KrinosAI?

● We're introducing AI-powered bone loss mapping, lesion segmentation, and treatment recommendation modules that integrate with digital patient records.

Future releases will include predictive analytics and cloud dashboards for mobile and web use-enabling clinicians to personalize care and track patient progress. Beyond technology, KrinosAI is actively collaborating with dental institutions, clinics, imaging centers, and next-generation dentists.

Our goal is to make the AI model more robust through diverse datasets and clinical validation, creating a unified, advanced AI-driven dental ecosystem that benefits practitioners, researchers, and patients alike.

10. What's your biggest learning from building a dental AI company in India?

● The most important learning is that technology must serve clinicians-not the other way around.

Understanding real clinical challenges, patient behavior, and workflow adaptation is crucial.

Innovation without empathy doesn't scale; KrinosAI's success lies in merging technical depth with user trust and clinical validation.

11. What advice would you give to young innovators entering the dental or med-tech AI space?

● Start with the problem, not the product.

Engage with real practitioners, validate early, and never underestimate the value of regulatory compliance and ethical AI.

The true impact of med-tech innovation lies in enhancing human expertise-not replacing it.

About KrinosAI

KrinosAI, a division of Golden Bird Healthcare Pvt. Ltd., is India's first company dedicated to developing state-of-the-art AI software for dental imaging and diagnostics. With deep learning-based analysis of 2D radiographs and 3D CBCT scans, KrinosAI bridges the gap between clinicians, educators, and patients-bringing intelligent, explainable, and accessible AI to modern dentistry.

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At KrinosAI, we believe that collaboration drives innovation.

We warmly invite dental institutions, clinics, imaging centers, and young dental professionals to join us in this AI revolution to co-create, validate, and strengthen India's position as a global leader in intelligent dentistry.

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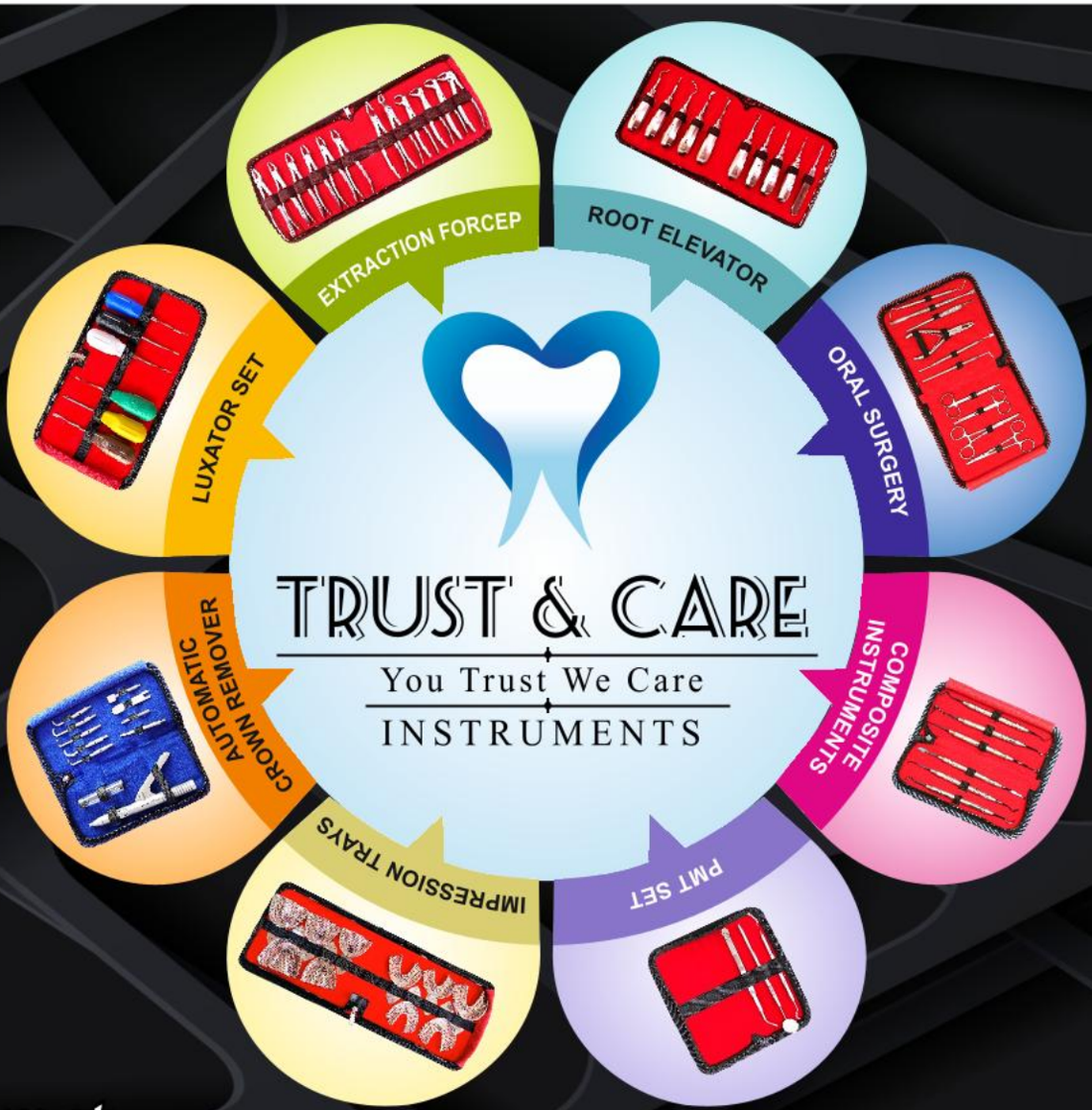

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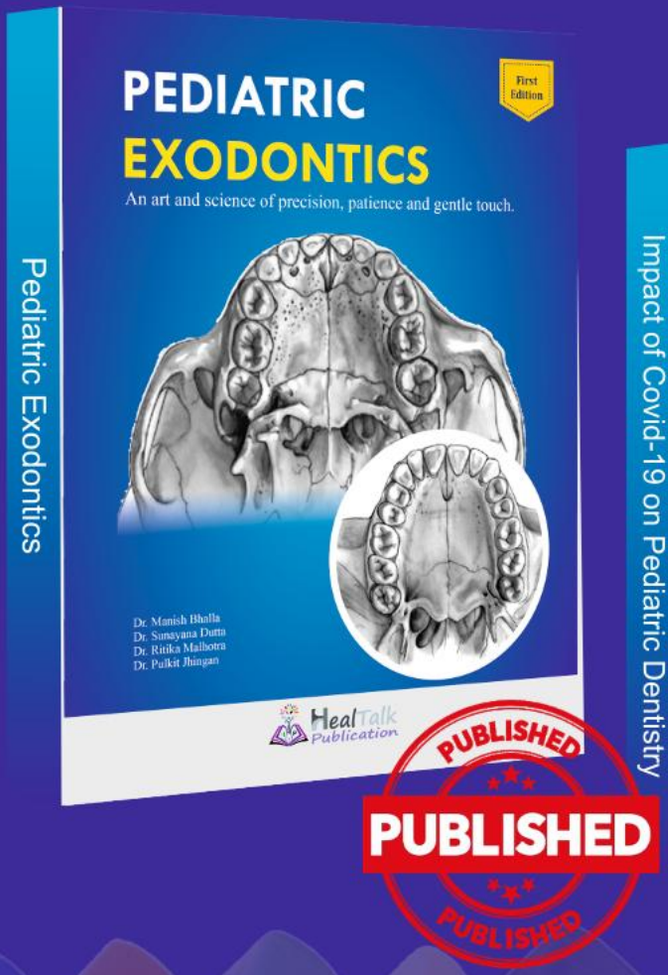

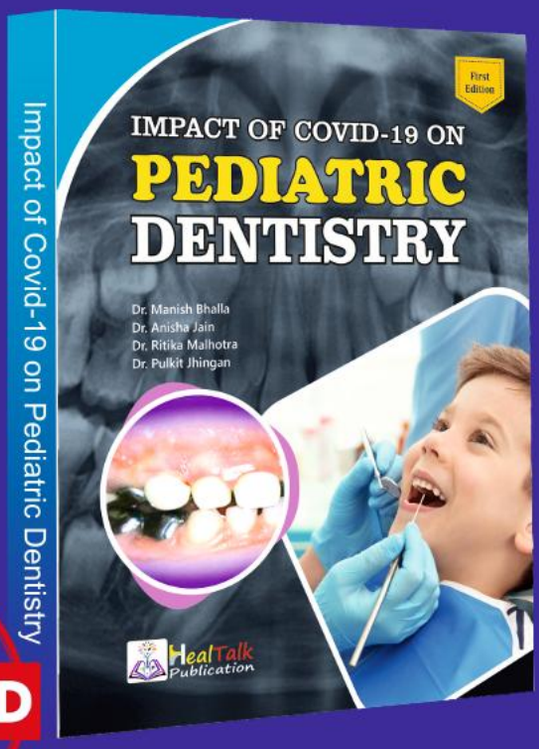

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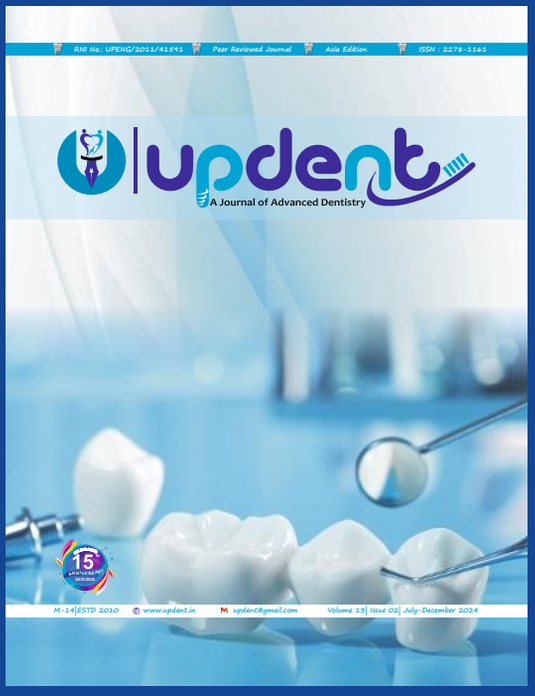

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